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THE EFFECTIVENESS OF INCORPORATING HEALTH AND SAFETY CRITERION IN CONSTRUCTION TENDER EVALUATION

BY

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DECLARATION

I TENDAI ELVIS NYANHETE, student number 217142060, declare that the dissertation entitled: **'The effectiveness of incorporating health and safety criterion in construction tender evaluation'** is my own work and has not been submitted for any other degree or examination in any other University other than the Cape Peninsula University of Technology. I have given full acknowledgment to the sources referred to in my study.

07 January 2021

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Tendai Elvis Nyanhete

DEDICATION

I dedicate this work to my parents Alois Nyanhete and Magaret Nyanhete, for their love and support. They have also inspired me and taught me the value of discipline, self-belief, hard work, and education.

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ABSTRACT

The South African construction industry is faced with challenges that impede the safe delivery of construction projects. While there have been systems, procedures, rules, and regulations enforced to improve the outlook of health and safety on construction projects, the South African construction industry has not fully exploited various routes of tender evaluation practices aligned with H&S to enhance safe project delivery of construction projects. Therefore, this study aims to explore the effective incorporation of H&S criterion in tender evaluation to help improve the safe delivery of construction projects.

This study adopted both the inductive and deductive approaches, whereby the inductive method was used to formulate the hypotheses. The deductive process was used to test the study's hypothesis. The theory of relative importance was engaged to establish the vitality of H&S as a criterion for tender evaluation, together with its essential elements that can be assessed during tender evaluation. Upon determining the importance of the H&S criteria, the inclusion criteria theory was engaged to incorporate H&S criteria and its important elements in tender evaluation. In the early stages of the study, an exploratory study was conducted to gain insight into the effective incorporation of H&S criterion in construction tender evaluation. Content analysis was engaged to find patterns in the qualitative data. A web survey was adopted for the empirical data gathering using questionnaires. Two sets of questionnaires were designed for construction clients and construction practitioners in the Western Cape Province of South Africa. Data analysis was done by means of ranking, paired sample test, ANOVA test, and Principal Component Analysis (PCA). The reliability test was done using Cronbach's alpha coefficient of reliability.

In total, 41 construction clients and 105 construction practitioners participated in the survey. The results emanating from the study, *inter-alia*, indicate that factors of identifying the extent to which H&S criterion is incorporated in tender evaluation can be classified as: technical competence and experience of the contractor, management capability, project efficiency and management capability, quality and insurance policy, financial stability and experience, and technical capacity. The results also indicate that there is ambiguity in the design of tender documentation, H&S is expensive to implement, preference of other criteria, lack of H&S knowledge, lack of client commitment and corrupt activities. Furthermore, the results outlined that there is poor implementation of safety law and regulation, lack of expertise, and insufficient resources are factors that hinder the effective incorporation of H&S criterion in tender evaluation. There was a statistically significant difference between the mean ranking on the motives of including H&S criterion in tender evaluation.

There was no statistically significant difference between the public and private sectors on the motives (time, quality, and cost) of including H&S criterion in tender evaluation. There was no statistically significant difference between public and private sector clients' perception regarding the extent to which H&S is incorporated in tender evaluation. There was no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners. There was no statistically significant difference in the public and private sector's agreement on the hindrances against incorporating H&S criterion in tender evaluation. Further study should focus on weighting and combining quantitative H&S and qualitative H&S for effective incorporation in tender evaluation. Further study should focus on integrating H&S culture in evaluating H&S criterion to ensure effective delivery of construction project in a safe environment.

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LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
ANOVA	Analysis of Test of Variance
BOQ	Bills of Quantities
CIDB	Construction Industry Development Board
CPUT	Cape Peninsula University of Technology
EFA	Exploratory Factor Analysis
F.A.	Factor Analysis
H&S	Health and Safety
KMO	Kaiser-Meyer-Olkin
MCDM	Multi-Criteria Decision Making
MS	Mean Score
PCA	Principal Component analysis
P.A.	Principal Agent
QS	Quantity Surveyor
SPSS	Statistical Package for Social Sciences

DEFINITION OF KEY TERMS

Construction Project: it is an organized process of constructing, refurbishing, renovating, erection, alteration, and demolition of any building or structure which is undertaken under a defined time period and delivered in organized activities and tasks of work packages (Safa, Sabet, Macgillivray, Davidson, Kaczmarczyk, Haas, Gibson, and Rayside, 2015:625).

Health and Safety (H&S): *Health* is the protection of one's physical body and mind from illness emanating from the accessories, procedures, and conditions of the workplace; *Safety* is defined as the state in which hazardous conditions that result in psychological, physical, and material harm are minimised and eliminated to keep the workplace and workers safe (Dėjus & Antuchevičienė, 2013:728).

Tender evaluation: A critical procedure of assessing and comparing tender submissions of different tenders to come up with the best price and best value for executing construction works (Sarker, Chowdury & Deb, 2012:15).

Tender evaluation criteria: these are a set of standard characteristics that are used to compare and assess tenderers in the process of tender evaluation to appoint the most qualifying tenderer to execute the works (CIDB, 2007:8).

CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.1 Background

The improvement of health and safety (H&S) in construction is a multi-faceted motive since, broadly, H&S is a perturb to society's social and economic standing. It also poses massive influence on project determinants as time, cost, and quality (Smallwood, 2002). H&S is now regarded as a fundamental part of every construction project (Ahmed, Kwan & Ming, 2000:35), and yet the construction industry is synonymous with fatal and non-fatal hazards (Pinto, Nunes & Ribeiro, 2011:616). Chileshe and Dzisi (2012:279) postulate that accidents and work-related illnesses cause suffering to the affected worker and their dependence, project delays, production loss, financial losses, and high premiums on insurance. Due to advances in construction processes and procedures, construction projects are becoming sophisticated, and this requires effective strategies and techniques to be implemented to mitigate the deficit of H&S associated with it (Olatunji, Sher, Gu, & Ogunsemi, 2010:141). Thurman and Hinze (2008:5) indicate that research studies have been conducted to improve and create new policies, strategies, and techniques for improving H&S; and these studies have focused mainly on H&S policies, H&S training, culture and attitudes, design for safety, risk, and technology. However, all these policies and strategies depend on the ability and capacity of the contractor to manage H&S, and the contractor's ability to execute the project is determined through a process of tender evaluation where bids are strategically analyzed through specific criteria intended for the project (Puri & Tiwari, 2014:45).

Incorporating H&S in tender evaluation establishes a standardized contractor selection technique based on proven H&S management, safety records, expertise, and capability to deliver safe projects (Smallwood, 1998). Also, Chigara and Smallwood (2016) propounded that the inclusion of H&S in the tender evaluation will minimize construction cost, boost production, and avoid time and cost overruns. Vojtecky and Schmitz (1986:58) allude that it is essential to evaluate H&S training programs used for the project. Elements such as H&S personnel, safety equipment, security features, worksite analysis, hazard and prevention, H&S control plan, and insurances are essential and should be incorporated in tender evaluation (Tam, Tong, Chiu & Fung, 2002). Also, Arnold (2000:8) laid down elements that should be evaluated under H&S to examine the contractor H&S management system document, which includes the work method plan, procedures, policies, and competency records. Furthermore, the analysis should also be based on the H&S management system's authenticity, including contractor H&S audits, plant records, safety meeting plan and accidents; and security of the contractor’s previous H&S performance reports including accident records, H&S infringements, and prosecutions.

Tender evaluation is a complex system and is regarded as a non-static procedure. It varies from one project to another; it considers the nature and duration of the project, the availability of funds, demands of the client, and other attributes (Watt, Kayi & Willey, 2009:250). Tender evaluation is based on the client's attributes and the professional consultancy representing the client (Oladapo & Odeyinka, 2006:108). Traditionally contractor selection was based on the lowest price without considering the contractor's technical ability to execute the project. Chee (2001) opines that basing tender evaluation on price alone does not guarantee effective project delivery. The Multi-criteria Decision-Making approach (MCDM) was established to address the shortcomings of the price evaluation criteria by incorporating criterions such as technical ability, management capacity, reputation, previous experience, and other attributes. H&S is also evaluated as a criterion in the MCDM approach (Chigara & Smallwood, 2016:155; Shen, 2004:385). Inclusion criteria are a technique of incorporating criteria in a study to determine and predict its outcome to include H&S in the tender evaluation process. Through MDCM, relative importance will be used to establish the H&S criteria's essential elements to be engaged in tender evaluation.

South African Construction Industry Development Board (CIDB) outlines four tender evaluation methods used to evaluate construction tenders: financial offer, price and preferences, a balance between price and quality, and finally based on price, quality, and preferences (CIDB, 2008:2). According to the CIDB tender policy, safety is evaluated under quality criterion where tenderers are required to submit a method statement on how they will execute works most efficiently and economically. In the CIDB tender evaluation policy, the H&S plan is a requirement. Failure of a tenderer to submit will render their tender non-compliant and not qualify for further evaluation. Quality is allocated points in the evaluation process, and elements under quality will share the points assigned; each particular element will then be evaluated against its sub-allocated points. Tenderers that fail to score an agreed set score in this criterion will be eliminated and will not make it for feather evaluation (CIDB, 2007:8).

The construction industry has a culture and tendency to award contracts to a tenderer with the least price, which overlooks the effective incorporation of H&S and other criteria (Akortsu, 2011:596). In public sector procurement, tender evaluation processes are influenced by corruption and unethical practices, this limit effective evaluation of H&S and other criteria; as a result, contracts will be awarded to tenderers without adequate H&S experience (Oyewobi, 2011:179; Chigara & Smallwood, 2016:155; Adnan, Hamish, Mohd & Ahamed, 2012:725).

The consulting team working for the client determines the selection criterion used in the tender evaluation process to appoint a contractor based on their required objectives and the desired

output (Chee, 2001:257). Plebankiewicz (2010:58) indicates that clients do not consider elements in tender evaluation with the same importance or value, which is why allocating weights to elements in the evaluation criteria. Both public and private clients in the United Kingdom perceive H&S criterion as reasonably necessary to evaluate civil and building projects. The public sector has cost elements dominating the evaluation criterion (Holt, 1994). Plebankiewicz (2010:62) opines that public clients prefer the financial aspect criterion. In contrast, private clients rank experience criterion first in their tender evaluation processes; in terms of H&S, it is not given substantial priority as technical ability, reputation, financial standing, and management capability are preferred.

Watt, Kayi, and Willey (2009) outline essential aspects of H&S that should be assessed in a tender evaluation as H&S plan, safety incidents, environmental compliance, H&S performance, H&S environmental record, corporate environmental policy, and incident rate. Wells and Hawkins (2014:6) state that H&S should be given an adequate allowance in the Bills of Quantities (BoQ) under a special section and should be assessed under tender evaluation. The Association of South African Quantity Surveyors (ASAQS) (2006) model bill contains an element of the Occupational H&S act under Preliminaries (Bill No.1), which outlines that the contractor should adhere to the Occupation H&S act, 1993 (Act No 85 of 1993) in the construction regulations, 2014. The Model bill also indicates that H&S is a compulsory element of a tender and it should be priced under the sections of the bills of quantities.

The data for this study will be obtained from construction clients and construction practitioners based in the Western cape province of South Africa. The data will be collected through conducting interviews with a selected number of construction practitioners. Also, data will be collected through means of questionnaire distribution. Two sets of questionnaires will be distributed targeting construction practitioners and construction clients. The qualitative data obtained by means of interviews will be analysed using content analysis, and the quantitative data will be analysed using descriptive and inferential statistics.

1.2 Context of the research

Previous research has outlined various problems caused by poor H&S that have consistently prevailed in construction projects (Tam, Tong, Chiu & Fung, 2004). Poor H&S results in fatal and non-fatal accidents, directly impacting construction workers and their families, losses on construction projects, loss of productive time, and high insurance premiums; this affects both the client and contractor (Chileshe, 2012:279). Poor H&S in construction projects usually emanate from but not limited to improperly designed safety policies, poor management

training, the attitude of workers, safety culture, and climate (Wilkins, 2011:1017; Tam *et al.* 2004; Glendon & Litherland, 2001). The identification of poor H&S elements will not be effective in preventing and eliminating hazards in construction projects. Construction stakeholders require an in-depth understanding of the preliminary root cause of poor H&S. Once the cause has been determined with substantial clarity, proactive measures can be implemented to avoid such situations.

Therefore, to attain safe projects within the construction sector, comprehensive studies on the effective selection of contractors to execute works, particularly tender evaluation processes that emphasize safety criterion should be effected. Previously tender evaluation of construction projects used to be evaluated based on price, and this technique is still widely used in evaluating South African construction projects (Ratshisusu, 2014:590). Recognising the lowest bidder's inadequacy on projects, the CIDB in 2008 drafted a guideline for evaluating tender offers that comprise four techniques. The first technique consists of selecting tenders based solely on price, the second technique is based on price and preference, the third is based on a balance between price and quality, and the fourth is based on a balance of price, quality, and preference (CIDB, 2008).

1.3 Problem statement

Regardless of the implementation of H&S procedures and policies in the construction sector to curb accidents that cause fatalities and injuries, poor H&S continues to prevail. However, the client’s perceptions of the relevance of incorporating H&S in tender evaluation has not been adequately explored to deliver safe construction projects. The inclusion of important H&S elements in the tender evaluation will enhance safe project delivery.

1.4 Sub-problems

1. The most important elements that motivate the inclusion of health and safety in tender evaluation are not evident.
2. The extent to which health and safety is incorporated in tender evaluation is not evident.
3. There are significant factors that hinder the incorporation of health and safety criterion in tender evaluation.
4. The extent to which construction clients perceive the reliance of incorporating health and safety in tender evaluation is not evident.
5. The most important aspects of health and safety that should be incorporated in tender evaluation are not evident.

1.5 Research questions

1. What motivates the inclusion of health and safety criterion in tender evaluation?
2. To what extent is health and safety criterion incorporated in tender evaluation.
3. What are the hindrances militating against the incorporation of health and safety criterion in tender evaluation?
4. To what extent do construction clients perceive the relevance of incorporating health and safety in tender evaluation?
5. What are the most important aspects of health and safety that should be incorporated in tender evaluation?

1.6 Research hypothesis

1. There is no statistically significant difference between the mean rankings on the motives of including H&S criterion in tender evaluation.
2. There is no statistically significant difference between public and private sector on the motives (time, quality, and cost) of including H&S criterion in tender evaluation.
3. There is no significant difference between the perception of public and private sector regarding the extent to which H&S is incorporated in tender evaluation.
4. There is no statistically significant difference in the agreement of public and private sector on the hindrances against the incorporation of H&S criterion in tender evaluation.
5. There is no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners.

1.7 Aim

This research aims to assess strategies for effectively incorporating health and safety criterion in tender evaluation to attain safe project delivery.

1.8 Objectives

1. To investigate what motivate the inclusion of health and safety criterion in tender evaluation.
2. To identify at what extent health and safety criterion is incorporated in tender evaluation.
3. To determine the hindrances militating against the incorporation of health and safety criterion in tender evaluation.
4. To investigate the extent to which construction clients perceive the relevance of incorporation of health and safety in tender evaluation.

5. To assess the most important aspects of health and safety that should be incorporated in tender evaluation.

1.9 Theoretical framework & conceptual framework

Figure 1.1 is a combination of the theoretical framework and conceptual framework that outlines the study's theory and knowledge gap. A theoretical framework is a blueprint of the research study based on the existing body of theories that are already proven and links with the study's objectives (Adom, Hussein & Agyem, 2018:438). This study is based on two theories, the first theory being the inclusion criteria theory. Inclusion criteria is a technique based on identified and predefined criteria included in decision-making to produce the desired outcome (Velasco, 2010). Inclusion criteria respond to the study's objectives, which allows it to select and optimize the validity of criteria included in the study. It also minimizes the possibility of the generality of an outcome. In the context of this study, the inclusion criterion is used to incorporate H&S in tender evaluation to eliminate the shortcomings of H&S on project delivery. This study's objective highlights the knowledge gap, outlining that incorporating H&S in tender evaluation regarding effective project delivery is not evident. A conceptual framework is a structure that outlines the flow of a phenomenon under research by exploring the gap missing in the theoretical framework (Baxter & Jack, 2008:553). It shows the variables to be tested, defining the input and the output of the research. The conceptual framework must clearly articulate the link between the variables identified for the study (Adom *et al.,* 2018:439).

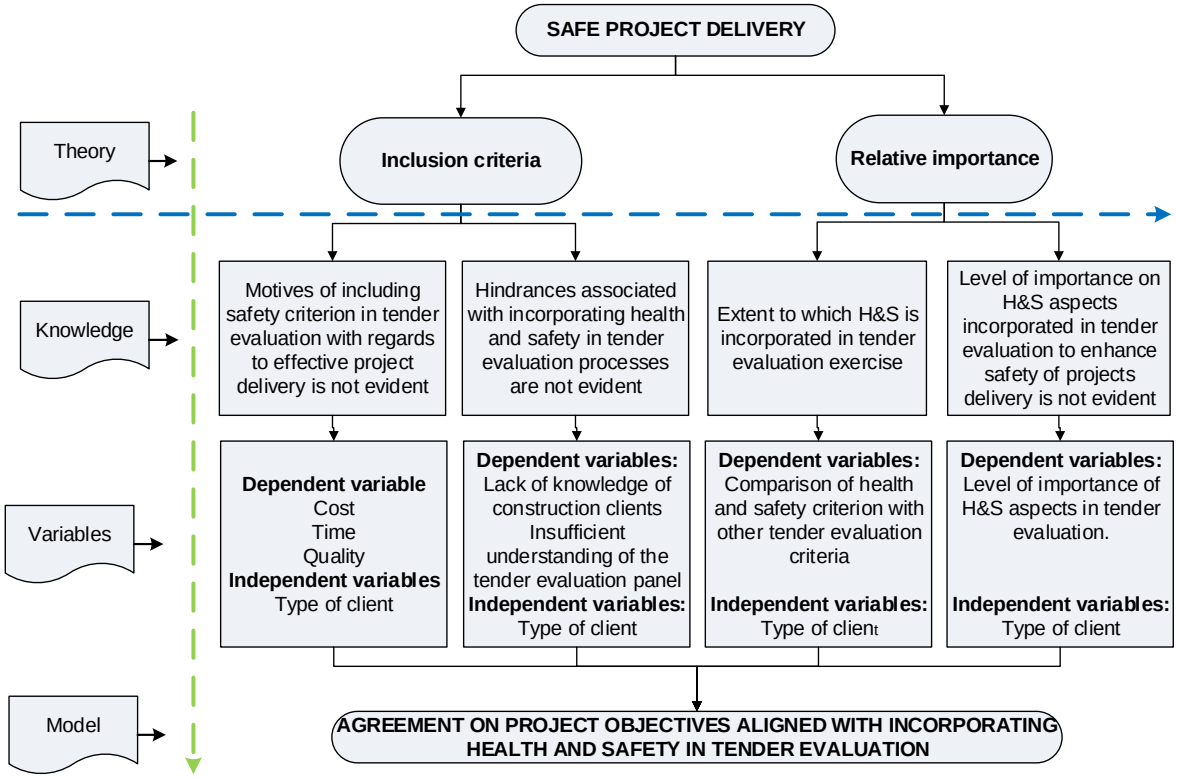

Figure 1. 1: Theoretical and conceptual frameworks

Source: Nyanhete: own figure

Independent variables for this study are the type of client. Depended variables include cost, time, project quality, and lack of knowledge of construction clients, insufficient understanding of the tender evaluation panel, comparison of H&S criterion with other criteria, and the level of importance of H&S aspects in tender evaluation.

The second theory of the study is based on the theory of relative importance. Noghin (1997:355) articulated that the theory of relative importance is a decision-making tool that falls under the multi-criteria decision making. Relative importance is a theory of measurement that ascertains the importance of a criterion over other criteria. To obtain reliable results using the relative importance theory, there is a great need to formulate a logical irreproachable definition of criteria (Goldstein & Beattie, 1991:110). Noghin (1997:355) outline that when deciding with relative importance, it is vital to start by assigning a weighting to criteria, then followed by determining which criterion is more important than other criteria, and finally establishment connections between relationships of results, then the best case will be articulated and motivated by the decision-makers. This study aims to evaluate the significance of H&S criterion compared with other tender evaluation criteria to deliver projects safely and effectively using relative importance.

1.10 Significance

This research study is of great significance to the construction sector as it shows how to effectively incorporate H&S in tender evaluation to achieve efficient and safe projects. Tender evaluation is a critical and crucial process of construction procurement to both the client and the contractor as it determines the overall success of a construction project. Singh and Tiong (2006:999) opine that rigorous assessments of attributes in line with H&S should be implemented in the tender evaluation process. Improved H&S on a project will enhance cost-saving, reduce construction waste, deliver the project within a specified time frame, and fewer accidents (Chan, Chan & Choi, 2010). Findings and recommendations drawn from this study could be implemented in tender evaluation processes so that the significance of H&S would be employed to efficiently and effectively deliver construction projects. The study will also add to the existing body of knowledge and become a reference source to other researchers in formulating studies and further research.

1.11 Limitations

The study is limited to construction professionals and clients in the Western Cape province of South Africa, where several construction professionals and clients will be accessed for

interviews and questionnaire distribution. This limitation is due to the restrained budget and limited time frame on which the research study is conducted.

1.12 Assumptions

- Health and safety is not given justifiable attention in the tender evaluation due to clients preferring criterions such as price, experience, and technical expertise. This has led to adverse impacts on the project in terms of time and cost overruns, and losses on construction projects.
- It is assumed that the Information required from the targeted population will be obtained, and research findings to justify objectives will be drawn from them.

1.13 Ethical statement

This study was conducted within the guidelines and confines of both internationally approved ethical standards and CPUT ethical standards. The research complies with practices that do not harm any part involved, Information obtained from the respondents has been treated with high levels of confidentiality. Moreso, observation of the law was exercised throughout the research process, quality and integrity of research were upheld, consent was obtained from the respondents, and the research process was independent and impartial. Also, the following is assured:

1. Quality and complete research instrument,
2. Quality data capturing and presentation of findings,
3. Good reference practice, and
4. Non-bias and conflicting interests**.**

1.14 Chapter outline

Chapter One: Introduction - The introductory chapter of the research study, it is comprised of the research background, context of research, problem statement, research questions, aim of the research, research objectives, conceptual and theoretical framework, significance of the research, limitations, assumptions, ethical statements, and the chapter outline.

Chapter Two: Literature Review – This chapter presents literature on the tender evaluation process, the criteria used in tender evaluation, H&S as a criterion of tender evaluation, including the benefits of incorporating it. The challenges of incorporating H&S in tender evaluation, perception of clients on incorporating H&S in T.E, and essential aspects of H&S that must be included in T.E have been critically reviewed in this chapter.

Chapter three: research methodology – This chapter outlines the research methods implemented for the study, research strategy, data collection strategy, data analysis techniques, and presentation.

Chapter four: Analysis of exploratory study - This chapter is comprised of the presentation and analysis of the exploratory study conducted at the early stages of the project.

Chapter five: Data presentation and analysis - This chapter presents the research data gathered from the exploratory study, further discussion and analyses of data were conducted, and finally, a discussion of the research findings was conducted.

Chapter six: Hypothesis testing and discussion of findings – This chapter includes an introduction, hypothesis testing, discussion of the findings in the context of the literature review, and a chapter summary.

Chapter seven: Conclusion and recommendations – This chapter is the final chapter where conclusions are drawn and recommendations made based on the data analysis. Limitations of the study, contribution to the body of knowledge, and areas for further research were discussed. The conclusion and recommendations were linked to the problem statement, research questions, and objectives of the research under study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the motives of incorporating H&S in tender evaluation, the extent to which H&S criterion is incorporated in tender evaluation, determining hindrances against the incorporation of H&S criterion in tender evaluation. The extent to which construction clients perceive the relevance of incorporating H&S in tender evaluation and important aspects of H&S incorporated in tender evaluation was also discussed. The literature will review the elements of H&S on how they are assessed and treated when evaluating tender documents. H&S elements are techniques, processes, and procedures that propel the successful implementation of H&S such as management commitment and employee involvement, hazard identification, prevention and control, H&S training, worksite analysis, emergency response, incident reporting, and investigation (Hallowell, 2010:28; Aminbakhsh, Gunduz & Sonmez, 2013:102)

Construction procurement and management systems are very dynamic, resulting in an imperative emphasis on the management of H&S and its incorporation in tender evaluation. Besides the rapid growth of the construction industry, issues regarding H&S seem to be neglected in the process of recommending and awarding construction contracts (Akortsu, 2011:571). The usual traditional criteria for evaluating construction tenderers, which is cost, time, and quality, are still dominant in the construction industry. This is a great impediment to incorporating criteria such as H&S (Jaskowski, Biruk & Bucon, 2010:120). H&S is an important criterion that has equal importance with preferred traditional criteria. Akortsu (2011:577) suggests that H&S should be one of the top four criteria on which tenders should be evaluated and further suggested the implementation of the golden square criterion. This chapter will also discuss the elements of H&S and strategies to implement these elements to incorporate H&S as a criterion of tender evaluation effectively.

2.2 Overview of H&S in the construction industry

Enform (2011:1-2) defines H&S as a system that is systematically implemented to eliminate the risk of injury and illness in the workplace, which is supported by proper planning, implementation, and checks from project inception to completion. H&S is propelled by management involvement and commitment, identification and assessment of hazards, hazard control, training, emergency response, incident reporting and investigation, and well-defined communication channels. Gallagher, Underhill and Rimmer (2003:69) also define occupational safety and health management systems (OSHMS) as a combination of proper planning and

assessment, company management, consultative arrangements, and selected tools and policies and strategies that perfectly link to address and improve H&S performance.

The construction sector is a vital element of most economies worldwide as it contributes to GDP and employment (Bouazza, 2015:1). Oladinrin, Ogunsemi and Aje (2012:50) outline that the construction industry is essential in society's socio-economic development. Despite the advantages the construction industry brings, it is complex, unsafe, and highly dangerous industry where accident frequency rate is very high. The International Labour Organization (ILO, 2005:6) reported that the construction sector accounts for one in every six fatalities across all the industries and 60 000 fatalities occur yearly on construction sites. Afosah (2014:15) points out that the construction sector in industrialized economies accounts for 6-10% of employment and at the same time, it is responsible for 25-40% of work-related deaths.

In the United States of America (USA) alone, over 10 000 fatalities and over 195 000 injuries were recorded in the construction sector between 2001 and 2010. In the United Kingdom (U.K.), the construction sector contributes 5% of total employment, and at the same time, it is responsible for 22% of fatal injuries across all sectors. Also, India despite contributing 7.5% of the global labour force, its construction industry is responsible for 16.4% of fatal injuries in the world (Kanchana, Sivaprakash & Sebastian, 2015:1). South Africa is not an exceptional case in terms of construction H&S concerns. Over the past decade, the construction sector recorded more numbers in terms of fatalities that occur on worksites than other sectors; from 2012 to 2017, the annual average of fatalities that were directly attributed to the construction sector were 39 people *(vanHeerden. 2018:3-4)*.

Ng, Cheng and Skitmore (2005:1354) state that H&S is essential on a project. It helps facilitate safety management, hazard management, identification, safety training and promotion, safety regulation implementation, recording, and reporting of safety issues, emergency plan and procedures, and safety review. Hare, Cameron and Roy (2006:438) opine that including H&S in the project planning phase is essential as it helps in accident prevention and ill health of site personnel which will, in turn, result in overall project success. Kamar, Ahmad, Derus and Khairunnisa (2018:161) outline that H&S is important on any project and if not properly managed it will result in unnecessary increment of project cost, project delays, and impaired company reputation, which result in loss of market share.

2.3 Rationale for incorporating H&S in tender evaluation

2.3.1 H&S impact on project cost

Brook (2012:10-11) outlines that poor H&S is costly on a project as it usually results in legal cost, payment of sick pay, extra wages, overtime working and temporary labour, cost of repairs to plant and equipment, and replacement cost of damaged products and raw materials. In the study of the impact of H&S investment on construction company costs, Mohammadi, Tavakolan and Khosravi (2018:382) determine the link between construction risk reduction variables. These variables include accident prevention cost, the cost associated with accidents, and H&S plan budget. The findings further reveal that high accident prevention cost is directly proportional to the high cost of accidents. Also, accidents rates are proportional to the number of workers and subcontractors engaged on a construction site. The number of construction workers and sub-contractors engaged is proportional to the size of the H&S budget. Establishing these relationships enables the contractor to make sound predictions concerning issues of H&S and hence present a feasible H&S plan and budget in tender evaluation. However, Feng (2013:28) emphasizes the importance of assessing contractor safety investment and performance as it is a culture for contractors to deliberately deflate the cost of H&S. On the other hand, greater demand for H&S in the tender evaluation will lead to contractors' better investment in safety and this in turn directly improves the degree of accident prevention and safety culture on a construction project.

Feng, Zhang and Wu (2015:103) opine that the effects of poor H&S are diverse; they include injuries or any accident on construction sites causing losses to the injured worker, the injured worker's family employer, and the society. Both indirect and direct accidents costs impact the project heavily as they demand a significant percentage of the project cost. To minimize the cost of accidents, the employer should employ a capable contractor with good management relating to health and safety.

Aminbakhsh, Gunduz and Sonmez (2013:100) state that poor H&S has a substantial impact on the cost element of construction projects as it may inflate the total project cost by 15%. Also, huge investments in improving H&S will engulf great portions of the contractor's profit. The contractor should be versed with H&S issues and carefully manage them with cost-benefit analysis in mind while avoiding diminishing returns. Cost-benefit analysis and the diminishing returns help the contractor to evaluate and justify if more investment is required to optimize H&S or to reduce funding if excess money is being spent without improving H&S. Gurcanli, Bilir and Sevim (2015:2) propose an injury prevention budgeting framework that aims to reduce bias decision making when the actual decision is made before commencement of the construction project by the contractor and also this framework can be used by the tender

evaluation panel. The framework is the analytical hierarchy process (AHP) and the theory of cost of saving. The framework, with the aid of AHP dissects the decision problem into a hierarchy of easily understandable sub-problems and assigns them with weights. The AHP will help assert the level of priority on criteria and sub-criteria of safety risk and the cost of safety theory facility in allocating values to the criteria and the overall budgeting of H&S. Furthermore, Gurcanli *et al*. (2015:2) allude that the framework is very instrumental in minimizing injuries. At the same time it is a powerful technique used for budgeting and decision-making of construction projects. However, Aminbakhsh *et al*. (2013:105) contend that the process of engaging the framework is long, tedious, and complicated since it involves pairwise comparisons.

Smallwood and Haupt (2005:3) and Pillay (2014:19) distinguish cost that affects H&S into direct, indirect cost and H&S programs. Direct costs are realized from worker compensation resulting from worker injuries and fatalities. Indirect cost is the cost incurred from loss of productivity, interruption of work schedules, and hiring and training costs. H&S program costs are comprised of salaries of H&S meetings, H&S inspections, medical and clinical personnel, induction processes, PPE, and H&S programs. Table 2.1 shows different variables of H&S that influence directly and indirectly on cost.

Table 2. 1 Direct and indirect cost of health and safety

Direct cost	**Indirect cost**
• workers' compensation, • public liability insurance • property insurances	• Disruption of production due to an accident; • Lower morale effects on co-workers; • Recruitment and training costs to replace workers; • Accident accounting procedures; • Poor quality due to occurrence of an accident; • Reduced productivity of injured workers on light duty; • Product damage; • Plant and equipment damage; • Legal costs; • Transportation of an injured person; • Loss of efficiency of workers; • Overtime working and the use of temporary staff; • Investigation costs; • Loss of expertise and experience

Adopted from (Pillay, 2014:19-22)

2.3.2 H&S impact on time

Brook (2012:10-11) indicates that poor H&S results in lost time and production delays due to increased staff absence, low staff turnover, and increased downtime. Faridi and El-Sayegh (2006:1167) in a study to determine the significant factors that cause delays in the United Arab

Emirates (UAE) construction industry, point out safety as one major key objective of a construction project along with time, cost and quality. According to the authors, if these objectives are jeopardized, they usually cause delays of the project and these delays entail extension of time for the project which leads to extra overheads and in turn increases the cost of the project. Han, Saba, Lee, Mohamed and Peña-Mora (2014:) atest that there is a strong link between safety and production pressure. Production pressure is usually done to obtain more output within the shortest possible time. Arguably, production pressure creates an unstable site as more workforce, machinery, and equipment will be obtained, resulting in congested sites. Notably, when workers work under pressure, they are bound to lapse in concentration and make mistakes; workers are bound to work overtime, and fatigue and poor concentration will affect them. Production pressure if poorly implemented, usually results in poor H&S and impaired H&S constrict production.

Manu, Ankrah, Proverbs and Suresh (2014:77) indicate time pressure and design buildability as the main causes of accident occurrence on construction projects; they further stipulate that time is a resource, and many projects run on a limited time scale. Contractors always try to maximize the use of time as a resource, and they end up increasing the speed of operation, which increases safety risk. However, Durdyev and Hosseini (2019:2) state that poor H&S affects project progress, and it is one of the major causes of construction delays. Cheng, Ryan and Kelly (2012:364), in their study of exploring the perceived influence of safety management practices on project performance in the construction industry, ranked how safety influences project determinants and their results ranked time second from price.

2.3.3 H&S impact on project quality

Brook (2012:10) states that good H&S systems ensure significant long-term business benefits, of which improved work quality is one of them. Wanberg, Harper, Hallowell and Rajendran (2013:1), in a study to determine the relationship between construction safety and quality performance, it was revealed that project cost, quality, safety, and duration are four critical elements that contribute to project success. The objective of their study was to empirically look at the relationship between construction quality and safety performance. They revealed a positive correlation between recordable injury rate and rework; from that, they concluded that a project with poor H&S has more chances of poor quality and vice versa. There is a strong link between reworks as an element of quality and safety because reworks require demolitions, the pressure to recover lost time, this result in unstable work processes.

According to Brook (2012:10), H&S is a major indispensable parameter of the project that complements the successful completion of a project, including achieving project timeframe, budget, and quality without damaging the environment and incurring diseases. Achieving a

project with zero defects as a result of zero injuries is one of the standards obtained from practicing H&S. Quality of a project is measured by the cost of non-conformance, which is the cost of doing things wrong and for H&S it is the cost of accidents (Smallwood, 1999). Smallwood and Haupt (2005:5) also outline a definition of quality as conformance to requirements, and they further allude that project requirements are generic. They include H&S. According to Sumner and Farrell (2003:194), when contractors have limited experience concerning H&S or when they do not fully understand its implication on the project, they under-price H&S. In fact, under-pricing H&S usually affects the project quality. When contractors run out of funds allocated for H&S they compromise other elements, which will lead to reduced quality. A healthy and safe working environment is important in construction projects as it improves the quality of output and other important elements required from a project such as productivity (Ayessaki & Smallwood, 2017:43).

2.4 Overview of tender evaluation in the construction industry

Bergman and Lundberg (2013:73) refer to tender evaluation as a stage in the procurement process in which the client and its representatives go through tenders and identify the best tender meeting the pre-set requirements or the preannounced award criteria, which is either the most economically advantageous or the lowest price. Oladapo and Odeyinka (2006:108) add that tender evaluation is a process that is normally carried out by the client and its professional advisors, and it is critical to the success of the project as it affects the subsequent outcome of the project.

Brook (2012:85-86) indicates that the client determines contractor selection criteria through an evaluation of his requirements. The selection aims to hire a contractor who can execute the works at a competitive price within a desirable timeframe and quality, along with other attributes deemed necessary. When construction clients want to execute a project, they hire a contractor to execute the works on their behalf, and this is done by both parties engaging in a contract. Mathonsi and Thwala (2012:3584) allude that if a client wants to enter into a contract with a contractor, they must first invite contractors to tender. In construction, various contracts are at the disposal of the parties who wants to engage in construction projects. The contract type chosen depends on the procurement route to be taken, the client's needs, and the project type and size. Identifying the procurement route and needs of the clients does not give a guarantee that a project will be successful rather, the client and its representative must select criteria that align with variables deemed necessary to select the best contractor (Pongpeng, 2002:13).

Watt (2009:59) encapsulate that contractor selection is a complex process that differs depending on the project's demands. Criteria used to make decisions in tender evaluation vary

depending on the client and the projects' objectives. Also, Watt (2009:258) in the study of identifying key factors in the evaluation of tenders for projects and services, outlined that there is no universal or right set of criteria for contractor selection. However, Watt (2009) classified criteria into clusters that clients should use to appoint contractors. The categories generated were the contractor's experience, capacity, project management expertise, performance on previous projects, company standing, relations with previous employers, and technical expertise.

Furthermore, each contractor should go through an analysis of H&S, financial standing, and quality control during the tender evaluation process. Adding on, Baranovsky, Tkachenko, Glonti, Levchenko, Bogatyrova, Beridze and Belinskaja (2020:44) outlined that the Ukrainian public sector considers evaluating tenders with aspects that are based on natural, economic, human, and social as opposed to traditional criteria that focus on price alone. Kozik (2019) also outlines criteria for tender evaluation that is evaluated under public procurement as experience, project execution time, and social aspects. Ye, Zeng and Wong (2018:160) outline 34 factors under which tenders can be evaluated. Some of the factors include bid price, bid quality, construction plan, health, safety, environmental measures, technical solutions to key elements, and construction plan.

2.4.1 Construction industry development board (CIDB) methods of tender evaluation

As alluded to in section 2.4, criteria for tender evaluation are not static, it varies from one project to another depending on the nature and type of the project. The South African construction industry development board (CIDB) outlines four methods of evaluating tenders: financial offer, financial offer and preference, financial offer and quality and financial offer, quality, and preferences.

2.4.1.1 Financial offer

Notably, the lowest price criterion is a technique that has long been used by the public sector in the construction sector to award contracts (Brook, 2012:123). Falagario, Sciancalepore, Costantino and Pietroforte (2012:525) stated that tender evaluation for highway projects considers various aspects such as time, quality, experience, capacity, and other criteria. Still, the price will be the underlying criterion in awarding contracts. Private clients are not subjected to their own code of procurement practice, just like public sector clients. Appointing a proficient contractor tender evaluation should be conducted where criteria such as price, technical ability, and economical ability are assessed (Fong & Choi, 2000:551). However, Mbachu (2008:472) states that awarding contracts based on the lowest price is associated with detrimental effects as it leads to cost overruns, time overruns, poor quality, disputes, and ultimately will end up in contract termination. Financial offer does not consider the importance of H&S, thereby being

susceptible to awarding the contract to a tenderer without adequate expertise on H&S leading to high accidents and injuries.

2.4.1.2 Financial offer and preferences

CIDB (2007:2) explains in the preferential procurement policy framework act of 2000 (Act 5 of 2000) that decision in tender evaluation is not based on price only, stating that preferences are scored and applied to the price to determine the tender outcome. Awarding tender based on prices only does not give sound justification that the project will be successfully delivered without disputes, time overruns, and cost overruns (Oladapo & Odeyinka, 2006:109). Instead of basing tender evaluation on price alone to award construction contracts, a multi-criteria technique should be used (Puri & Tiwari, 2014:44). A multi-attribute criterion is a process that collectively draws together all techniques that are required for a contractor to effectively execute the project and assess them in tender evaluation (Tiong, 2005:62). Puri and Tiwari (2014:46) outline H&S as one of the preferences that are assessed in tender evaluation besides prices. By assessing tenders with the multi-criteria technique and including H&S as a criterion, identify the potential contractor that can safely execute the project with minimised injuries and fatalities.

2.4.1.3 Financial offer and quality

Quality is a fundamental aspect that construction clients consider when evaluating contractors in tender evaluation (Brook, 2012:9). CIDB (2007:3) outlines quality as an important criterion when evaluating offers under price and quality where tenders failing to meet the minimum quality requirements are disqualified for feather evaluation. Furthermore, H&S is considered one of the evaluated attributes under quality criteria (CIDB, 2007:7). Quality is evaluated on a score basis, and the score is divided and allocated among its components. Since the H&S method statement is a component of quality, it is allocated allocated points, meaning that it contributes to the success or failure during tendering.

Watt *et al*., (2010:52) outline that quality is one of the most important criteria for tender evaluation. Bergman and Lundberg (2013:74) attest that combining quality and price in evaluating tenders will enhance efficiency in procuring contracts. Quality criterion incorporates quality control procedures, technical merit, safety, aesthetics reliability, and some other depending on the project's demands where each element is allocated weight (CIDB, 2007:4).

2.4.1.4 Financial offer, quality and preferences.

According to CIDB (2007:10), evaluating tenders using the financial offer, quality, and preference is a more holistic approach as there is no dominance of one aspect. The incorporation of financial offer, quality, and preference brings balance in appointing a

contractor for the project, and chances for the project to fail are minimum (Tiong, 2005:62). Regardless of all factors being incorporated, financial offer is allocated more points. Financial offer and quality command 90 points, but of the 90 points, financial offer command 80% and quality commands 20%. Preference will then command the remaining 10 points (CIDB, 2007:10).

2.5 Criteria for tender evaluation

Tender evaluation is a decision-making process that encapsulates various criteria to select the most appropriate contractor to do the work on behalf of the client (Brook, 2012:86). Pongpeng (2002:27) alludes that criteria for contractor selection must be non-biased, they should support the project's objectives and ultimately the project's success. Criteria for contractor selection in the tender evaluation are usually divided into sub-criterion, and in some instances, the sub-criteria are further subdivided; this creates a hierarchy of criteria. A hierarchy creates diversity and a broad pool from which clients can draw specific elements to appoint contractors (Mousakhani . 2018:1747). Sporrong (2011:61-63), Plebankiewicz (2010:59-62), (Watt *et al*., 2010:54) and Pongpeng (2002:27-28) outline criteria for contractor selection with the distinction of private sector client and public sector. Criteria for public clients usually consist of:

- Performance focusing on assessing projects past failures and successes, contractor's previous performance, quality performance of previous projects, project management capacities, skill of personnel available, work management capabilities, and H&S performance;
- The capacity of the contractor to execute the current project at hand, the capacity to add on a new project, manpower resources;
- Location of the contractor's office and site location, familiarity and exposure of the contractor of the geographical location of the project; and
- Financial capacity whereby an assessment of the contractor's finances is done to determine its ability to undertake the project.

Criteria for private sector clients according to Sporrong (2011:61-63), (Watt *et al*., 2010:54) and Pongpeng (2002:27-28) usually consist of:

- Management capability focusing on productivity, the expertise of the staff available, project management ability, company organisation;
- Safety performance policies and records on previously completed projects;
- Availability of resources which incorporates workforce, technical and management expertise, and equipment;
- Performance and competence assessed by evaluation of reference from previously completed projects and level of quality achieved from those projects; and

- Financial capabilities that focus on financial performance and evaluate the tenderer's capacity to assume a new project and the bonding capacity.

In a study conducted to ascertain the decision criteria for selecting main contractors with a purpose of identifying and ranking the actual criteria used by Malaysian clients to select contractors, Idrus, Sodangi and Amran (2011:1358) indicated track performance, financial ability, and technical ability as the most important criteria for selecting contractors. In evaluating green public construction contracts in Poland, they either use the most economically advantageous technique or the lowest tender technique. Concerning the most economically advantageous technique, they consider criteria such as quality, price, aesthetics, and functionality, H&S, project delivery period, environmental characteristics, running cost, and cost-effectiveness (Kozik, 2014:75). Criteria for tender evaluation differ depending on various factors such as the magnitude of the project, type of client, and many other factors.

2.6 Factors influencing criteria for tender evaluation

Watt, Kayi and Willey (2009:250) suggest the nature of the project, project drives, type of client, client's requirements, and building procurement system engaged as the predominant factors that directly and indirectly influence the criteria used in tender evaluation. Dave (2017:489-490) states that many factors affect the choice of criteria used to evaluate construction tenders, including internal, external, and environmental factors. Concerning internal factors, the selection of criteria is based on the client's characteristics, characteristics of the project, and type of contract. The criteria are based on project financing, contractor characteristics, and contractors' experience regarding the external factors. The criteria related to environmental factors include bidding situation, economic situation, and competition. Table 2.2 outlines different characteristics that influence the choice of tender evaluation criteria

Table 2. 2 Factors affecting the choice of tender evaluation criteria

Dimension		**Indicator**
Internal	1. Client Characteristics	1. Type of client (Private/Public) 2. The client requirements 3. Clients' financial capacity 4. Client relationship with contractors
	2. Project Characteristics	5. Size of the contract 6. Project Duration 7. Type of project 8. Methods of construction 9. The project's stakeholder 10. Safety hazards
	3. Contract	11. Type of contract 12. Type of Sub-contractors 13. Penalties 14. Work Structure, Planning, and Specifications

External	1. Project Financing	15. contractor's bid amount 16. The projected cash flow of the project 17. Project Mark-up 18. Percentage of insurance 19. The anticipated value of liquidated damage 20. Tax liability 21. Market Share
	2. Contractor characteristics	22. Financing ability of the contractor 23. Contractor's ability to execute works 24. availability of construction equipment 25. Qualified Personnel 26. Current workload 27. Contractor's competitive advantage
	3. Contractors' Experience	28. Experience of similar project 29. Past profit in a similar job 30. Previous experience with clients
Environment	1. Bidding Situation	31. Required bond capacity 32. Timeframe for bid submission. 33. Bidding document price 34. Bidding methods
	2. Economic Condition	35. Risk involved 36. Overall economic situation 37. Fluctuation in material and labour
	3. Competition	38. Contractors likely to bid for this job 39. Number of contractors invited to bid 40. Market conditions

Adopted from (Dave *et al*., 2017:490)

2.6.1 Nature of the project

Oyegoke, Dickinson, Mcdermott and Rowlinson (2009:339) outlines that the type or nature of a construction project determines the procurement method to be engaged concerning project characteristics, attributes, and criteria. Furthermore, Oyegoke *et al*. (2009:348) irrefutably agree that contractor selection criteria are influenced by choice of procurement system engaged and the nature of the project. Likewise, Salama, Abd El Aziz, El Sawah and El Samadony (2006:532-533) elucidate that contractor selection criterion varies according to the nature of the works and the procurement criteria. They cited the construction of a parallel runway for Kingfors Smith Airport where the design-build system was engaged for the project as an example. In this case, the tender evaluation process's criteria were project management capability, occupational H&S, project delivery capability, and financial capability.

Furthermore, Salama (2006:533) mentioned the construction of a multi-story office facility with an estimated construction price of ten million and four hundred thousand United States Dollars and yearly operation cost of one million seven hundred United States dollars which used the design, build and manage procurement system. This project's selection criteria were price, annual life cycle cost, experience, H&S performance, previous project performance, and completion time. In water-based projects, tenders are best evaluated using technical performance (construction proposal, plan, layout, quality, equipment, environmental protection

measures), qualification assessments (qualified personnel, government awards) and commercial performance (price) (Cheng, Wang & Sun, 2012:59-60). In evaluating tenders of cultural heritage objects, criteria such as experience and qualified employees are very important as they prevent poor quality, disputes, time overruns and cost overruns (Morkunaite, Podvezko & Kututc, 2017:91). Besides the diversity on criteria for tender evaluation, the actual criteria required on projects differ depending on the nature of the project but H&S is a universal criterion essential for every construction project.

2.6.2 Project Drivers

Project drivers have much influence on the tender evaluation criteria to be engaged for each specific project. Clients and their representatives in most cases, determine and select the project drivers. The selected drivers directly determine the tender evaluation criteria (Blismas, Pendlebury, Gibb & Pasquire, 2005:159-160). Common project drivers for construction projects are completion time, project budgeting, and quality standards. Although H&S is considered a constant drive in every project, sometimes it is overshadowed by the time, cost, and quality aspects as shown in Figure 2.1.

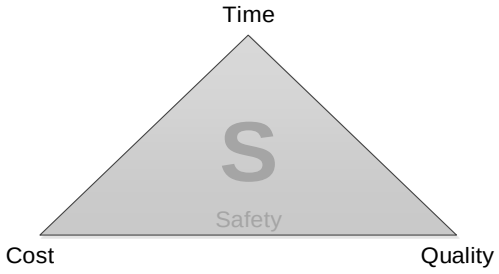

Figure 2. 1: Project Triangle

Adopted from (Blismas et al., 2005:159)

Due to H&S criterion being one of the principal project drivers, it must influence awarding construction projects (Manu, Ankrah, Proverbs and Suresh, 2014:65). Other industries such as mining and manufacturing have adopted safety as a equally important drive as time, cost, and quality. It is depicted in a diamond formation as shown in Figure 2.2.

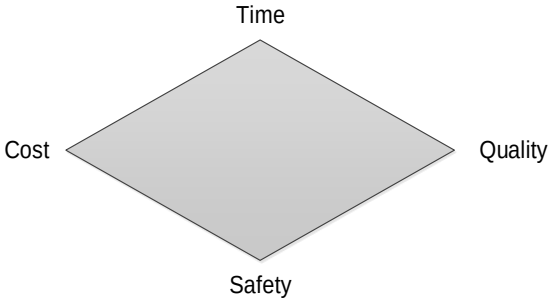

Figure 2. 2: Project Diamond

Adopted from (Blismas et al., 2005:160)

2.6.3 Client characteristics

Chinyio, Olomolaiye, Kometa and Harris (1998:91) distinguished construction clients as small, sporadic, and inexperienced clients as opposed to large, consistent, and experienced clients. Experienced and consistent clients usually want to achieve the best value on a project, and they consider capability as a fundamental criterion of evaluating tenders other than small and inexperienced clients that focus more on price in tender evaluation (Tookey, Murray, Hardcastle & Landford, 2001:21). Experienced clients value sustainability in executing a project that means they take H&S as a serious element of delivering their projects rather than profit-driven private clients. Furthermore, clients are distinguished as either private clients or public clients. Public clients usually evaluate tenders based on the lowest price criteria (Costantino, Falagario, Pietroforte & Sciancalepore, 2011:2). When formulating criteria for tender evaluation, private clients focus more on experience where they want proof of experience since their overall outcome is mainly focused on quality (Plebankiewicz, 2010:61).

It is also important to note that criteria for tender evaluation to be used on a project are determined based on the client's objective (Banaitiene & Banaitis, 2006:280). Chinyio (1998:91) classified construction clients as private, public, and developers, considering their different objectives, they are all concerned with completion timeframe, aesthetics, and safe delivery of the project. Project performance and success depend on the validity of the client's criteria to evaluate contractors in the tendering process (Aje, 2012:164). Public sector clients are synonymous with basing tender evaluation on price criteria, but there has been a shift over the last decade where the public sector clients have reduced the dependence of basing tender evaluation on price only to create fair and genuine competition. However, they are now adopting the most economically advantageous technique that is multi-attribute criteria in evaluating tenders (Sporrong, 2011:65). Plebankiewicz (2010:61) outlines that private sector clients focus mainly on technical ability, reputation, liquidity, H&S, and management capability when evaluating tenders.

2.6.4 Building procurement system engaged

The selection of the best suitable project delivery method has a massive impact on project success (Sari & El-Sayegh, 2007:1). Each building procurement system has its strengths that are based on its preferential demands. Al-reshaid and Kartam (2005:309-310) indicate that the availability of various project delivery methods that respond to vast types of projects depends on the nature of the project and the owner's objectives. Puri and Tiwari (2014:47) stress the importance of accounting for the risk of cost overruns, project delivery time, and quality when procuring a construction project using the construction management at-risk method. *Manu et al*. (2010) opine that management contracting has more impediments than traditional

procurement methods in addressing the maintenance of good H&S. Competitive tendering marginalizes H&S because the market forces of the industry force tenderers to under-price H&S to be competitive enough to win the tender. Procurement strategies influence H&S, and indecorous choices will contribute to the neglect of H&S on the project. Design and build strategy has better incorporation of H&S as it combines both designing and building aspects together, which makes it easy to identify and track elements that need the attention of H&S during the design phase and the construction phase (Smallwood & Venter, 2012:59)

2.7 Evaluating H&S in tender evaluation

Sumner and Farrell (2003:193) outline that the culture of awarding construction projects basing on the lowest price has limited the inclusion of other criteria in tender evaluation. H&S is one of the criteria restricted in tender evaluation, which results in low safety standards and poor quality. Health, safety and Environment (2007:46) indicates that problems that arise in construction projects linked to H&S originate from projects that commence without quantifying and elaborating on H&S elements that are required for the project. When there is no yardstick and structures for measuring and assessing H&S, the process of evaluating H&S to award the contract becomes biased, porous, and inconsistent, and this lead to greater chances of appointing a contractor without adequate knowledge regarding H&S or a contractor with an insufficient H&S bid price to complete the project safely (Brook, 2012:154).

Gowda, Repaka, Gowda and Chandrasekhar (2008:109) emphasize that the selection of contractors with minimum to none accident record on their projects is essential in this era of vibrant and dynamic markets where sophisticated projects are required to be completed within the shortest possible time. The selection of capable contractors in H&S must be done by evaluating factors such as previous contractor safety performance. The selection of most qualifying contractors with safety into consideration is negated in most projects; however, it is a great solution in terms of sustainability and execution of projects economically and efficiently (Xu,Chan & Lam, 2013:177).

Akortsu (2011:572) indicates that construction professionals in the Ghanaian construction industry prefer time, cost, quality, and safety as the main elements that determine project success which must be used to assess tenders. However, in actuality, emphasis is only given to price, time, and quality at safety expense. Regardless of consultants allowing contractors to allocate safety and welfare facilities for the actual assessment of tenders, the tender evaluation panel rarely has an in-depth check on contractor allocation of safety (Omale & Oriye, 2013:75).

According to the South African government gazette of 2018, the process of H&S starts with the client by preparing a H&S specification. A H&S specification is a document prepared by

the client that outlines all H&S requirements of the project; it is done after carrying out safety and risk assessment of the project and it forms part of the tender documents when inviting tenderers to bid for construction works (Hughes, 2007:408). The contractor upon receipt of tender documents including the H&S specification should respond to the outlined requirements of the documents. Basing on the H&S specification, the contractor must draw a H&S plan that best fits and reflect the demands of the H&S specification. The client must assess the tenderer's H&S plan to establish if the tenderer is capable or competent enough to manage the project (Hughes, 2007:402).

The South African government gazette 2018 draws a checklist to evaluate a health & safety plan's adequacy. Table 2.3 summarizes the elements of evaluating H&S to appoint a suitable contractor.

Table 2. 3 Elements of evaluating H&S

	H&S plan sections	**Elements of H&S plan evaluated**
1	Project information	A general description of the project, work program, details of the parties involved, and the project documents.
2	Client requirements for H&S management on project	• H&S Responsibilities • Method statements ` • H&S goals • H&S file • Hazard identification and risk assessments • H&S Communication and consultation • Co-operation between contractors • H&S Monitoring, Inspections, and Review • H&S Training • Permits • Site security and access • Construction employees' facilities • Waste management and handling • Personal Protective Equipment • Working hours • Emergency, first aid, and Medical surveillance • Reporting H&S incidents and accidents
3	Environmental restrictions and existing on-site risks arrangements	• Fall protection and prevention plan • Falling objects • Structures • Temporary works • Excavations • Demolition works • Scaffolding and suspended platforms • Material hoists and cranes • Bulk mixing plant • Construction vehicles and plant • Electrical installations and machinery • Water environments • Housekeeping and general safeguarding: • Stacking and storage

		• Fire precautions • Manual handling of materials • Noise and vibration • Traffic planning • Confined spaces
4	H&S file	Standard of layout and format of the H&S File including maintenance and management

Adopted from the South African Government Gazette (2018)

Arnold (2000:20-21) designed a process flow chart on how H&S is evaluated in Australian city council projects. The flow chat commences with selecting a contract to be engaged, which will entail the source documents required for the project. Tenders will then be assessed following outlined guidelines by examining the documents, verifying the system, and interviewing tenderers. Also, risk assessment and H&S review follow, upon approval of the risk assessment and the H&S review, the contractor will be awarded the contract. This process is well elaborated by a H&S tender evaluation process flow chart in Fig 2.3

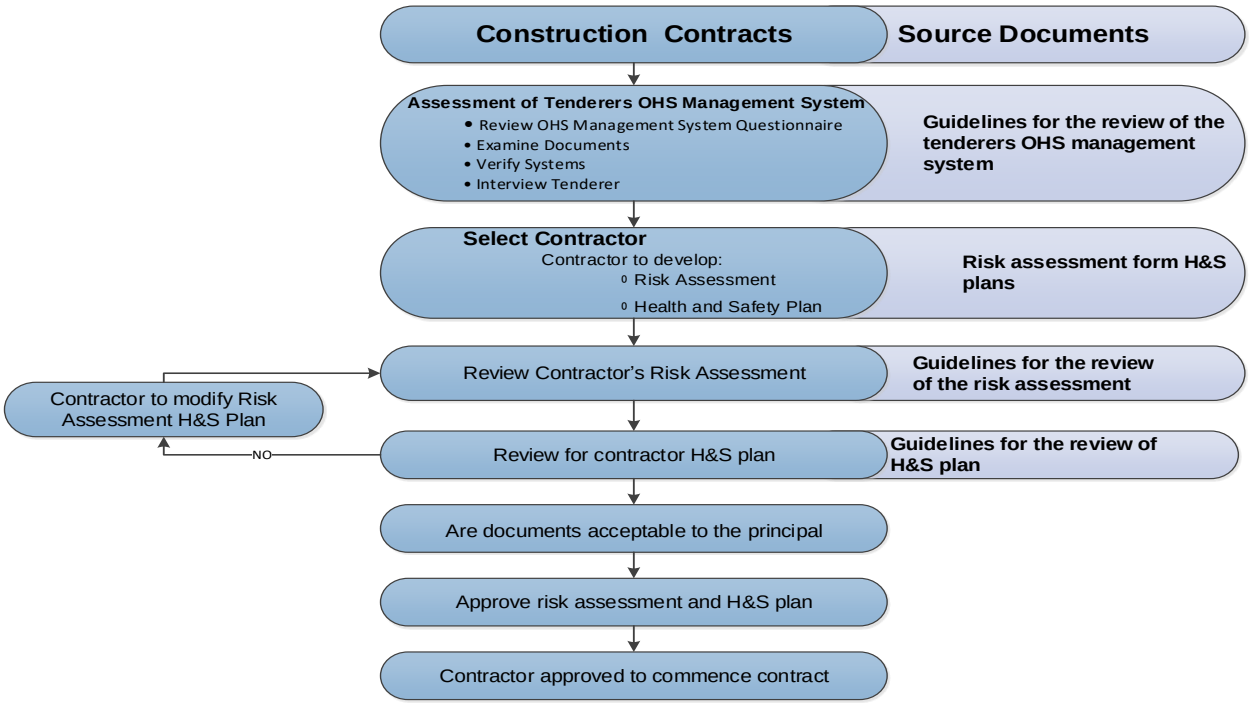

Figure 2. 3: Health and safety tender Evaluation - Process Flow Chart

Adopted from (Arnold, 2000:21)

2.8 Aspects of H&S evaluated in tender evaluation

2.8.1 H&S plan

A H&S plan is a primary document prepared before the commencement of the works, it lays out the management blueprint and strategies regarding how H&S will be implemented in construction projects (Hughes, 2007:402). Griffith and Howarth (2014:5) articulate that the

H&S plan is the cornerstone of delivering safe projects. Dodo (2014:82) asserts that a H&S plan seeks to improve and encourage a high degree of physical, mental, and social health of construction workers. The H&S plan is usually developed with three fundamentals that aim to minimize accidents. These fundamentals include maintenance and encouragement of workers' health and working capacity; improvement of working environment conducive for H&S to be implemented; and facilitating a good working culture and social climate that supports H&S at work and enhances productivity (Friend & Kohn, 2018:1). The guidance on occupational H&S in government procurement states that a H&S plan should clearly describe the contract; outline the structure and system of occupational H&S for the works to be done under the contract; how induction and H&S training will be conducted; safe work practices and procedures for the works to be executed. It should also outline risk assessment for proposed works; H&S inspection schedule for the duration in which works will be executed; H&S consultation procedures to be implemented for the project; emergence plan implemented for the project; incident investigation, recording and reporting procedures. Lastly, it should indicate H&S performance monitoring arrangements to be implemented in project delivery (Australian Safety and Compensation Council, 2006:39).

2.8.1.1 Contract description

In assessing criteria for tender evaluation, in particular, H&S, the description of the works associated with the project should be well-articulated, sufficient detail should be provided giving an overview of the type of work to be conducted and the conditions in which it will be operated under (Robson *et al.* 2001). Usually, the work description outlines a summary of major actives to be executed, a list of specialist tasks, and procedures that require comprehensive H&S processes. Also, the description should show the list of areas of the project that requires specialist H&S perspective such as restricted areas for the members of the public, traffic management, work restriction such as confined spaces and long working hours and, exposure to hazards such as heights, noise areas and dust areas (Australian Safety and Compensation Council, 2006:39).

2.8.1.2 Contractor H&S structure

Laryea (2010:3) indicates that the contractor should outline the structure of its management involved to be involved in the project. The management team should be able to enforce standards and control the system that best fits the contract to ensure that H&S requirements are adequately addressed. The contract should include H&S policies that should prevail on-site; H&S organization and structure that includes names and positions of H&S personnel with their H&S responsibilities; and senior employees who will represent the contractor and liaise with agents on H&S issues (Ahmed *et al*., 2000:41).

2.8.1.3 H&S training

H&S training is an important element of the H&S plan. H&S training for construction workers is essential as it provides workers with an understanding of the nature of work they will be engaged with. The occupational H&S act of 1993 in 2014 construction regulations, section 7.5 mandates the contractor that every employee they engage must undergo H&S induction and training before they enter the site (RSA, 2014:17).

Among sub-criteria evaluated under H&S, safety training is regarded as one of the essential criteria. H&S training encompasses aspects such as safe work practices, hazard identification and preventive measures, proper usage of machinery and equipment, correct usage of personal protective equipment (PPE), and responding strategies in emergencies (Ajayi, 2016:402). Wilbanks (2017:29) indicates that it is difficult for contractors to keep the same labour force as they might hit dry spells in terms of projects, so they only hire the workforce when they have a project. This impediment of failing to keep the same workforce results in contractors hiring new and inexperienced workforce. Usually, 48% of the workforce contractors hire on project inception are new to the construction industry, and they do not have any form of H&S training. Also, 54% of the recruits are exposed and assigned to work with equipment they have not worked with before.

Goldenhar, Moran and Colligan (2001:247-248), in their study of H&S training in a sample of open-shop construction companies, found out that H&S training has a positive impact on construction projects as it reduces accidents and near misses. H&S also improves job performance and improves worker morale, quality of work, and productivity. Despite the benefits of H&S training, most contractors do not understand the importance of training their labour force before project commencement.

Wilkins (2011:1019) States that the majority of construction workers on construction sites have either low or no educational background, and that makes it difficult for them to understand the requirements of H&S without going through H&S training. Also, an assessment of safety management programs was done to determine their effectiveness in improving H&S on construction sites; the assessment findings recommended that managers consider training as a priority.

2.8.1.4 Risk assessment

The Australian Safety and Compensation Council (2006:41) outlines that risk assessment is an integral part of an H&S plan. Risk assessment helps identify hazards associated with the project before commencement of work to determine the extent and level of risk associated with the project to plan and formulate appropriate risk control and mitigation strategies. Carter and

Smith (2006:199) elaborate that each task associated with the project must be assessed and hazards associated with it identified. Hazard identification on any project is essential because it allows preventive measures to be implemented. Before the project starts, risk assessment worksheets must be completed, these worksheets are used to assess possible consequences that can materialism.

Garvey (2001:3-9) outlines steps in which risk worksheets are incorporated as part of the risk assessment to be scrutinized in the tender evaluation as:

- **Document the activity:** the contractor must use the risk assessment worksheet to formulate a step by step strategy to create tasks that will create activity;
- **Identify the hazards:** each task must identify its elements that may injure or harm workers that are involved in the task and others that are in the vicinity;
- **Assess the risk:** once a hazard has been identified, the level of risk to workers involved must be determined. A risk assessment must determine the possible extent of injury or harm that were to occur, such as fatalities, devastating injury, trivial injuries, and near misses;
- **Establish appropriate control measures:** Once a risk has been identified, appropriate corrective measures and systems must be put in place, and high-risk areas must be given priority, and
- **Identify who is responsible:** the personnel responsible for implementing risk corrective measures must be identified and made known across the board.

2.8.1.5 Safe work procedures and practices

Safe work procedures and practices are important aspects that should be established and incorporated in developing a H&S plan and must be adhered to. The safe work procedures must be developed based on the specification and demands of particular project hazards (Australian Safety and Compensation Council, 2006:42).

2.8.1.6 Workplace H&S inspections

H&S inspections are essential in construction projects as they identify hazards and help facilitate control measures. The H&S plan must state the procedures and methods by which construction sites will be inspected. The contractor should provide details of how workplace H&S inspection will be performed during the project such as a checklist to be used, frequency of inspection, team structure to perform the inspections. The methods of dealing with inspection findings, the establishment of hazard reporting procedures for the project, for example report forms, and provision for specific activities and areas targeted for inspection such as plant, heights, hazardous materials (Australian Safety and Compensation Council, 2006:42).

2.8.1.7 H&S consultation

The contractor's strategy for H&S consultation with its employees enables a great mechanism for H&S issues to be dealt with in a way that encourages ownership and prompt resolution. As part of the H&S plan, the contractor must provide a list of its current H&S representatives, details, and H&S personnel and their duties in terms of H&S and details of the contractor's issue resolution processes (Maloney & Cameron, 2003:1).

2.8.1.8 Emergency preparedness procedures and response

Including emergency preparedness and response as a sub-criterion of H&S in the process of tender evaluation increase the chances of delivering a safe project. Construction projects have massive potential for a range of emergencies that can surface both on and off construction sites influenced by the project. Emergencies need to be identified, and procedures to address these emergencies need to be addressed before the project commences. As part of the H&S plan, the tenderer must provide a holistic emergency plan and structure for the project; in that plan, they must specify emergency equipment and their locations such as first aid facilities and fire extinguishers, site register, and clear site routes. H&S facilities such as first aid workplaces and coordinated worksite facilities that are used in case of an emergency such as exit routes and assembly points must be adequately planned (Choudhry, Fang, Ahmed & Asce, 2008:22). Abrahamsson, Hassel and Tehler (2010:18) outline that the contractor's emergency plan should clearly show evacuation procedures, communication and alerting systems, procedures to protect all people on the site, alarms, and notification systems, emergency exit routes, and lighting. For the emergency plan to be fully effective, it must show how workers will be granted adequate training on responding in case of emergencies. Also, tenderers should outline worker training's regularity to constantly remind workers of the emergence drills (Kobes, Helsloot, de Vries & Post 2010:9).

2.8.2 H&S personnel

The importance of H&S personnel is unquestionable on construction projects as they are responsible for managing, monitoring, maintaining, and reporting all aspects of safety (Hohnen & Hasle, 2011:1029). The quality of H&S personnel is very vital in the successful delivery of safe projects, and it must not be compromised. Aje (2012:168) articulated that the client needs to assess a contractors' H&S personnel team's experience and competency before awarding a contract. H&S personnel competency reflects the outcome of project safety. The contractor is mandated to employ H&S personnel such as safety executives and managers, construction H&S officers (CHSO), and safety health and environment representatives (SHE Reps) on every construction project. H&S personnel has different roles in terms of safety but some of their duties are related and they work hand in hand for a common objective of delivering safe construction projects (Aksorn & Hadikusumo, 2008:716).

SHE representatives are workers employed to represent the H&S interest of workers in construction projects. Their main duties are to conduct H&S audits, identify potential hazards associated with work, investigate H&S incidents, conduct H&S inspections, and provide recommendations regarding H&S (Goh & Chua, 2013:461; Blewett & O'Keeffe, 2011:1015). Construction H&S officer's primary responsibility is to help foster a safer work environment by ensuring that works follow established policies and safety guidelines. Also, as part of their duties, they are responsible for policy and regulation maintenance, site safety inspection, accident investigation, training of construction safety officer, and record keeping (Hadidi & Khater, 2015:117)

2.8.3 Personal protective equipment (PPE)

Tanko and Anigbogu (2012:1342) refer to personal protective equipment as all clothing or accessories used by workers on-site to protect them against H&S hazards to which they are exposed. PPE usually include safety helmets, visible clothing, dust mask, safety shoes, safety harness, and eye protection.

Construction is a hazard-prone industry, and it is associated with high statistics of poor H&S, which has resulted in mandatory use of PPE full gear by every construction worker to reduce chances of injuries, diseases, and fatalities (Hinze, Hallowell & Baud, 2013:2). Ali (2018:iv) also indicates that PPE is one of the main important factors incorporated in tender evaluation and safety performance.

When evaluating H&S for a project, aspects such as the nature, type, and size of construction projects are important. They determine the type of H&S programs and procedures to be engaged through risk assessments. PPE to be used for the project is also determined according to the project's nature and type (Toutounchian, Abbaspour, Dana & Abedi, 2018:39). Every duty that a worker is assigned to on a construction site has some degree of danger, and they should be protected from it by providing them with necessary and adequate PPE (Shamsuddin, Ismail, Norzaimi & Ibrahim, 2015:626). Table 2.4 shows PPE that should be provided in different conditions.

Table 2. 4 PPEs Classification according to H&S condition

Item	Condition	PPE requirement
1	General site condition	Reflective work suit, safety shoes, hard hat
2	Rainy condition	Raincoats,
3	Concrete mixing	Gumboots, concrete gloves, goggles
4	Heights	Safety harnesses, safety belts, safety hooks, and fall arresters

5	Dust conditions	Dust musk, respirators
6	Noise conditions	Ear-muffs, ear-plugs
7	Electrical work	Flame-resistant and non-current conducting work suits, safety shoes, gloves with leather protectors, safety glasses, face shields, hard hats, insulating (rubber), insulating sleeves,

Adopted from (Brouwer, Marquart & VanHemmen, 2001:543-544)

In most cases, workers are protected from physical injuries because they are noticeable as they occur. However, little concern is given to health hazards that affect workers' internal biology as they do not manifest immediately but take time to be evident. H&S aspects that affect internal biologies such as cancer and asbestosis have devastating effects on the construction workers as they will live the rest of their lives nurturing these diseases (Senso, 2017:12).

Contractors must be assessed on how they incorporate the cost of PPE on their projects cost during tender evaluation. Ulang, Salim, Baharum and Agus Salim (2014:2) state that the contractor must make sure that every worker understands the importance of PPE, and if they do not understand how to use it correctly, the employer must offer training to those workers. Also, Pandey, Paudyal and Campus (2018:104) outline that construction workers require training that is focused on the correct use of PPE. Workers must be educated on the importance of PPE, the type of PPE to use that best suit the task they are engaged, the correct way of using their PPE, care and maintenance of the PPE and the life span of the PPE they are using.

2.8.4 Contractor Injury History

Wilbanks (2017:25) opine that construction clients and their representatives must pay great attention when evaluating a contractor’s injury history and safety experience. Injury history can be used to measure how the contractor manages H&S issues and how they protect their workers on site. Under injury history criterion, they focus on Injury rates; injuries are usually analysed in terms of quantifiable data by counting the number of injuries occurring in a specific time period. Also, assessment of the level of severity and reason of occurrence are analysed. Data required to evaluate injury history usually include records of fatalities and injury rates, incident rates, worker compensation, and worker absenteeism due to H&S incidents (Shannon, Mayr & Haines, 1997:201). Ng . (2005:1348) outlines that poor incident rates are direct highlighters of the contractor's performance and contractor history determines their behaviour.

However, Bowen, Akintoye, Pearl and Edwards (2007:631) indicate that since H&S reports, accidents, and incident rates are self-reported by the contractor, there are high chances of dishonesty by either deliberately excluding implicating information or by falsifying documents.

Misleading statistics will lead to poor credibility of the tender evaluation process and possibly appointing a contractor with poor H&S capabilities. Wilbanks (2017:27) brings out an example of a Cleveland wrecking company that did not disclose an accident during the demolition of a power plant. Though this was later discovered, Cleveland had gained an advantage over other competing bidders.

2.8.5 H&S Signs and signals

Cigularov, chen and Rosecrance (2010:1503) state that safety communication on construction sites is an important contributor to overall workplace safety. Also, Huang (2018:359) indicates that safety communication reflects the outcome of a safe climate on a construction site. When there is poor safety communication, safety climate is impaired, and to avoid this, proper communication techniques must be employed. The benefits H&S signs and signals greatly impact improving the overall outlook of a project H&S; hence, it must be part of sub-criteria that are evaluated under H&S criterion.

Bust, Gibb and Pink (2008:586- 591) state that safety engineers introduced the use of safety posters in the 1920s to alert workers of the possible hazards on-site to prevent them. The safety engineers believed that an informed worker could perform the job safer. In the United Kingdom (UK) more than 50% of construction laborers are foreign nationals with little understanding of English. H&S managers identified that visual communication in construction sites is essential because they eliminate language barriers and accommodate illiterate workers. Pictures and visual amination are proved appealing as they capture the workers' attention while conveying information (Bust *et al*. 2008:591).

The HSE (2015:7) outlines that the European Union members states in 1992 were mandated to use standardized H&S signs in construction sites. This regulation was covered in the H&S at work Act 1974. The regulation incorporated vast H&S communication channels such as illuminated safety signs and acoustic signals, e.g. spoken communication and fire alarms. Safety signs were categorized depending on the type of information they convey as outlined in Table 2.5.

Table 2. 5 H&S signs and signals

Type	Shape	Colour	Pictograms
Prohibition signs These signs prohibit actions detrimental to safety no smoking	Circle	Red with a white background red band and crossbar	
warning signs These signs give warning of potential risk triangular	Triangle	Yellow with black symbol or text	
mandatory signs Signs that require actions or activities that will contribute towards safety	Circle	Blue with symbol or text in white	
safe conditions signs These signs indicate exits routes in the event of fire or emergency	Rectangle	Green with white symbols or text	
fire equipment signs These signs are used to indicate the location of fire equipment	Rectangle or circle	Red with symbol or text	
Supplementary information signs	Rectangle	Gree, red, yellow with white or black text	

Adopted from (HSE, 2015)

2.8.6 Insurance cost

Odeyinka (2000:519) states that risk is inherent in human activities and construction activities are no exception, instead construction is one of the highest risk-bearing sectors. Construction risks are broad and diverse, and their nature requires comprehensive strategies to cater to them to ensure smooth flow of actives during works, also in cases of accidents the stakeholders involved will be protected. Zavadskas, Turskis and Tamošaitiene (2010:33) further allude that risk in construction is very high, and besides strategies implemented to identify and eliminate them, it has proved to be difficult to eliminate all possible risk. To remedy and combat the effects of risk in construction projects, the construction sector sets various laws that certain forms of insurance must be employed.

Naphade and Bhangale (2013:68) defined insurance as an agreement by which one party (insurer) undertakes to provide a guarantee of reimbursing another party (beneficiary) for specified loss, damage, illness, or death under which the beneficiary pays a stipulated premium to the insurer on terms agreed. The purpose of insurance is to transfer a particular risk from the beneficiary to the insurer in the course of completing works just in case of an accident occurring for a certain premium (Malik, 2011:316)

Janani (2017:87), in a study of establishing a decision support system for contract bidding and selection in construction projects he outlined a list of data that forms part of contract documents a contractor should submit for bid evaluation. Insurance formed part of these documents and was deemed mandatory.

The diversity of risk in construction requires various protection systems, and hence different insurances are available such as a contractor's all risk insurance, public liability insurance, plant and machinery insurance, and worker compensation should be implemented.

- **Contractor's all-risk insurance:** this is general construction insurance covering all the project's construction works. The contractor effects this insurance to cover them against any possible accident or mishap during the project. This insurance is mandatory on construction projects, the contractor must submit proof of insurance with other tender documents for bid evaluation, and failure to submit might render their bid nonresponsive (Perera, Rathnayake and Rameezdeen, 2010:24-25)
- **Public liability insurance**: This insurance is for third parties enforced to cover the contractor from injury, harm, death of other people, and property of parties other than the insured employees (Everett & Frank Jr, 1996:160). This form of insurance is essential, and it is a requirement for contractors to have it before the commencement of works. Proof of its availability must be part of tender documents the contractors submit for bid evaluation.
- **Plant and machinery insurance:** If a construction project is big and sophisticated, it usually requires plant and machinery to make work easy and faster. Where there is the use of plant and machinery, there are associated risks that must be covered to protect the plant itself. Plant and machinery insurance is required as part of tender documents submitted for bid evaluation because it gives the client surety that the project will not fail because of damage of contractor’s equipment failing (Imriyas, 2009:4025).
- **Worker compensation:** The contractor effects this insurance to cover its employees during their employment against accidents that they are exposed to, resulting in injuries, diseases, and death by providing them with compensation (Im, Kwon, Kim, KIm, Ju & Lee, 2009).

2.8.7 Safe work method statement

The OHS regulations mandate that a safe work method statement should form part of contractor submissions when tendering for work. The safe work method statement identifies high-risk work; states the hazards and risks to health or safety of that work; sufficiently describes measures to control those risks; describes how the risk control measures are to be implemented (Borys, 2012:210-212).

2.8.8 H&S Study

According to Reyes, San-José, Cuadrado and Sancibrian (2014:228), the H&S study is an assessment of the constructive system documents. The contractor prepares the H&S study, and it provides details and measures that will allow a smooth flow of work to be done concerning safe project delivery. This study is prepared before project commencement and is a requirement in tender evaluation; however, it is not a once-off thing as necessary modifications can be implemented throughout the project. Since H&S study is a major indicator that is assessed under H&S criteria it should outline risk identification activities, evaluation of risk, and risk prevention plan.

2.8.9 Remedial response to H&S

Dodo (2014:81) opines that H&S is an inevitable element of construction procedures. Due to rapid changes in the construction sector, there is now mass hiring, and some of the workers have no experience with construction works. Construction projects have become more vulnerable to accidents, and this requires a remedial response to be always available. Charehzehi and Ahankoob (2012:303) outline that the certainty of poor H&S on construction sites is preventable by analyzing possible hazards and then putting in place remedial techniques and strategies.

Most construction materials are manufactured with hazardous substances such as chemicals, acids, gases, etc. Regardless of workers being provided with PPE to some extent, they are still exposed to these substances; that's why there should always be an alert remedial response on every construction project to act in cases of accidents and undetermined contamination that causes harm (Naidu, 2013:1-2).

2.8.10 H&S coordination

Zhang and Fang (2013:104) state that the H&S coordination plan is comprised of a list of names, positions, and duties of people who will have massive influence for H&S. Ulang (2005:4-5) indicates that a systematic arrangement for coordinating H&S personnel engaged in the project must be well elaborated. Also, there must be precise arrangements for managing H&S incidents upon their occurrence and developing and clarifying site safety rules and ensuring that every stakeholder in the site understand the rules.

2.9 Hindrances of incorporating H&S in tender evaluation

According to Esteves and Barclay (2011:212), it is important to assess how different criteria are incorporated in tender evaluation. Including H&S as a criterion of tender evaluation is not easy, it requires great effort from both the employer and tenderers. Ruparathna and Hewage (2015:419) identify challenges of incorporating H&S criteria in the tender evaluation as lack of understanding, lack of information, and lack of commitment to H&S. Also, it is because of insufficient and inconsistent policies on H&S, the vagueness of H&S tender documents, lack of sufficient time to address H&S documents, insufficient research and development of H&S issues and, separation of H&S technicalities and H&S pricing.

Pongpeng and Liston (2003:21) state that tender evaluation lacks realistic working models capable of incorporating risk and uncertainty. They drew a model in which they showed how clients either hinder or facilitate incorporation of H&S in appointing contractors as shown in Fig 2.4.

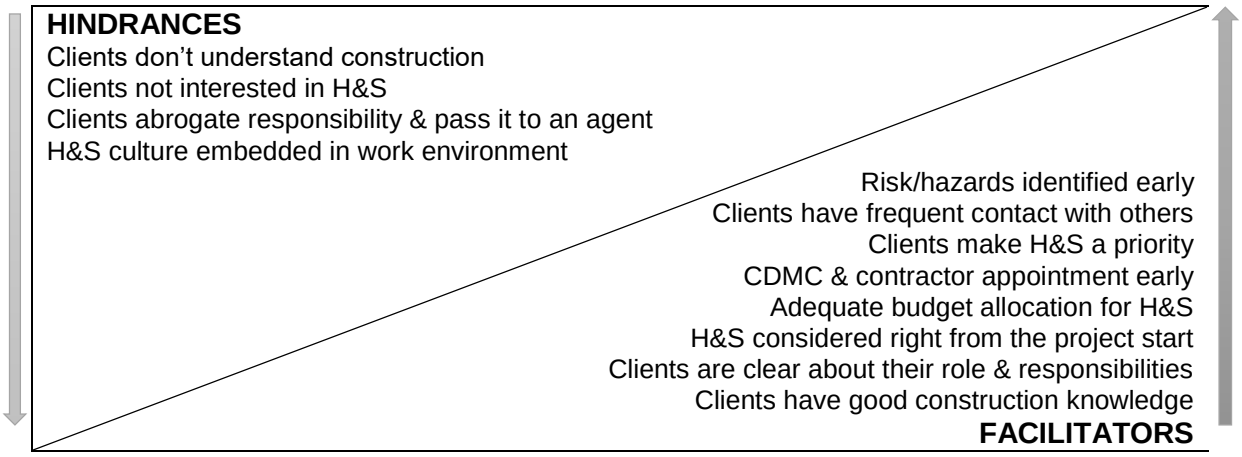

Figure 2. 4: Main hindrances to and facilitators of incorporate H&S in tender evaluation

Adopted from: Shamsuddin, Ismail, Norzaimi and bin Ibrahim (2015:624)

Sunindijo (2015:112), in a study of improving safety among small organizations in the construction industry, mentions the use of the lowest bid technique to evaluate tender submissions as one of the topmost barriers of incorporating safety in assessing tenderers and ultimately archiving safe projects. Poor client commitment to safety is a huge reason for poor safety performance in construction projects. Most clients focus on getting the job done as soon as possible and as quickly as possible if contractors notice that the client is reluctant about H&S aspects, they usually bypass and neglect H&S aspects (Sunindijo, 2015:112).

2.9.1 Corruption

Osei-Tutu, Badu and Owusu-Manu (2010:240) define corruption as a social phenomenon that promotes an undemocratic environment characterized by uncertainties, irregularities, and poor moral values and, disrespect for rules and guidelines. In its raw form, corruption is an unethical and illegal practice and activities that transpire in executing official duties or handling commercial or public transactions.

Corruption is prevalent both in the private and public sectors. According to Bowen, Edwards & Cattell (2012:888), corruption is equivalent to 5% of global economic output, which equates to US$1.5 trillion per year. Its adverse effects result in low economic growth, stifled investment, poor service delivery, inefficient projects coupled with H&S hazards, income inequality, poverty.

According to Mantzaris (2014:71); Woods and Mantzaris (2012:123), corrupt practices specific to procurement transactions include bribery, extortion, embezzlement, nepotism, patronage systems, fraud, kickback schemes, false invoices, overpaying, fronting in black economic empowerment (BEE) companies, inflated prices, unnecessary purchases, payments made for goods or services not received, ghost suppliers on the preferred suppliers' list, the use of shell companies, and facilitation fees required by state officials. Asiedu & Deffor (2017:82) outlines that corrupt practices impede the effective implementation of H&S regulation and environmental regulation for a project.

Groenewald, (2011) cites how the Matlosana Municipality awarded a tender of R20,6 million to Ke A Dira Construction & Civil Engineering in a manner that was deemed fraudulent. Several irregularities were pointed out in which the tender was awarded, and substantial proof was provided that tender documents changed hands to meet tender requirements. Also, submissions of missing tender documents after the tender closing date were done; the contractors did not provide all the tender requirements. furthermore, there was forgery and falsification done on the list of trade references provided. Upon discovery of the fraud, it was advised that the contract must be terminated, and failure to do so, the case will be elevated to the public protector

Bowen, Edwards and Cattell (2012:887) outline that there is no strategic system or technique that can ultimately eliminate, detect, and prevent corruption. However, they opine that implementing rigorous auditing system will be a good solution to combat inflation, but the issue of adequately sourcing such systems becomes expensive, which is a drawback.

2.9.2 Contractor management capabilities

2.9.2.1 Environmental management system

Joslin and Müller (2016:374) define project environment as the vicinity in which a project is being conducted and its connections; these include land, air space, water, natural resources. Also, aspects such as social, political, and economy are within the project environment's boundaries. Environmental management is broad, and some of its aspects are difficult to assess during tender evaluation, and they affect safety on construction sites either directly or indirectly (Phoya, 2012:6-7). Environmental factors can be defined before project commencement, but in some instances, there can be unexpected elements not forecasted, such as storms, tornadoes, and unforeseen ground conditions. Table 2.6 shows environmental management aspects that should be analysed in tender evaluation, but their degree of accuracy or predictability is hard to determine when evaluating H&S elements of a project.

Table 2. 6 Environment management factors

Environmental Factors	Aspects of Environmental Factors
Environmental factors	• Conservation restrictions • Weather conditions (wind, temperature, rain, etc.) • Natural disaster (flood, earthquake, etc.) • Geological conditions • Unforeseen ground conditions
Political environment factors	• Changes in government policies (environmental protection, sustainability, waste recycle) • Changes in legislation on employment, and working conditions • Delays in planning permission approval
Social environment factors	• Demography change and its impact on labour demand and supply • Skill shortage on certain trades • Opposition of neighbouring community
Economic environment factors	• Economic development cycle and its impact on demand • Inflation impact on material, equipment, and labour price fluctuation • Market competition
Technological environment factors	• New materials • New construction methods • Technology

Source: (Pheng & Chuan, 2006:28-29)

2.9.2.3 Risk management

Risk management is a subject that is rare to most construction contractors which makes it difficult for them to prepare a detailed risk management plan that can be assessed in tender evaluation (Enshassi, Mohamed & Mosa, 2008:36). The norm of appointing contractors with little knowledge on risk management has resulted in many projects failing to materialize due to risk mitigation failure (Phoya, 2012). Risk management contributes greatly to the success

of H&S, and the failure to properly address risk management will result in cost overruns and delays, whereby most of them are as a result of poor H&S (Carroll, 2014:65-67).

2.10 Clients perception on incorporating H&S in tender evaluation

Deacon (2016:68) states that the client should be clear on their approach, tone, and objectives in the early stages of the tender; this also includes details and specifications concerning H&S of the project. All these must be discussed and referenced during pre-tender meetings. A study of prioritizing project performance criteria within the client perspective conducted by Idrus, Sodangi and Husin (2011:1142) in Malaysia states that there is no standard approach engaged by clients to evaluate tenders as the definition of project success differ from one client to another, but there are certain elements that are constant in every project such as H&S.

Sumner and Farrell (2003:201) state that clients should pay great attention to H&S at the tender stage as it benefits directly in the overall improvement of H&S during project delivery. Furthermore, they outlined that H&S can be improved by educating clients in H&S management. Raising clients' awareness will improve their appreciation of the role they have to play and improve standards in the construction industry.

In Saudi Arabia, public sector clients adhere and concur with the policies implemented by the government. The Suadi Arabian government created a generic list of criteria on which tenders must be assessed during tender evaluation. The criteria set by the government is comprised of H&Srecord, the technical capability of the contractor, the financial capability of the contractor, reputation, management ability, and the organization's culture. Each criterion was further broken down into subcriteria. The subcriteria for H&S records were OSHA incidence rate, management safety accountability, experience in handling dangerous substances, experience in noise control, safety record, company safety policy(Al-Otaibi & Price, 2010:1145-1146).

Idrus, Sodangi and Husin (2011:1142) identify and rank criteria used by Malaysian clients to evaluate tenders based on the relative importance of criteria as perceived by experienced professional consultants working for the client. It was determined that most clients in Malaysia are still accustomed to the system of awarding tenders based on the lowest bidder. Besides the price being ranked as the most important criterion, other criteria were assessed, and occupational H&S was ranked as the fourth important criterion on clients' choice to evaluate tenders with after construction cost, construction time, and quality (Idrus . 2011:1362). Furthermore, they outlined that every construction project's objective depends on selecting criteria chosen and knowing the importance of each criterion and its contribution to the project's success.

Plebankiewicz (2010:62) reveals that the Polish law does not mandate the public and private sector to engage in a detailed and comprehensive tender evaluation process when appointing a contractor. The public sector uses one criterion to evaluate a contractor who is usually the contractors' experience. The private sector focuses mainly on competence and reliability as the main criteria for selecting a contractor. Also, they look at the type of projects completed and how they were completed, and the contractor with a great track record is engaged.

Watt (2010:59), in a study to reveal the relative importance of tender evaluation and contractor selection criteria they investigate the criteria choice of clients when evaluating contractors, and they outline nine criteria engaged through the multinomial logit model. The model ranks the criteria according to relative importance; hence cost, previous performance, and technical expertise were ranked as important, and H&S was not part of the list. Price was deemed the ultimate decider in evaluating their tender.

Wong (2000:767) conducted a study in the UK investigating clients' perception of tender evaluation criteria. The study aim was to assess whether clients are motivated by price or by value in evaluating tenders. The definition of value comprised aspects such as H&S, financial capability, previous performance, plant availability, and human resources. The study's results ranked site organization, rules, and policies as second important criteria for evaluating public projects and H&S was part of this criterion. For private project site organization, rules and policies in which H&S is incorporated were considered relatively important. When all the factors were combined to assess the overall importance of criteria across the board, site organization and H&S was rank fourth after the contractor's ability to complete projects on time, financial capacity, and contractor's ability to deal with unanticipated problems.

2.11 Perception of construction practitioners on incorporating H&S in tender evaluation

Phoya and Eliufoo (2016:959) outlined the importance of incorporating H&S in tender evaluation and a different perception of construction professionals on incorporating H&S in tender evaluation. A study of perception and uses of stakeholders' power on H&S risk management in construction projects in Tanzania outlines the perception of construction practitioners on H&S on different elements of a project, and tender evaluation was one of the elements laid out, the stakeholders laid out in the study were architects, quantity surveyors, project managers, and engineers.

2.11.1 Quantity Surveyor's perception of incorporating H&S in tender evaluation

Phoya and Eliufoo (2016:957) indicate that quantity surveyors (QS) perceive themselves to possess expert powers, as they are associated with attributes such as credibility, trustworthiness, relevance, and they can better advise the client on issues concerning H&S. QS's power to influence H&S of a project lies mainly in incorporating it in the BOQ (Bills of Quantities) by drawing up specifications and ensuring that the principal contractor incorporates an adequate allowance for H&S at tender evaluation. Phoya and Eliufoo (2016:959) indicate that quantity surveyors have great perceived power in the design stage, especially in terms of BOQ estimates that incorporate H&S. In the procurement stage, the QS has influential power on the preparation of tender documents that emphasizes the aspects of H&S, and also tender evaluation process that considers the capability and commitment on H&S aspects. On the aspect of awarding a contract to the contractor who is committed to H&S a QS has great perceived power.

2.11.2 Architects' perception on incorporating H&S in tender evaluation

Phoya and Eliufoo (2016:957) indicate that architects consider H&S aspects when carrying out their project obligations. Regarding H&S architects, they are responsible for identifying, appraising, and controlling aspects of H&S from a design perspective. Architects possess more influential power in the design concepts that incorporate H&S, and at the procurement stage, they also possess influential power in tender evaluation that considers the contractor's capability and commitment to H&S aspects. Architects also have perceived power in awarding a contract to the contractor committed to H&S Phoya and Eliufoo (2016:959-960). Bong, Rameezdeen, Zuo, Li, Yi and Ye (2016:277). Outlines that many accidents in the construction sector are related to design and that it is more effective to eliminate hazards at the design stage than at any other stage in the project. Bong *et al*. (2016:280) indicate that designers are confident in their ability to design safety initiatives but are unwilling to implement them.

2.11.3 Project Managers perception on incorporating H&S in tender evaluation

Phoya & Eliufoo (2016:957) indicate that project managers are the single point of all key decisions of the project in terms of project excellence as they are involved in planning, tracking, measuring, and controlling all aspects of a project. Project managers possess legitimate power and expert power, enabling them to manage, identify, and assess H&S safety risk factors in construction projects. Phoya and Eliufoo (2016:959) indicate that the project manager has great power in terms of perceived power and influential power in tender evaluation that considers the contractor's capability and commitment to H&S aspects.

2.11.4 Engineers perception on incorporating H&S in tender evaluation

Phoya and Eliufoo (2016:961) indicate that engineers the same as architects identify, appraise, and control H&S and all risk from a design perspective. In the design, stage engineers have

influential power design concepts and detail that incorporate H&S and great perceived power in tender evaluation that considers contractor's capability and commitment on H&S projects Phoya and Eliufoo (2016:959-960). Bong *et al*. (2016:277) articulate that design engineers in Western Australia accepted the positive impact of design safety on construction workers' safety, regardless of that, they viewed design for safety as simply paperwork. Engineers are responsible for providing information concerning design such as design loads of the structure, methods, and construction sequence and providing soil investigation report. The engineers should also inform the contractor of the anticipated dangers and hazards or special measures required for the works' safe execution; however, the engineers are not keen on effectively executing some of their responsibilities (Smallwood, 2004:3).

2.12 Chapter summary

This chapter reviewed the literature concerning the incorporation of H&S criterion in tender evaluation. The motives of incorporating H&S and safety criterion in tender evaluation were discussed, and they were categorised as H&S impact on project cost, H&S impact on quality, and H&S impact on time. The literature indicates that adverse effects of H&S negatively affect time, cost, and quality on a project resulting in project delays, poor quality of work, and cost overruns. Furthermore, the literature on the extent to which H&S criterion is incorporated in tender evaluation was revealed. A comparison of the H&S criterion with other criteria for tender evaluation was done, and the literature revealed that the construction industry prioritises other criteria such as project cost, experience, project time frame, and quality. The literature also reviewed the CIDB methods of evaluating construction tenders, which are financial offer, financial offer and preference, financial offer and quality, and financial offer, quality, and preferences. These methods do not give adequate value to H&S as it is only covered as an element of quality.

The literature related to the hindrances of incorporating H&S criterion in tender evaluation was revealed. It was revealed that aspects such as the lack of the client's commitment to implement and promote H&S, corruption, and poor contractor management capabilities limit the incorporation of H&S in tender evaluation. The literature on the extent construction clients perceive the relevance of incorporating H&S in tender evaluation has been reviewed. The literature perceived that construction clients prefer criteria such as financial capability, reputation, management ability, and experience. Construction practitioners' perception of tender evaluation criteria was also reviewed, and it was outlined that practitioners prefer criteria like tender amount, quality, contractor's capability, and project completion timeframe. The literature related to the most important aspects of H&S that should be incorporated in the tender evaluation was reviewed. Aspects such as H&S study, H&S training, H&S plan, H&S coordination, contractor H&S personal, PPE, contractor injury history, H&S signs and signals,

insurance cost, safe work method statement, and remedial response to H&S were identified as important aspects of H&S that must be assessed in tender evaluation.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter presents an overview of the literature regarding the research methods and methodology used for this research. It includes the introduction, research approach and justification, methodological approach, the sources of data, population and sampling methods, questionnaire design, administration of the survey, data analysis, reliability and validity of the data, and the chapter summary.

3.2 RESEARCH APPROACH AND JUSTIFICATION

3.2.1 Inductive approach

Inductive approach is also known as inductive reasoning, is a theory-building process, it is based on observations where patterns are built for the development and explanation of theories (Leedy & Ormrod, 2014:18-19). Also, O'Reilly (2012:2) elucidates that the inductive approach begins with minimum assumptions to build a theory from the data. Thomas (2006:237) outlines that the inductive approach is used to deduce unprocessed bulk data into a summary, create links between the research objectives and findings established from the research data, and build a theory from the elements processes that are evident in the research data. The inductive approach is generally associated with qualitative data; however, it is not mandatory as quantitative data could also use inductive reasoning (Burnard, Gill, Stewart, Treasure & Chadwick, 2008:429-430). Kathleen, Eisenhardt, Graebner and Sonenshein (2016) indicate that the inductive approach is advantageous because it provides the researcher with vast options facilitated by probabilities and encourages further exploration to test if the probable inference is correct or not. However, Leedy and Ormrod (2014:19) contend that the inductive approach is susceptible to weaknesses as it is limited in scope and lacks inaccuracy of inferences.

3.2.2 Deductive approach

Deductive reasoning focuses on establishing a hypothesis based on existing theory and developing a research strategy to test the hypothesis (Leedy & Ormrod, 2014:17). vanHoek, Aronsson, Kovács and Spens (2005:133) elaborate that deductive approach begins with an expected pattern that is tested against observations. Furthermore, Leedy and Ormrod (2014:18) outline a sequence of deductive approach that starts with deducing a hypothesis from a theory, followed by formulating the hypothesis, testing the hypothesis, and examining the test's outcome and modifying the theory if the hypothesis is not confirmed. Ndihokubwayo

(2014:110) indicates that deductive reasoning's main strengths as a scientific approach are embedded in control and precision.

3.2.3 Justification of the approach used.

According to Holmström, Ketokivi and Hameri (2009:73), deductive and inductive reasoning are fundamental in steering and determining the research direction. Inductive reasoning develops concepts and theories based on observations and consultations, whereas deductive mode is scientifically based on using deductive reasoning (Lukka & Modell, 2010:467). Ndihokubwayo (2014:110) maintains that deductive approach is a top-down approach; on the other hand, inductive approach is a bottom-up approach, as illustrated in Fig 3.1. This study adopted both inductive and deductive approaches to achieve the main objectives of the study. Inductive approach has been adopted because the research process started with an inductive exploratory study to generate hypothesis (Simpeh, 2018:122). The hypothesis was tested using the deductive approach to reach a valid conclusion, hence adopting qualitative and quantitative methodology for the research.

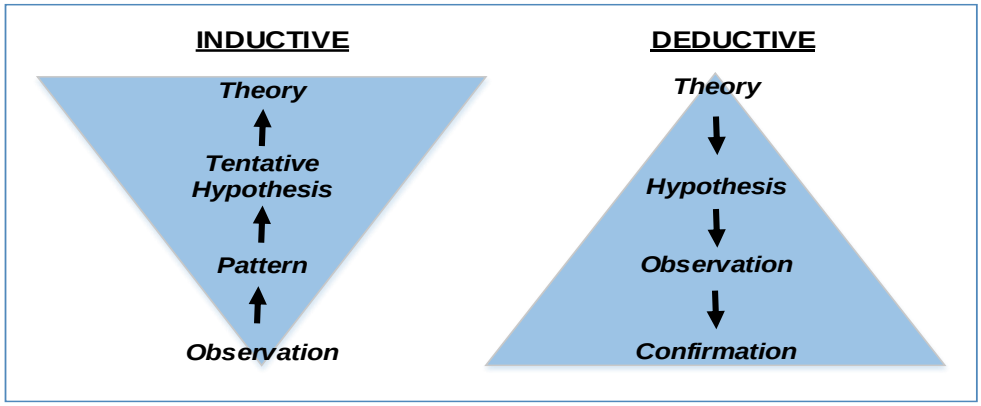

Figure 3. 1: Distinction between deductive and inductive approach

Adopted from Burney & Saleem (2008)

3.3 METHODOLOGY APPROACH

Considering the objectives of the study, a triangulation approach involving several techniques has been adopted. Leedy and Ormrod (2014:269) opine that the triangulation method employs both qualitative and quantitative approaches. Furthermore, Leedy and Ormrod (2014:268) indicate that using both quantitative and qualitative approaches is increasingly becoming a trend because no one approach can answer all the questions and provide insights regarding all aspects of research. Adopting both approaches eliminates the shortfalls of another while also gaining the advantage of combining the two approaches.

3.3.1 Quantitative research

A quantitative research method is based on numbers and statistics to measure, predict, and control a phenomenon's specific aspect (Leedy & Ormrod, 2014:190). Onwuegbuzie and Leech (2006:474-475) indicate that quantitative research first outlines the study's specific objective and then formulate direct and narrow questions to obtain quantifiable data from selected respondents. Also, it facilitates an analysis of data using statistical tools, eliminating the possibility of bias. In quantitative research, the researcher should only observe and measure without much interference with the research subjects to avoid data contamination (Williams, 2007:67). The main objective of quantitative research is to produce statistically reliable data in the form of averages, ratios, ranges, and other statistical elements that show numbers of respondents attesting or detesting an objective (Leedy & Ormrod, 2014:191). Quantitative research is the best fit for a deductive approach as a theory is deduced to a narrow perspective as possible from a broader perspective (Borrego, Douglas & Amelink, 2009:54). In quantitative research, respondents are expected to answer questions such as how many, what, and how much (Leedy and Ormrod, 2014:141). The goal of quantitative research is to measure and determine the relationship between variables and describe the current state of a phenomenon (Williams, 2007:66).

Table 3. 1 Advantages and Disadvantages of Quantitative Research

Advantages	**Disadvantages**
Quantitative research allows access to a big sample size in a short space of time (Amaratunga, David, Sarshar & Rita. 2001:22).	Does not consider social aspects due to the guided focus of the research hypothesis (Rahman, 2016:106).
Can be tested and checked, therefore results obtained will be reliable and less open to argument (Bagdonienė & Zemblytė, 2005:30).	Focuses on statistical relationships, which result in overlooking of broader themes and relationships (Rahman, 2016:106)
Data analysis is less time consuming as it uses statistical software such as SPSS (Rahman, 2016:105)	Quantitative research is expensive as it requires large volumes of data to be obtained from a population to make results reliable (Bagdonienė & Zemblytė, 2005:31).
Interpreting data and presentation of findings is straightforward, resulting in fewer errors and subjectivity (Amaratunga *et al*., 2001:23).	Requires no mistake in formulating a hypothesis and a model for collecting and analysing data as it will result in biased and invalid results (Amaratunga *et al*., 2001:21).

Quantitative research will be used to gather data from construction practitioners and construction clients through a survey. A questionnaire that seeks to gather opinions of

construction practitioners on different aspects of incorporating H&S was designed on a 5-point Likert scale. A different questionnaire that aims to gather attitudes and opinions of construction clients on varying aspects of incorporating H&S in the tender evaluation was also designed on a 5-point Likert scale. The information obtained through the quantitative research will be used to draw results and recommendations for this study

3.3.2 Qualitative Research

According to Leedy & Ormrod (2014:141), qualitative research's main focus is to examine how the respondents think and feel towards a variable under study concerning real-life experience in their own words and perspective. Also, Hox and Boeije (2005:595) elucidate that qualitative research is a methodical and subjective approach that facilitates and enables the researcher to obtain an in-depth understanding and status of the research respondents' reality. Leedy and Ormrod (2014:141) further indicate that qualitative research is an interactive technique that seeks to understand human experiences, attitudes, emotions, and behaviours. It is focused on developing a narrative of a social phenomenon that utilises interviews, observation, and open-ended questionnaires to collect, analyse, and interpret data. Qualitative research aims to understand a complex phenomenon either left out by mainstream research due to complexity to study or explored in a one-dimensional view (Leedy & Ormrod, 2014:141).

Table 3. 2: Advantages and Disadvantages of Qualitative Research

Advantages	**Disadvantages**
Provides individual case information (Bagdonienė & Zemblytė, 2005:29)	Because of big data, data analysis is time-consuming (Rahman, 2016:104-105)
It possesses a great degree of flexibility when conducting research (Rahman, 2016:104)	Results are easily influenced by the researcher's biasness (Bagdonienė & Zemblytė, 2005:29)
It provides depth and detail of the topic under study (Smyth, 2011:117); (Rahman, 2016:104)	Research findings cannot be generalised to a wide population or other settings (Rahman, 2016:105)
Qualitative research collects data in its natural setting, which increases its credibility (Rahman, 2016:104)	It is more difficult to test hypotheses and theories with a large population (Rahman, 2016:105)
	It takes more time to collect data as compared to quantitative research (Bagdonienė & Zemblytė, 2005:29)

Qualitative research aims to answer the "how" and "why" elements of an outlined phenomenon, thereby providing an in-depth understanding (Hox & Boeije, 2005:595). Typically, qualitative data for this study will be gathered through semi-structured interviews

during the exploratory study. The qualitative data will be obtained from construction practitioners based on two objectives of the study. The first objective was to determine the hindrances against the incorporation of H&S criterion in tender evaluation. The second objective was to investigate the extent to which construction clients perceive the relevance of incorporation of H&S in tender evaluation. The data obtained through qualitative research will help to draw results and conclusions for this study.

3.3.2.1 Interviews

An interview is a qualitative research technique that is based on intensive interaction with the respondents of the study to explore their perspective regarding a particular idea, program, or situation (Qu & Dumay, 2011:328). According to Leedy and Ormrod (2014:158-159), the purpose of a research interview is to explore individuals' views, beliefs, and experiences concerning specific matters. Fundamentally there are three types of interviews, namely structured, semi-structured, and unstructured (Qu & Dumay, 2011:238). Unstructured interviews were used for this study. An unstructured interview does not reflect any preconceived theories or ideas, and it is conducted with little or no organisation. It starts with a lead question that will open up the interview to further more questions and reveal a lot of information (Reid & Mash, 2014:2). An unstructured interview allows the researcher to have direct control over the interview flow process and have the chance to clarify issues during the process if needed (Jebreen, 2012:167-168). Leedy and Ormrod (2014:196) state that an interview can be conducted either in person or via telephone. This study adopts both personal and telephone interviews.

3.4 The sources of data

3.4.1 Secondary data

Data obtained through the study and analysis of completed research and research in progress to gain an in-depth understanding of the subject matter is known as Secondary data (Johnston, 2017:619). For this study, the secondary data was obtained through a comprehensive literature review of topics related to H&S as a criterion of tender evaluation and also the elements and process of tender evaluation to award construction contracts. There are two ways of reviewing literature: a preliminary review and a comprehensive review of previous research studies (Feltus, 2008:1). A preliminary literature review was conducted in chapter one to develop a framework and insight relative to the study, and a comprehensive literature review was conducted in chapter two, where an in-depth analysis of relevant topics was carried out. Examples of secondary data used in compiling the literature review include, but are not limited to, journal articles, books, newspaper articles, conference proceedings, diaries, dissertations and thesis (Church, 2002:33).

3.4.2 Primary data

Primary data refers to information collected firsthand from the sources that witnessed an event; it can also be in the form of artifacts or documents such as personal journals, newspaper articles, photographs, and interviews (Leedy & Ormrod, 2014:174). Hox and Boeije (2005:593) inform that primary data is original data that is collected specifically to address a specific research objective. This method requires the researcher to ensure that the respondents understand the study and are aware of its purpose. Leedy and Ormrod (2014:190) outline methods of collecting primary data in a quantitative form to include surveys or questionnaires, observation procedures, and experimental methods. Typically, primary data for this study was collected in the form of questionnaires comprising closed-ended questions. The qualitative primary data was obtained through face to face interviews, where the respondents were construction clients and construction practitioners who are well equipped with tender evaluation processes.

3.5 Population and sampling method

3.5.1 Population

According to Asiamah, Mensah and Oteng-Abayie (2017:1607), population refers to an entire group from which information is required to be ascertained. Population also refers to every individual element that fits in the criteria or parameters within which the research is being conducted (Leedy & Ormrod, 2014:221). *Asiamah* (2017:1607) postulate that a population is the total unit of a group under study from which a sample is selected. The population considered for this study are construction practitioners, comprising architects, health and safety personnel, quantity surveyors, construction project managers, engineers, and construction clients based in the Western Cape Province of South Africa.

Table 3. 3: Population of consultant team members

Trade	**Population of consultant team**
Architects	315
Engineers	121
Project & Construction Management	37
Health and safety	62
Quantity surveying	128
Total	**663**

Adopted from (Professions and projects register, 2019)

The practitioners' statistics in the Western Cape were obtained from the professional and projects register of 2019, as outlined in Table 3.3. The total established population of the practitioners was 663. Leedy & Ormrod (2014:222) indicates that a population around 500 requires a sample of 50% of that population and based on this, a sample of 40% was drawn for this study. A sample of 40% entails that 265 questionnaires were distributed. The outlined sample is adequate to draw up sound results of the study and make a solid generalisation of the whole population. The population of construction clients in the western cape was obtained from SAPOA register 2019-2020, as outlined in Table 3.4. The clients' total population was 60, and questionnaires were sent to all the population members since the population was relatively small and manageable.

Table 3. 4: Population of clients

Type of client	**Sector involved in**	**Quantity**
Property developers	Private sector	14
Property owners	Private sector	18
Real estate investment trust (REIT)	Private sector	5
Education and Training	Private sector	6
Facilities management	Private sector	3
Financial institution and financiers	Private sector	4
Government and Parastatals	Public sector	2
Miscellaneous	Both	8

Adopted from (SAPOA, 2020)

3.5.2 Sampling methods

According to Acharya, Prakash, Saxena and Nigam (2013:330), a sample is a group of elements (people, objects, or items) drawn from the entire population to generalize decision of the whole population. Also, Leedy and Ormrod (2014:212) further articulate that a sample is a selected sub-part of the entire population selected to show the entire population's traits. Sampling aids the researcher in collecting manageable data that is easy to work with; this is allowed by collecting data from a specific sector of the entire population. Nielsen and Einarsen (2008:265) indicate that selecting a larger sample in research is beneficial because there will be more representation of the population, therefore generalisation of results will be more accurate. When deriving a sample for a research study, it is important to note whether the sample represents the population with regard to the sample size, sampling design, and the sample frame (Leedy & Ormrod, 2014:212-213).

Sampling is classified into two classes, which are probability sampling and non-probability sampling. Probability sampling allows the researcher to select a sample from a population using a method based on probability theory (Schreuder, Gregoire & weyer, 2001). Non-probability sampling is a sampling technique in which a sample is selected based on the researcher's subjective judgment (Acharya . 2013:330).

It is vital to note that non-probability sampling, specifically convenience and purposive sampling techniques, were used to select samples for this research study. According to Leedy and Ormrod (2014:220), convenience sampling makes no decoy of identifying a population sample. Convenience sampling takes readily available variables, and for this study, practitioners around the city of Cape Town and Stellenbosch municipality were deemed convenient due to their higher density population of construction practitioners. Convenience sampling is fast and cheap; however, it is not very decisive in representing the whole population (Leedy & Ormrod, 2014:220).

Purposive sampling is an important technique that extracts information from a designated sample that best suit the required characteristics required for the subject matter under investigation (Suri, 2011:63). Purposive sampling was used to select the Western Cape province of South Africa due to its wide range of exposed construction practitioners and its extensive developments in the construction sector. One of the main traits of purposive sampling is to establish careful judgment on who can provide quality information to achieve the objectives of the study (Leedy & Ormrod, 2014:221). Researchers are best accustomed to knowledgeable and keen respondents to provide the information required for the study.

3.6 Questionnaire design

3.6.1 Types of questionnaire

Graesser, Wiemer-Hastings, Kreuz, Wiemer-Hastings and Marquis (2000:257) define a questionnaire as a document that contains a list of questions designed to solicit required data that can be analysed to conclude the study. Lucienne and Chakrabarti (2009:269) also define a questionnaire as a document used to collect thoughts, opinions, beliefs, reasons from a selected sample of the population about the past, present, or future facts and events, by asking questions. Leedy and Ormrod (2014:197) opine that questionnaire design is the most important part of a research study as its quality directly determines the quality of data analysis, results of the study, conclusion, and recommendations for future research. The questionnaire design process determines the type of data to be collected and the data analysis methods to be engaged for the study. The questionnaire questions should be clear, interesting, short, and precise because there is little or no incentive to the respondents to spend their time and effort

in answering the questionnaire (Leedy & Ormrod, 2014:203). Lucienne and Chakrabarti (2009:270) also state that besides the questionnaire's questions being unbiased, the questions should be relevant and understandable to the respondents because the study results are dependent on how the questions are formulated. Furthermore, the questions should also link and relate to the answers produced. A questionnaire is advantageous because of its ability to collect more data based on its characteristic of accessing a bigger sample (Graesser, 2000:254);(Rowley, 2014:312). Reja, Manfreda, Hlebec and Vehovar (2003:161) point out that there are two main types of questionnaires: open-ended and closed-ended questionnaires.

3.6.2 Open-ended questionnaire

An open-ended questionnaire consists of questions that allow the respondents to freely express themselves without a specific guide or pattern (Züll, 2016:1). This is corroborated by Leedy & Ormrod (2014:203), who stated that open-ended questions allow the respondent to express an opinion without being influenced by the researcher. Reja (2003:159) adds that using open-ended questions in a study helps discover spontaneous responses from the respondents and eliminate biases resulting from suggested responses to the respondents. Open-ended questions in focused surveys have a great potential of yielding accurate and useful data (Singer & Coupe, 2017:116; Song, Son, & Oh, 2015:323)

3.6.3 Closed ended questionnaire

Closed-ended questions are structured questions that require respondents to answer from a distinct set of pre-defined responses (Leedy & Ormrod, 2014:203). Kazi and Khalid (2012:515) indicate that closed-ended questions are used to obtain quantitative insights where value is allocated to every answer to facilitate comparison of different responses and, in turn, enables statistical analysis to be computed. The set of specific responses increases consistency as the parameters are clearly defined. It is also used to survey on a large scale as they are adjudged to work best when the sample population is big (Jenn, 2006:33).

3.6.4 Questionnaire structure

The study used two questionnaires to collect data. The first questionnaire targeted construction practitioners and the second questionnaire was for construction clients. Both questionnaires used Likert scales, and the questions were arranged in sections.

3.6.4.1 Construction practitioner's questionnaire structure

The questionnaire for construction practitioners consists of six different sections. Each section was based on the objective of the study except for section "A" which is aimed at obtaining biographical information of the respondents.

Section A: profile of respondents – this section was designed to elicit general personal information of the respondents. This included the gender, age, level of qualification, sector

they are engaged in, experience in the construction industry, profession, and their involvement in tender evaluation practices.

Section B: Motives of incorporating health and safety criterion in tender evaluation - this section of the survey instrument aimed to investigate what motivates the inclusion of H&S criterion in tender evaluation. This section was divided into 3 sub-sections where the first sub-section was based on H&S implications on cost. The second sub-section was based on H&S implication on time, and the third sub-section was based on H&S implication on quality. The questions in this section were designed using a five-point Likert scale where, 1 = strongly disagree, 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure.

Section C: The extent to which health and safety criterion is incorporated in tender evaluation compared with other criteria – the third sub-section aimed to identify the extent H&S criterion is incorporated in tender evaluation. The survey participants were asked to rate the importance of each statement using a 5-point Likert scale where, 1 = Unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure.

Section D: Hindrances of incorporating health and safety criterion in tender evaluation – the fourth section provided scales for the factors that hinder effective incorporation of H&S criterion in tender evaluation practices. To determine the factors hindering the incorporation of H&S criteria in tender evaluation, respondents were asked to rank their level of agreement on a 5-point Likert scale where, 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure.

Section E: Clients' perception regarding incorporating health and safety in tender evaluation – the fifth section was centered on investigating the extent to which construction clients perceive the relevance of incorporation of H&S in tender evaluation. The survey participants were asked to rate the impact of these factors using a five-point Likert scale where, 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure

Section F: Aspects of health and safety that are incorporated in tender evaluation and their relative importance – the sixth section of the questionnaire was centered on assessing the most important aspects of H&S in tender evaluation. This section comprised of sub-section 6A and sub-section 6B. Under sub-section 6A respondents were required to indicate the frequency of incorporating H&S elements in tender evaluation using a five-point Likert scale where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = often, 5 = always, and U = Unsure. Sub-section 6B aimed to ascertain the level of importance on the elements of H&S when evaluating construction contracts. The respondents were required to rank the H&S elements on a 5-point Likert scale where 1 = Unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure.

3.6.4.2 Construction client's questionnaire structure

The questionnaire for construction clients comprised of four sections. The sections were based on the objective of investigating the extent to which construction clients perceive the relevance of incorporating H&S criterion in tender evaluation.

Section A: Profile of respondent – this section was formulated to acquire biographical information of the respondents. This included gender, age, sector they are engaged in, type of client, and their involvement in the construction industry.

Section B: Client's H&S commitment – the second part of this questionnaire required the respondents to indicate their level of commitment with regard to aspects of H&S on their projects. This section used a 5-point Likert scale to determine the level of respondents' commitment where 1 = Not committed, 2 = somewhat committed, 3 = committed, 4 = very committed, 5 = extremely committed, and U = Unsure.

Section C: H&S pre-construction activities – this sub-section of the questionnaire consists of a scale used to indicate the extent of respondents' involvement in H&S related activities using a 5 point Likert scale, where 1= never; 2= seldom; 3=sometimes; 4= often; 5=always, and U=Unsure.

Section D: Clients' perception of incorporating health and safety in tender evaluation – the fourth section was developed to ascertain respondents' perception regarding the importance of incorporating H&S criterion in tender evaluation. This section required the respondents to rank their perception using a 5-point Likert scale where, 1 = unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure.

3.6.5 Piloting the questionnaire

Bowden, Nixon, Fox-rushby and Nyandieka (2002:328) refer to piloting as a dress rehearsal and further allude that questions are designed and presented as they will appear on the final questionnaire and the dynamics of the survey as a whole are investigated. Leedy and Ormrod (2014:201) opine that it is essential that the researcher conduct a pilot study to test the study's instruments and the procedures it will be exposed to. Before surveying the intended respondents, it was decided that it is essential to pilot the questionnaires with selected respondents to acquire their perception regarding the questionnaire design. Piloting the questionnaires was deemed necessary because some of the questionnaires' questions might be difficult to understand to the intended respondents unless a proper explanation is provided. For this study, constructive feedback and comments regarding both questionnaires' drafts were sought from selected relevant respondents. The questionnaire for construction practitioners was piloted to eight registered and experienced construction professionals within the Western Cape province. The questionnaire for construction clients was piloted to five experts in H&S research in the built environment. Both questionnaires were

scrutinized, and the recommendations and corrections made were taken into consideration. Subsequently, the questionnaire was presented to the researcher's supervisor, and corrections were made based on the research supervisor's comments.

3.7 ADMINISTRATION OF THE SURVEY

Rowley (2014:310) opines that it is advantageous to hand-deliver questionnaires because the researcher can help the respondents with clarity regarding difficult questions; personal persuasion and reminders by the researcher can ensure a high response rate. Indeed the reason why some people refuse to complete the questionnaire was established, and there was a probability of checking responses if they seemed incomplete (Greer, Chuchinprakarn and Seshadri, 2000:98). However, Truell, Bartlett and Alexander (2002:46) opine that in a population in which a member has web access, a web survey can achieve a comparable response rate than a post mail questionnaire.

The distribution of both survey questionnaires started on the 1st of March 2020 and was open until the 15th of May 2020. A total of 265 questionnaires were distributed to the construction practitioners and of the 265 distributed questionnaires, 17% were hand-delivered, and the rest were distributed through emails. Regarding the construction client questionnaire, 60 questionnaires were distributed through emails. During the administration phase of the survey, several challenges were encountered. For instance, some of the respondents' emails used to send the questionnaires were not delivered. It is important to note that out of the 220 sent emails to the construction practitioners, 214 (97%) were delivered, and 6 (3%) were not delivered.

Furthermore, 60 emails that were sent to construction clients, 59 (98%) were delivered, and 1 (2%) was not delivered. The non-delivery report was indicated by a postmaster emailing system that generates an automatic reply indicating that the email was not delivered to the recipient. The electronic form of the construction practitioners questionnaire was accessed through the following web link: https://docs.google.com/forms/d/e/1FAIpQLSdeI-6kbMvvnuCGHRAcOt2hBED0xQpRhIum6hIqI5JDQ1Gs6g/viewform. Also, the questionnaire for construction clients was accessed through the following web link: https://docs.google.com/forms/d/e/1FAIpQLSdgpEd1CM ac8KywUxUNUc2pnyFcMEzCL6NpTybG624UKy1w/viewform

3.8 DATA ANALYSIS

3.8.1 Qualitative data analysis

Mason (2002:91) describes qualitative data analysis as a process that seeks to deduce and make sense of a big volume of data collected from different sources to draw results for the research questions. This process takes descriptive information and draws an explanation or interpretation. The analyzed data may be obtained from, but not limited to interviews, surveys, pictures, and videos. Qualitative data analysis considers the respondents' direct response, context, consistency, contradiction of views, frequency and emphases of comments, data themes' specificity, and trends (Leedy & Ormrod, 2014:144). Qualitative data can be analysed with quite a few techniques such as content analysis, ethnography, grounded theory, phenomenology, and historical research. Content analysis was used for this study to analyse the qualitative data.

3.8.1.1 Content analysis

Content analysis is a qualitative research technique that is used to determine the presence of specific words or concepts within a body of text. It takes greater emphasis in analysing and quantifying the presence, meaning and link of words and concepts, this allows inferences about the messages in the text to be made (Leedy & Ormrod, 2014:150). This study used qualitative analysis on the data that was collected via interviews from construction practitioners based on the objective of determining the hindrances militating against the incorporation of H&S. Also, content analysis was used in analysing the extent to which construction clients perceive the relevance of incorporation of H&S in tender evaluation and the hindrances militating against the incorporation of H&S criterion in tender evaluation. According to Maier (2018:2), the advantage of content analysis is that it enables vast amounts of quality data to be collected and analysed. However, Leedy & Ormrod (2014:151) opine that content analysis is time-consuming, and also it is subjected to errors, particularly when there are higher volumes of information that require a higher level of interpretation.

3.8.2 Quantitative data analysis using descriptive statistics

Descriptive statistics is a branch of statistics that describes several features of the data involved in the study to provide a summary of the samples and measures of central tendency and measures of variability done on the study (Leedy & Ormrod, 2014:190). According to Rendón-Macías, Villasís-Keever & Miranda-Novales (2016:397), descriptive statistics summarises quantitative data and lays it into easily understood formats such as graphs, diagrams, and tables. Ndihokubwayo (2014:121) indicates that closed-ended questions are responsible for formulating quantitative empirical data. Quantitative data capturing and analyses for the study were done using the Statistical Package for Social Scientist (SPSS). Gray (2004:298) alludes that descriptive statistics elaborates and simplifies the study variables

using central tendency (mean, mode and median), the measure of dispersion, and trends over time.

3.8.2.1 Mean rankings

Simpeh (2018:142) stresses that important factors in each data set can be achieved by determining the variables' mean score. Therefore, the mean scores of the variables were computed to establish the construct's most important factors. The mean scores obtained from the motives of incorporating H&S criterion in the tender evaluation were subsequently ranked. Ndihokubwayo (2014:141), alludes that ranking is a relationship between a set of numbers such that those numbers are ordered in ascending or descending order. Fellows and Liu (2015:182) note that ranking can be produced from rating. Rating establishes the degree of importance, and ranking displays the hierarchy. Therefore, the mean ranking was adopted in this study to establish the degree of importance of the impact of H&S on cost, time, and quality as motives of incorporating H&S criterion in tender evaluation

3.8.3 Quantitative data analysis using inferential statistics

3.8.3.1 Factor analysis

Pallant (2011:181) postulates that factor analysis (FA) includes a variety of different but related techniques employed to narrow down a large set of variables to aid the selection of smaller sets of components. Hair, Black, Babin and Rolph (2010:16), describe FA as a multivariate statistical technique for examining the underlying constructs or the structure of interrelationships within a large number of variables. Pallant (2011:182) indicated that there are two main techniques for generating factors that characterise the structure of the variables in the analysis are FA, and principal component analysis (PCA). Abdi and Williams (2010:433) refer to PCA as a multivariate method that analyses a data table in which several inter-correlated quantitative dependent variables describe observations. The main motive for employing FA, according to Lei (2009:505), is to enable the reduction of a large data set to a fewer number of uncorrelated latent factors that will account for intercorrelations of the response variables. This is to deter the presence of latent factors from the response variables, and afterward, a dataset with no remains of any correlations between a given set of response variables. Moreover, Pallant (2011:183) added that sample size and the strength of variable relationship determine the degree of appropriateness of a group of data for FA purpose.

Regarding sample size, discrepancy still exists in the body of literature on how large a sample should be for FA and PCA (Hair, Anderson, Tatham and Grablowsky, 1979; Tabachnick and Fidell, 2012:618). Nonetheless, Hair *et al*. (2010:28) acknowledge that a sample size

of 50 is acceptable but must have a factor loading of 0.75. Field (2013:684) claims that a sample of 100 requires a factor loading of 0.6. Tabachnick and Fidell (2012:618) specify that sample size in the range of 100-200 is acceptable for PCA, and they also outline that a small sample run has a great risk of failure of the solution to converge. Ultimately, we can assert that there is no one acceptable sample size for FA and PCA with a clear understanding. In that case, it is advisable to consider a sample size above 100. For this study, a sample size of 105, which is above 100, was used, indicating that the sample size is adequate for FA and PCA, as suggested by Tabachnick and Fidell (2012:618). There are overriding conditions that must be satisfied to undertake factor analysis. The overriding conditions are but not limited to the following: reliability assessment to measure the internal consistency of the responses; test of significant differences or consensus among the respondents; Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, and Bartlett's test of sphericity (Pallant, 2011; Hair *et al*. 2010; Tabachnick and Fidell, 2012).

3.8.3.1.1 Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy

(Ifeanyichukwu, 2012:41) indicates that the Kaiser-Meyer-Olkin (KMO) test is a measure of how suited data is for FA. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. The lower the proportion, the more suited your data is to Factor Analysis (Williams, Onsman & Brown, 2010:5). Wakary, Pangemanan and Tielung (2019:2874) indicate that KMO values run between 0 and 1, and 0.6 is the least accepted value for a FA to be conducted. KMO was performed to examine the sampling adequacy, ensuring that FA was appropriate for the study.

3.8.3.1.2 Bartlett's test of sphericity

Simpeh (2018:143) indicates that Bartlett's test of sphericity is used to compare the correlation matrix and the identity matrix. Essentially it verifies to see if there is a certain redundancy between the variables that can be summarized with a few factors. Same as the KMO, Bartlett's test will be used to examine the sampling adequacy, ensuring that FA was appropriate for the study.

3.8.3.2 Paired-Samples T-Test

The paired sample test, also known as the dependent sample t-test, is a statistical procedure used to determine if the mean difference between two sets of observations is zero (Leedy & Ormrod, 2014:354). McCrum-Gardner (2008:40) further indicates that the paired-samples test is used where there is one element from which data is extracted on two different occasions, or the same element is measured on two different questions. Also, Leedy and Ormrod (2014:354)

indicate that the paired sample t-test can be engaged before and after observations of the same subject and compare two different methods of measurement where the measurements are applied to the same subjects.

3.8.3.3 ANOVA

Analysis of variance (ANOVA) is a statistical procedure used to test the degree to which two or more samples vary in a study (Fellows and Liu, 2015:146). Leedy and Ormrod (2014:354) indicate that ANOVA can be regarded as an extension of the t-test for two independent samples to more than two groups. Its main purpose is to test the significant difference between class means, which is done by analysing the variances. The process of using ANOVA is based on the assumption that the observations are independent of one another, the observation of each sample comes from a normal distribution, and that the population variance in each sample is similar (Leedy & Ormrod, 2014:354).

3.9 VALIDITY AND RELIABILITY OF DATA

Reliability and validity are techniques of demonstrating and communicating the firmness of research processes and the authenticity of research findings (Golafshani, 2003:597). Also, Roberts & Priest (2006:41) indicate that both reliability and validity ensures that the research is free of harm and misleading facts to those who use it

3.9.1 Validity

According to Leedy and Ormrod (2014:103), validity is the soundness of a research study, and specifically, it applies to both the research design and the methods used in the study. Validity as an indication of whether the research instrument fulfills its obligation in measuring what it is intended for. Leedy and Ormrod (2014:91-92) further stated the different validity aspects: content validity, face validity, criterion validity, and construct validity.

- Content validity attests to the extent to which a measuring instrument covers a representative sample of behaviors' field to be measured.
- Face validity attests to the extent to which a research instrument appears valid on its surface.
- Criterion validity attests to the extent to which a research instrument accurately predicts the area under study's behavior.
- Construct validity attests to the degree to which the research instrument accurately measures the variables it is designed to measure.

Validity in data collection ensures that the findings truly depict the phenomenon being measured. Brewer (2000:3) emphasises that it is essential that all possible factors that threaten the validity of research must be controlled to produce a good research study. Leedy and Ormrod (2014:103) distinguished validity into internal validity and external validity. Internal

validity is affected by weaknesses within the study itself, such as inadequate control of major variables or poorly designed research instrument. Factors that usually affect internal validity are subject variability, size of the target population, time period for data collection and the research instrument. External validity is when findings of a research study can be generalised to a larger group or other context. Factors that affects the external validity are population characteristics, data collection methodology, time effect, research environment, and descriptive explicitness of the independent variable (Leedy and Ormrod, 2014:103).

3.9.2 Reliability

According to Leedy and Ormrod (2014:93), reliability is when data collection techniques and analytical procedures would yield consistent results if they were repeated at a different time or conducted by another researcher without changing the entity. Also, Golfasni (2003:598) defines reliability as the extent to which results are consistent over time while possessing an accurate representation of the whole population under study. Reliability in research helps in terms of ensuring that the results are stable, accurate, and consistent. Kimberlin and Winterstein (2008:2277) opine that the reliability level increases upon the research instrument's accuracy and consistency. Noble and Smith (2015:34-35) opine that reliability is an indicator of the consistency of a measuring instrument. Leedy and Ormrod (2014:93) outline different reliability types as test-retest reliability, alternate-forms reliability, split-half reliability, and interrater reliability.

- Test-restest reliability is a reliability coefficient determined by comparing the relationship of two scores on the same test run on two different occasions.
- Alternate-forms reliability is a reliability coefficient determined by comparing the degree of relationship between results on two similar tests.
- Split-half reliability is a reliability coefficient determined by comparing results on one half of a measure with results on the other half of the measure.
- Interrater reliability is a reliability coefficient that weighs the agreement of results provided by two or more judges.

Reliability is mostly engaged to assess whether the formulated measures for concepts in the study are consistent. Barnette (1999:41) indicates that Cronbach's co-efficient alpha is one of the dominant techniques used to test a research study's inner consistency. To ensure the reliability of this study, the Cronbach's coefficient alpha was used in testing the consistency of the scale questions. The alpha co-efficient operates on a variation scale between 1 (indicating perfect internal reliability) and 0 (representing no internal reliability). When the alpha coefficient is close to 1 it implies high consistency, and if it is close to zero, it implies low consistency (Liu, Wu & Zumbo, 2010:15).

3.10 CHAPTER SUMMARY

This chapter outlined a comprehensive overview of the research methods and methodology used in this research study. The study used both qualitative and quantitative methodological approaches, however, quantitative was more dominant in this study. The data source was comprised of secondary data (literature review) and primary data (empirical data). The study used purposive sampling to select Western Cape province because of its wide range of construction practitioners of different backgrounds and its extensive developments in the construction sector. Cluster sampling was also adopted to gather quantitative data from practitioners in the Western Cape province of South Africa. To ensure the research questionnaires' quality, both questionnaires for the study were piloted before sending out the final versions to the respondents. Piloting the questionnaires was deemed beneficial as it improved the quality of the questionnaires. It is important to note that the questionnaires comprised only closed-ended questions, and the distribution was both by hand and web survey. The data analysis techniques included descriptive and inferential statistics. The comparisons of means were done using a paired sample t-test and analysis of variance (ANOVA). The reliability and validity of the data were also discussed.

CHAPTER FOUR

ANALYSIS OF EXPLORATORY STUDY

4.1 Introduction

This chapter presents the analysis of the qualitative data gathered in the early stages of the study. An exploratory study was conducted to gain more insight into the effective incorporation of health and safety criterion in construction tender evaluation. Furthermore, this chapter will discuss the overview of the methodology used to collect data; the process of preparing interviews; analysis based on the extent of investigating how construction clients perceive the relevance of incorporation of H&S criterion in tender evaluation; determining the hindrances against the incorporation of H&S criterion in tender evaluation; finally, the conclusions.

4.2 Findings from the exploratory study

4.2.1 Justification for adopting exploratory study

The study adopted an exploratory design due to the limited research undertaken in South Africa regarding clients' perception on the incorporation of H&S criterion in tender evaluation. An exploratory study seeks to explore the situation in which elements under study have not been clearly outlined and have no clear outcome (Baxter & Jack, 2008:547). The exploratory study explores different perceptions and views of the population (Chigara & Smallwood, 2016:155). The primary data was obtained through semi-structured interviews. Interview questions were formulated to obtain data on how construction clients perceive the importance of incorporating H&S in tender evaluation and determining the hindrances militating against incorporating H&S criterion in tender evaluation. Ten interviews were scheduled, and only eight interviews were conducted and analysed. The interviews were conducted with registered construction professionals, including architects, construction project managers, H&S consultants, and quantity surveyors. These construction professionals were chosen because they work closely together with construction clients as the client's representatives. This enables them to understand the client's needs and demands; also, they have a clear understanding of the tender evaluation process since they form part of the tender evaluation panel. Purposive sampling was used to interview professionals located in Cape Town. Furthermore, purposive sampling was used to select the registered construction professionals who are client representatives and, at the same time, have immense knowledge and experience in tender evaluation processes.

4.2.2 Demographics of respondents

Table 1 elucidates the respondents' information, which is their qualifications, experience, position, and gender. Eight interviews representing an 80% response rate were successfully

conducted and analysed. Construction professionals were interviewed, among the eight; three were H&S consultants (37.5%), two quantity surveyors (25%), two construction project managers (25%), and one architect (12.5%). The respondents' experience was between 5 to 31 years, and the mean work experience was 13.13 years. Seven respondents were males (87.5%), and one respondent was a female (12.5%). All the respondents were registered professionals with their relevant professional bodies.

Table 4. 1: Profiles of respondents

Respondent	Position	Gender	Qualification	Experience	Duration	Location	Means for recording
A	Professional quantity surveyor	Male	PrQs, Bsc Quantity surveyor	31 years	35 min	Respondent office	Phone-recording and notes
B	Professional quantity surveyor	Male	PrQs, Bsc (Hons) Quantity surveyor	13 years	20 min	Remote	Telephone interview
C	Health and safety consultant	Male	BTech Health and safety	7 years	15 min	Respondent office	Phone-recording and notes
D	Health and safety consultant	Male	BTech Health and safety	5 years	10 min	Respondent office	Notes
E	Construction project manager	Male	BSc. Construction management	28 years	30 min	Respondent office	Phone recording and notes
F	Construction project manager	Male	BSc Construction management	10 years	30 min	Respondent office	Phone recording and notes
G	Construction project manager	Male	BTech Construction management	5 years	20 min	Respondent office	Phone recording and notes
H	Architect	Female	MSc Architecture	6 years	10 min	Remote	Telephone interview

4.2.3 Analysis of the interviews

4.2.3.1 Client's perception of incorporating H&S in tender evaluation

4.2.3.1.1 Extent to which clients emphasize on incorporating health and safety within tender evaluation criteria

Respondents were asked to indicate the emphasis clients put on incorporating H&S criterion in tender evaluation. Respondent A, D, and E concurred that construction clients are distinguished into two groups, which are private sector and public sector; they indicated that the clients perceive H&S with different significance. Respondent A and E outlined that public sector clients do not compromise on H&S on their projects as standards and guidelines bind them to implement H&S measures on projects. Respondent D opined that both public and private sector clients treat H&S with the same magnitude as they are bound by the same construction regulations of 2003. The construction regulation specifies that the client is mandated to create a H&S specification that forms part of the tender documents. The purpose of the H&S specification is to guide the contractor to create a proposed H&S plan that is evaluated in the tender evaluation process (CIDB, 2005:5). Respondent D further opined that the purpose of evaluating the proposed H&S plan is to assess if the contractor has responded

to the client's H&S specification. However, after tender evaluation, the successful tenderer will be required to submit a conclusive H&S plan within seven days of the day being appointed.

Respondent A and B stated that the incorporation of H&S in tender evaluation is just a formality as the proposed H&S plan only forms part of a list of retainable documents, and no weighting is assigned on it. Haupt *et al.* (2012:39) outline that a H&S report provided by a contractor is used in selecting contractors during tender evaluation; this concurs with Respondent A and B's opinion. However, a contractor is disqualified if they fail to submit the H&S plan as they are rendered non-compliant. Respondent H stated that private sector clients are profit-driven and are mainly keen on price, quality, and contractors' experience when evaluating tenders. Private clients only incorporate H&S in tender evaluation because it is a requirement. The construction regulations require clients to appoint a H&S consultant; the consultant must prepare a H&S specification that precisely meets the project's demands. Respondent A and G stated that private clients regard H&S consultants with the least importance resulting in H&S consultants being appointed after appointing the contractor. They further indicated that H&S consultants are paid based on the number of visits they make to the site, while other consultants are paid in relation to the contract value. Respondent A further outlined that since private sector clients employ a H&S consultant at a later stage, the principal-agent will provide a generic H&S specification on behalf of the client that will be part of tender documents.

Respondent C stated that though the public sector follows the regulation, the methods they use, which is the 90-10 and the 80-20 rule give greater significance to price and suppresses other criteria including H&S. While CIDB (2008:9-10) outlines that tenders are evaluated on either a 90-10 or 80-20 bases giving price a greater percentage of either eighty percent or ninety percent; this rule is silent about the exact percentage that must be allocated to H&S. Respondent B, G, and E were of the opine that H&S is a very important element in delivering construction projects as it affects projects determinants such as price, cost, and quality. Respondent B further indicated that many private projects have failed to materialize because of cost overruns, time overruns, and legal implications caused by poorly assessing H&S in tender evaluation. However, Respondent A indicated that clients are not worried about H&S and its implication as they are covered; if the contractor becomes non-compliant and causes the client damages, it will sue the contractor for those damages. Also, the client can sue the H&S safety consultants for their insurance for failing to protect them. Respondent H mentioned that the public sector on their projects wants to train disadvantaged contractors, so they require them to comply fully with guidelines set for tendering; hence it is a requirement for the public sector to evaluate H&S.

4.2.3.1.2 Construction clients' knowledge on the impact of health and safety to deliver construction projects

Respondents were asked if clients know the impact of H&S in terms of delivering constriction projects. Respondent A, B, and E stated that private sector clients have limited understanding concerning construction procedures and their implications on H&S. Respondent A added that the client should provide a H&S specification from which under the construction regulations contractor should use when tendering. Respondent A further stated that due to the limited understanding of construction practices, the client employs a principal-agent to help and act on their behalf. Since it is a requirement for the client to issue a H&S specification, the principal agent usually provides a generic H&S specification on behalf of the client. Private sector clients focus more on the cost aspects of the project when assembling a consultancy team in the design stage, they usually do not include a H&S consultant; also, H&S consultants are paid less in comparison to other consultants. Respondent A concurs with Loosemore & Richard (2015:42), who found that private sector clients favour price and quality as major elements of evaluating contractors.

Private clients treat H&S consultants with the least significance because they do not know their importance on a project. Additionally, Respondent F and H opined that public sector clients are aware of the cost, time, and quality implication that H&S has on a project that is why they employ a H&S consultant in the design stage. Despite the awareness of H&S by the client, Chigara & Smallwood (2016:155) revealed that the public sector is accustomed to award tenders based mainly on price. Respondent G indicated that the client, through its agent, the quantity surveyor, an annexure, and a section of pricing H&S is included in the bills of quantities. However, when evaluating tenders, they do not specifically focus on the assigned value of the H&S but on the overall price of the project and rates of items that are directly involved in executing the project. Respondent G further opined that failing to justify if the value assigned to H&S in tender evaluation will result in H&S being compromised as contractors deflate elements such as H&S to have a low price. Respondent D outlined that the client, in most cases will understand the implication of H&S after the occurrence of a major incident that has a legal implication or that results in project delay; for example, the death of a worker on-site due to non-compliance of H&S.

4.2.3.1.3 Measure put in place to make construction clients conscious of the importance of incorporating health and safety in tender evaluation

Respondents were asked about the measures that can be implemented to make construction clients conscious of the importance of incorporating H&S criterion in tender evaluation. Respondent H outlined that when the client employs the principal agent (PA), the PA should advise and educate the client on all important aspects required to enhance the project's

success. Health and safety authority (2009:5) states that the client must get good service from the consultants they employ. H&S is an important aspect of the project, and its implications should be articulated; also, all possibilities that it might bring to the project outlined. On the other hand, Respondent C, D, and E's opinion varied with that of Respondent H, they pointed out that the client should rather employ a H&S consultant than a PA to advise on matters concerning H&S.

Respondent D indicated that the client should engage a H&S consultant and treat them equally as other consultants. Clients should pay the consultant based on project value, not on the number of site visits; this will make the H&S consultant available on the project all the time and minimize deficiency on H&S issues. Respondent B outlined that the principal agent should advise the client to employ the H&S consultant simultaneously as another consultant to be part of the design team. Employing a H&S consultant gives the project a blueprint of safety as the consultant will advise the client and other consultants on key elements that need attention during the design phase, construction phase, and post-construction phase. This opinion is supported by Smallwood (2013:46), who believes that the agent should advise the client and help them to design a detailed H&S specification that best fits the project, rather than using a generic specification. Respondent B and E stated that the quantity surveyor consultant should advise the client to budget properly for H&S. Also, the quantity surveyor, when preparing bills of quantities should create a detailed section for H&S, which the contractor should price rather than putting H&S as a lump sum under preliminaries and generals.

4.2.3.2 Hindrances against the incorporation of H&S in tender evaluation.

4.2.3.2.1 Hindrances against the incorporation of health and safety criterion in tender evaluation.

Respondents were asked to outline factors that hinder the effective incorporation of H&S criterion in tender evaluation. Respondent A and D indicated that the criteria of evaluating H&S is rigid and not conclusive; they established that the manner in which H&S is evaluated in the South African context is that the client and its representatives draft a H&S specification and give it out as part of the tender document so that tenderers should respond with a proposed H&S plan. Zhang and Mohandes (2020:1) support this finding by alluding that there is no proper channel that has been set yet to effectively evaluate H&S criterion to eliminate the safety risk projects face. Respondents A outlined that this process has a lot of loopholes because in many instances, the client and its representative mainly use a generic template for a H&S specification, which does not align with the demands of the project and ultimately this distorts the whole chain of H&S process including appointing a tenderer with a good H&S track record. Respondent G, D and E argued that using a proposed H&S plan as a submission during

tender evaluation is not adequate, stating that the H&S plan must be conclusive and binding as other criteria like the project cost.

Furthermore, respondent A, C, and F opined that H&S must be categorised between H&S price and H&S documentation, of which these two aspects must both be assessed during tender evaluation. To buttress these findings, Wells and Hawkins (2014:5) elucidate that H&S pricing should be evaluated independently, allowing adequate financing of all H&S aspects. However, respondent A mentioned that it is unusual for H&S pricing to be assessed during tender evaluation due to the dependence of the H&S regulation that articulates that only a proposed H&S should form part of tender documentation. Respondents E and H acknowledged that the major hindrance of incorporating H&S in tender evaluation is the dominance of other criteria such as quality, price, experience, and time. Rashvand *et al*. (2015:81) concur with these finding by indicating that price, quality, and time are the main dominating criteria for tender evaluation.

Adding on, respondent E outlines that corruption is a hindrance to effective incorporation of H&S criterion to various tender evaluation criteria. They outlined that aspects such as forgery, bribery, and falsification of documents result in selecting a tenderer without H&S knowledge. Osei-Tutu *et al.* (2010:236), in line with these findings also detest corrupt practices. Regarding the technical aspects of evaluating tenders, Respondent B and F indicate that the tender evaluation panel sometimes lacks the competence to exhaust all the aspects of tender evaluation effectively. In most instances, H&S is not effectively evaluated because H&S agents rarely appear in tender evaluation meetings.

4.2.3.2.2 Impacts of restricted incorporation of H&S in tender evaluation on a project

Respondents were asked to outline the impacts of restricting the incorporation of H&S in tender evaluation on the overall project outcome. Respondent A, D, and E acknowledged that the failure of H&S on a project mainly emanates from appointing a tenderer without adequate knowledge to implement H&S. Shabangu (2017:42) indicates that appointing a contractor without adequate H&S results in poor safety on projects. All the respondent unanimously pinpoints the shortfalls of inadequate H&S as high accident rates resulting in injuries and fatalities.

Respondent G and D Mentioned that the visible results of a poorly effected H&S on a project are time overruns and cost overruns. They further remarked that time overruns are caused by stopping works to address accidents during production time and by the absenteeism of workers due to injuries. Cost overruns mainly result from the loss of production time and the compensation of injured workers. Respondents H, B, F, and C stated that poor H&S on a

project is associated with poor quality, and this is buttressed by Oke et al. (2017:153). Respondent A outlines that failure of incorporating H&S in tender evaluation also results in appointing a tenderer without a solid H&S culture, which results in continuous accidents. Respondent A and E indicated that the gross violations of H&S regulations result in shutting down the site and probably dismissing the contractor.

4.3 Summary

The findings presented in the exploratory study were obtained from a content analysis of two objectives of the study. The first objective was to determine hindrances against the incorporation of health and safety criterion in tender evaluation. It was established that hindrances such as corruption, the dominance of other criteria, lack of competence of the tender evaluation panel, and the use of a generic H&S specification by the client limit effective incorporation of H&S criterion in tender evaluation. It was also established that failure to incorporate H&S in tender evaluation results in appointing a tenderer without H&S knowledge and ultimately having a project with poor H&S. The second objective of the study was to investigate the extent to which construction clients perceive the relevance of incorporation of H&S in tender evaluation. The qualitative findings revealed that H&S is part of the tender evaluation criteria, but it is not adequately evaluated as only the H&S plan is assessed. Also, it was evident that most construction clients are not well knowledgeable about H&S and it impacts on the project, especially private sector clients. It was established that it is important to alert construction clients on incorporating H&S in tender evaluation.

Table 4. 2: Summary of findings

clients emphases on incorporating H&S within tender evaluation criteria	The results from the analysis showed that the respondents distinguished clients into public and private sector. The public sector clients adhere to the outlined guidelines, so they are strict on implementing H&S in tender evaluation compared to private clients. Most respondents indicated that clients usually take H&S as a formality when evaluating tenders as they are required to submit a proposed H&S plan. This gives clients a leeway to put less emphasis on H&S and, in turn, give more attention to other criteria such as quality and price.
Clients' knowledge on the impact of H&S to deliver construction projects	Most of the respondents interviewed outlined that private sector clients have limited knowledge of H&S as opposed to public sector clients. Private sector clients are more driven with aspects that are time and cost serving, and they negate H&S. On the other hand, public clients have almost the same element of choosing price over other criteria, but they are strict when tenderers do not comply

	by attaching a H&S plane or a non-competent plan that address the needs of the project by disqualifying them.
Measure implemented to make clients conscious of the importance of incorporating H&S in tender evaluation	The respondents indicated that the client must appoint a H&S consultant in the pre-design stage when other consultants are appointed. Appointing a H&S consultant early allows them to design all the safety structures, including a H&S specification that best fits the project rather than using a generic one. The client must also remunerate the H&S consultant well the same as the other agents so that the agent will better advise the client and be always available to monitor and implement policies rather than the agent conducting sporadic visits.
Hindrances against the incorporation of H&S criterion in tender evaluation.	The respondents outlined that H&S in the South African construction industry is mostly evaluated in a one dimensional way. The client gives tenderers a H&S specification to formulate an H&S plan that will be part of tender documents evaluated in tender evaluation. It was established that this system has loopholes as tenderers usually use a generic H&S plan that is not specific to the project. Also, the H&S plan will be a proposed document, which makes it inadequate to assess if a tenderer is competent in terms of H&S. The nature of H&S of being quantitative and qualitative makes it difficult to evaluate. Aspects of corruption also suppress effective incorporation of H&S criterion.
Impacts of restricted incorporation of H&S in tender evaluation on a project	All the respondents unanimously concurred that appointing a contractor with limited knowledge of H&S is detrimental to the project. Prevalence of poor H&S on a project results in high fatalities and injury rates, time overruns, cost overruns, and poor project quality

CHAPTER FIVE

DATA ANALYSIS AND PRESENTATION

5.1 Introduction

This chapter presents the analysis of data collected with two sets of questionnaires from construction practitioners and construction clients. The chapter is subdivided into two sections presenting the empirical data obtained from the questionnaires. Both sections in the research participation section present the profile of the respondents. The construction practitioners section presented the analysis of motives of incorporating H&S in tender evaluation, H&S criterion in comparison with other tender evaluation criteria, hindrances of incorporating H&S in tender evaluation, clients' perception regarding the incorporation of H&S in tender evaluation, and aspects of H&S that are incorporated in tender evaluation and their relative importance. Furthermore, the section for construction clients presented an analysis of clients' H&S commitment, H&S pre-construction activities, and clients' perception of incorporating H&S in tender evaluation. Also, factor analysis was used on the extent H&S criterion is incorporated in tender evaluation compared with other criteria and on identifying the hindrances against the incorporation of H&S criteria in tender evaluation.

5.2 CONSTRUCTION PRACTITIONERS PERCEPTION OF INCORPORATING H&S IN TENDER EVALUATION

5.2.1 Research participation

The construction practitioners' questionnaire was designed and sent to practitioners in the Western Cape province of South Africa. A total of 265 questionnaires were distributed; of the 265 questionnaires, 105 questionnaires, representing a response rate of 39.62% was duly completed and returned, as shown in Table 5.1.

Table 5. 1: Questionnaire response rate

Questionnaire	Administered	Total Returned	Response rate
	N	N	%
Construction practitioners	265	105	**39.62%**

5.2.2 Profile of respondents

The first section of the questionnaire consists of questions aimed at obtaining biographical information of the respondents. Biographical information that was analysed in this section includes gender, age, experience, qualification, sector of operation, and level of qualification.

5.2.3.1 Respondents' Gender

Table 5.2 presents the gender of the respondents that participated in the survey. The sample comprised 26.7% females and 73.3% males. Regardless of the representation of both genders in the survey, there is less representation of females than males, this depicts the fact that the construction industry is more dominated by males than females.

Table 5. 2: Gender of respondents

Gender	Frequency	Percentage
Female	28	26.7
Male	77	73.3
Total	**105**	**100**

5.2.3.2 Age group

Table 5.3 depicts the age group of survey respondents. The distribution of the table shows that 2.9% of the respondents were below the age of 25 years, 23.8% were between 25 and 30 years of age, 40.0% were between 31 and 40 years of age, 23.8% were between 41 and 50 years of age, 8.6% were between 51 and 60 years of age and 1.0% was above 60 years. The table indicates that 63.8% of the respondents are between 31 and 50 years, suggesting that the majority of the respondents had adequate maturity.

Table 5. 3: Age Group of respondents

Age group	**Frequency**	**Percent**
Under 25	3	2.9
25-30	25	23.8
31-40	42	40.0
41-50	25	23.8
51-60	9	8.6
Over 60	1	1.0
Total	105	100.0

5.2.3.3 Highest formal qualification

Table 5.4 indicates the various academic qualifications within the population response group. It is important to note that 100% of the respondents had tertiary learning qualification, including Diplomas (18.1%), Bachelor's degree (35.2%), Honours Degree (27.6%), Post Graduate Diplomas (1.9%), Master's Degree (15.2%), Doctorate Degree (1.0%) and other qualifications (1.0%). This suggests that the respondents had the relevant educational background to understand and respond appropriately to the survey.

Table 5. 4: Formal qualification of respondents

Qualification	Frequency	Percent
Diploma	19	18.1
Bachelor's degree	37	35.2
Honours Degree	29	27.6
Post Graduate Diploma	2	1.9
Master's degree	16	15.2
Doctorate Degree	1	1.0
Others	1	1.0
Total	105	100.0

5.2.3.4 Working sector of respondents.

Table 5.5 presents the working sector in which the study respondents are engaged. it is evident that 27.6% of the respondents had experience working in the public sector, 64.8% of the respondents worked in the private sector, and 7.6% worked in both the public and private sectors. It indicates that the survey had both opinions of the private and the public sector.

Table 5. 5: Working sector for respondents

Sector	Frequency	Percent
Public sector	29	27.6
Private sector	68	64.8
Both	8	7.6
Total	105	100.0

5.2.3.5 Working experience of the respondents

Table 5.6 outlines the work experience of survey participants in the construction sector. The descriptive analysis discloses that the respondents with less than 5 years of work experience represent 24.8% of the respondents. Respondents having 5 to 10 years of experience constitute 36.2% of the population, while respondents with experience above 10 years constitute 39.0% of the population. The respondents' years of experience were sufficient to achieve the purpose of the study, as a significant 39.0% of the study population had more than

10 years of work experience. However, the input from respondents with work experience under the bracket of less than 5 years is also significant.

Table 5. 6: Experience of respondents

Years of working Experience	Frequency	Percent
Less than 5 years	26	24.8
5 to 10 Years	38	36.2
Over 10 Years	41	39.0
Total	105	100.0

5.2.3.6 Profession of the respondents

Table 5.7 presents the profession of survey participants. The largest group of respondents representing 39.0%, were quantity surveyors, followed by architects, representing 19.0% of the respondents. Engineers made up 15.2%, project managers 15.2%, H&S practitioners 7.6%, and other unspecified construction practitioners constituted 3.8% of the total respondents. This result indicates that the respondents surveyed represent a broad spectrum of different practitioners across the construction sector.

Table 5. 7: Profession of respondents

Profession	Frequency	Percent
Architect	20	19.0
Engineer	16	15.2
Project Managers	16	15.2
Quantity Surveyor	41	39.0
H&S	8	7.6
Others	4	3.8
Total	105	100.0

5.2.3.7 Participation in tender evaluation

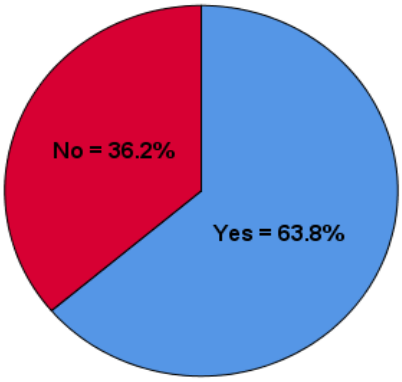

Figure 5. 1: Participation in tender evaluation

Figure 5.1 shows that most of the respondents 63.8% (67), were involved in tender evaluation processes, and the remainder of the respondents, which is 36.2% (38) have not been engaged in tender evaluation processes. Having majority of respondents with experience of tender evaluation indicates great practicality and reliability in the information obtained.

5.2.3.8 Inclusion of H&S in tender evaluation.

Inclusion of H&S in tender evaluation is a follow-up question to establish how many of the respondents witnessed the inclusion of H&S criterion in tender evaluation. Figure 5.1 in section 5.2.3.7 indicates that 63.8% (67) of the population were involved in tender evaluation. From the population of 67 respondents that were involved in tender evaluation, 61.9% (42) respondents indicate that they have incorporated H&S in tender evaluation, and 38.1% (25) indicate that H&S was not part of the criteria that was evaluated during the tender evaluation process.

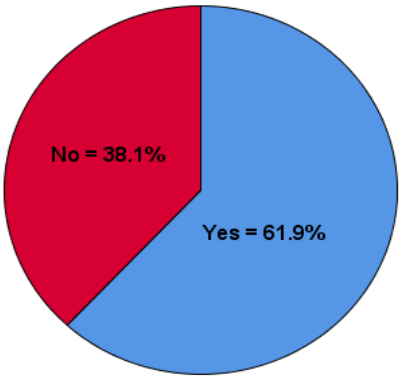

Figure 5. 2: Inclusion of H&S in tender evaluation

5.2.3.9 Percentage of H&S cost to the overall tender price

Table 5.8 shows how the H&S cost compares to the overall tender price as a percentage; the percentages were obtained only from the respondents that had previously been engaged in tender evaluation, which is 61.9% of the overall respondents as outlined in section 5.2.3.8. Table 5.8 indicates that the average percentage of all the projects assessed is 3.43%, and the mode was 2.0%. The minimum Percentage recorded was 0.65%, and the maximum was 10.00%.

Table 5. 8: Percentage of H&S cost to the overall tender price

Variable spread		**Central tendency**			**Standard deviation**
Minimum %	Maximum %	Mean %	Median %	Mode %	Std deviation
0.65	10.00	3.43	3.00	2.00	2.13

5.2.4 Reliability test

Table 5. 9: Reliability test for construction practitioners research instrument

Section	**Statement**	**Number of items**	**Cronbach's alpha coefficient**
B	Motives of incorporating H&S in tender evaluation	23	0.79
C	Elements of tender evaluation versus health and safety criterion	25	0.86
D	Hindrances of incorporating H&S in tender evaluation	24	0.79
E	Clients' perception of incorporating H&S in tender evaluation	24	0.70
F-6a	Frequency of incorporation of aspects of H&S	25	0.75
F-6b	Level of importance of aspects of H&S	25	0.84
	Total questions	**146**	**0.81**

The reliability test of the practitioner's research instrument was assessed using Cronbach's alpha coefficient. Cronbach's alpha coefficient's basic assumption is that the optimal co-efficient alpha should be 0.7 and above. If the coefficient is closer to 1, that shows more reliability in the scale and the survey instrument. Thus, Cronbach's reliability test results for construction practitioners' instruments are presented in Table 5.9.

Table 5.9 indicates that the Cronbach's alpha coefficient values are greater than 0.7, this is, however, in agreement with the assertion of Ahire and Devaraj (2001:322) and Feldt, Woodruff, Salih and Srichai (1986:3) that a co-efficient alpha value above 0.7 is good, and

above that co-efficient value above 0.8 is preferable. The results presented confirm that the questionnaire instrument used for construction practitioners for this research is dependable and adequate since all the alpha coefficient values of the scales were above 0.7. The Cronbach's coefficient of all the questions was 0.81.

5.2.5 Interpretation and definition of the scales

This section deals with the analysis of the data gathered using the construction practitioner's questionnaire. The analysis of the various questions is listed according to the sequence followed in the questionnaire. The various headings of the specific sections were: motives of incorporating H&S criterion in tender evaluation; the extent to which H&S criterion is incorporated in tender evaluation compared with other criteria; hindrances of incorporating H&S criterion in tender evaluation; clients perception regarding incorporating H&S in tender evaluation; aspects of H&S that are incorporated in tender evaluation and their relative importance. Excluding inferential statistics used for testing postulated research hypotheses, all the Likert-scale type questions were deliberated based on the measurement scale indicated in Table 5.10, and in some instances, percentages were used in the discussion. The analysis was centered mainly on the mean and the standard deviation. Given the descriptive nature of the results, the use of hierarchy noted with ordinal data was considered suitable for presenting the results.

Table 5. 10: Definition of the scales

Section	Mean score range	Meaning
B, D, E	$> 4.20 \leq 5.00$ $> 3.40 \leq 4.20$ $> 2.60 \leq 3.40$ $> 1.80 \leq 2.60$ $\geq 1.00 \leq 1.80$	Between agree to strongly agree / strongly agree; Between somewhat agree to agree/agree; Between disagree to somewhat agree / somewhat agree; Between strongly disagree to disagree/disagree; Between strongly disagree to disagree
F-6A	$> 4.20 \leq 5.00$ $> 3.40 \leq 4.20$ $> 2.60 \leq 3.40$ $> 1.80 \leq 2.60$ $\geq 1.00 \leq 1.80$	Between often to always / always; Between sometimes to often / often; Between rarely to sometimes / sometimes; Between never to rarely / rarely; Between never to rarely
C, F-6B	$> 4.20 \leq 5.00$ $> 3.40 \leq 4.20$ $> 2.60 \leq 3.40$ $> 1.80 \leq 2.60$ $\geq 1.00 \leq 1.80$	Between very important to extremely important / extremely important; Between important to very important / very important; Between somewhat important to important/important; Between unimportant to somewhat important / somewhat important; Between unimportant to somewhat important

5.2.6 Motives of incorporating health and safety criterion in tender evaluation

Respondents were asked to indicate their level of agreement on motives of incorporating H&S criterion in tender evaluation: where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure.

One of the study's objectives is to investigate what motivates the inclusion of H&S criterion in tender evaluation. To achieve this objective, the need to evaluate the impact of cost, time, and quality implications on H&S is essential. Table 5.11 indicates the respondents' degree of concurrence on the factors affecting incorporation of H&S in tender evaluation in terms of responses to a scale of 1 (strongly disagree) to 5 (strongly agree), and a mean score (MS) ranging between 1.00 and 5.00. These factors were categorised under three sub-headings: H&S cost implications, Impact on time, and quality. It should be noted that all 23 (100%) MSs listed in Table 5.11 are above the midpoint score of 3.00, thus the possibility of these factors influencing the inclusion of H&S criterion in tender evaluation.

With respect to cost, the hierarchical ranking indicates that well-annotated H&S structures eliminate the possibility of contract price adjustment is ranked 1st with a mean score (MS) of 4.04. This is followed by adequate H&S investment entails low-cost spending on compensating incidents caused by disability and early retirement with a MS of 3.99, and an adequate H&S budget that entails a lower cost of accidents on a project is ranked 3rd with a MS of 3.97.

Notably, all the 10 (100%) factors under H&S cost implications are above the mid-point of 3.00. However, 9 out of 10 (91%) MSs in this category are > 3.40 ≤ 4.20, indicating that these factors influence the incorporation of H&S criterion in tender evaluation and are deemed to between somewhat agree to agree/agree. More so, respondents' degree of concurrence to good H&S practices allows a saving in terms of social cost with a MS of 3.20 was deemed to be between disagree to somewhat agree / somewhat agree since the MS is between > 2.60 ≤ 3.40. The descriptive statistics further revealed that the average mean score (AMS) for all the factors in the category of cost is 3.81.

Regarding H&S impact on time, the descriptive statistics revealed that Good H&S performance assists in terms of delivering construction projects on time is ranked 1st with a MS of 4.16. This is closely followed by Avoiding serious accidents and fatalities to prevent suspension of construction work and ultimately project delays with a MS of 4.15. The 3rd ranked factor is Avoiding accidents prevents production disruptions and ultimately prevents extension of time with a MS of 4.11. It is also evident that all the 7 (100%) factors have MSs above the mid-point of 3.00, which indicates that in general, the likelihood of these factors influencing the incorporation of H&S criterion in the tender evaluation may be significant. The respondents'

concurrence with all the factors of H&S impact on-time category is deemed to be between somewhat agree to agree/agree (MS > 3.40 ≤ 4.20), and the AMS for the combined factors is 3.95.

In the category of H&S impact on quality, the findings indicate that good practices of H&S are associated with injury-free projects with a MS of 4.09 is ranked first, constructability of a project has an impact on H&S with a MS of 3.79 ranked second, and well-managed H&S improves the quality of work on construction projects with MS of 3.73 is ranked third. Additionally, it is notable that all six factors (100%) recorded MSs above the midpoint of 3.00. However, 5 of the mean scores in this category are > 3.40 ≤ 4.20, indicating that these factors influencing the inclusion of H&S criterion in tender evaluation are deemed to be between somewhat agree to agree/agree. Adding on, respondents' concurrence to the least ranking factor that is avoiding accidents prevents reworks had a MS of 3.22 and was categorised to between disagree to somewhat agree / somewhat agree since the MS is between > 2.60 ≤ 3.40. Overall, the AMS for all the factors associated with the category of H&S impact on quality is 3.65

Table 5. 11: Motives for incorporating H&S in tender evaluation

Motives	No.	Response (%) Never……..…..Always					MS	SD	Rank
		1	2	3	4	5			
H&S cost implications									
Well annotated H&S structures eliminate the possibility of contract price adjustment	105		2.9	19.0	49.5	28.6	4.04	.77	1
Adequate H&S investment entails low-cost spending on compensating incidents caused by disability and early retirement	105			20.0	61.0	19.0	3.99	.63	2
Adequate H&S budget entails a lower cost of accidents on a project	105		1.0	24.8	50.5	23.8	3.97	.73	3
Strict scrutiny of H&S during tender evaluation facilitate adequate pricing of H&S for construction projects	105		1.0	22.9	58.1	18.1	3.93	.67	4
Good accident management prevents disruptions in production, this alludes to positive cost saving	105		1.0	24.8	54.3	20.0	3.93	.70	5
Good H&S practices entail low staff turnover which allows great saving in terms of replacement and training cost	105		1.0	36.2	47.6	15.2	3.79	.72	6
Good H&S practices entail the minimum occurrence of legal implications on a	105		1.9	32.4	50.5	15.2	3.77	.71	7

project which results in positive cost saving									
Good management of H&S results in low insurance premiums	105		1.9	34.3	52.4	11.4	3.73	.68	8
Low accident rate is associated with quality work and this allows cost-saving in terms of reworks and corrective works	105		6.7	38.1	44.8	10.5	3.59	.77	9
Good H&S practices allows a saving in terms of social cost	102	3.8	10.5	41.0	32.4	8.6	3.20	1.11	10
Average mean score for H&S cost implications							**3.81**	**0.33**	
Impact on time									
Good H&S performance assist in terms of delivering construction projects on time	105	1.0	1.9	13.3	47.6	36.2	4.16	.80	1
Avoiding serious accidents and fatalities prevent suspension of construction work and ultimately project delays	104		1.9	14.3	49.5	33.3	4.15	.84	2
Avoiding accidents prevents production disruptions and ultimately prevents extension of time	103	1.0	0.0	14.3	54.3	28.6	4.11	.91	3
Avoiding accidents prevent the adoption of overtime to recover lost time	105		2.9	21.9	59.0	15.2	3.84	.79	4
Good time management avoids production pressure, and this has a positive impact on project H&S	105			37.1	44.8	18.1	3.81	.72	5
Maintaining the project in a good timeframe prevents straining of workers and occurrence of H&S incidents	105			32.4	55.2	12.4	3.80	.64	6
Avoiding overtime and long working hours prevents burnout and fatigue in workers and this keeps them healthy and safe	105		1.0	32.4	55.2	11.4	3.77	.65	7
Average mean score for Impact on time							**3.95**	**.41**	
Impact on quality									
Good practices of H&S is associated with injury-free projects	105	1.0	1.0	17.1	50.5	30.5	4.09	.774	1
constructability of a project has an impact on H&S	105		1.0	33.3	51.4	14.3	3.79	.69	2
Well managed H&S improves the quality of work on construction projects	105		1.0	38.1	47.6	13.3	3.73	.70	3
Design can influence H&S practices	105	1.0	3.8	38.1	44.8	12.4	3.64	.79	4
Price of H&S directly impact the quality of work	105		7.6	44.8	42.9	4.8	3.45	.71	5
Avoiding accidents prevents reworks	105	1.0	12.4	48.6	30.5	5.7	3.22	.91	6
							3.65	**.42**	

5.2.7 The extent to which health and safety criterion is incorporated in tender evaluation compared with other criteria

Respondents were asked to indicate their perception on the importance of health and safety criterion when incorporated in tender evaluation in comparison with other criteria of tender evaluation: where 1 = Unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure.

Table 5. 12: Comparison of H&S with other aspects of Tender evaluation.

Criteria for tender evaluation	No.	Response (%)					MS	SD	Rank
		Never……..…Always							
		1	2	3	4	5			
Cost of project completion	105	1.9	2.9	14.3	45.7	35.2	4.10	.88	1
Projects completion time	105	1.0	2.9	22.9	38.1	35.2	4.04	.89	2
Management capability to plan, organize and control the project	105		6.7	30.5	47.6	15.2	3.71	.81	3
The actual quality achieved for similar works	105	2.9	14.3	25.7	35.2	21.9	3.59	1.07	4
Financial stability and the ability to execute the project	105	3.8	23.8	50.5	20.0	1.9	2.92	.82	5
Experience demonstrated through previous projects	105	1.9	28.6	49.5	16.2	3.8	2.91	.82	6
Insurance policy	105	9.5	28.6	38.1	19.0	4.8	2.81	1.01	7
Environmental protection	105	8.6	27.6	46.7	14.3	2.9	2.75	.91	8
Engineering co-ordination	105	4.8	37.1	39.0	16.2	2.9	2.75	.89	9
Availability of equipment	105	7.6	30.5	46.7	13.3	1.9	2.71	.86	10
Technical capacity of the contractor to execute the project	104	2.9	34.3	51.4	9.5	1.0	2.69	.76	11
Productivity improvement procedures and awareness	105	9.5	37.1	40.0	7.6	5.7	2.63	.96	12
Availability to execute the project	105	15.2	34.3	36.2	5.7	8.6	2.58	1.09	13
Type of performance bond	105	11.4	38.1	36.2	9.5	4.8	2.58	.98	14
Construction method statement	105	12.4	41.0	37.1	6.7	2.9	2.47	.90	15
Availability of technical expertise	104	8.6	44.8	39.0	5.7	1.0	2.45	.81	16
Ethical behaviour and fair dealing.	105	21.9	34.3	32.4	7.6	3.8	2.37	1.03	17
Size of the company	105	14.3	46.7	32.4	4.8	1.9	2.33	.85	18
Qualification and experience of professional technical staffs	105	18.1	46.7	27.6	4.8	2.9	2.28	.91	19
References for previous work complete	105	17.1	54.3	21.0	2.9	4.8	2.24	.94	20
Previous records of claims and litigation	104	20.0	49.5	21.9	3.8	3.8	2.21	.96	21
Familiarity with local working culture and regulatory authorities	105	22.9	43.8	27.6	2.9	2.9	2.19	.92	22
The reputation of the contractor	105	24.8	43.8	22.9	5.7	2.9	2.18	.97	23
Past relationship with other entities engaged within construction activities	105	23.8	48.5	19.0	2.9	4.8	2.15	.98	24
Location of home office	105	33.3	44.8	10.5	7.6	3.8	2.04	1.05	25

The questionnaire survey required the respondents to indicate their opinions on H&S criteria compared to other criteria for tender evaluation. The respondent's concurrence level was deemed using a 5-point Likert scale of 1 (Unimportant) to 5 (extremely important), and a MS ranging between 1.00 and 5.00. The hierarchical ranking of the mean scores revealed that cost of project completion is ranked first with a MS = 4.10, projects completion time is ranked second with a MS = 4.04, followed by management capability to plan, organize and control the project (MS = 3.71).

It should also be noted that only 4 (16%) of the criteria listed in Table 5.12 have a MS above the midpoint of MS 3.00, which indicates that the majority of the tender evaluation criteria are deemed less important than H&S criteria.

4 out of 25 (16%) MS > 3.40 ≤ 4.20 suggest that the respondents' concurrence can be deemed to be between important to very important / very important for the following criteria: Cost of project completion (MS = 4.10), projects completion time (MS = 4.04), management capability to plan, organize and control the project (MS = 3.71), and the actual quality achieved for similar works (MS = 3.59)

More so, 8 (32%) of the criteria had MS ranging from > 2.60 ≤ 3.40, which indicates that the respondents' level of concurrence can be deemed between somewhat important to important/important. The criteria involved in this range included financial stability and the ability to execute the project (MS = 2.92), which ranked 5th, experience demonstrated through previous projects (MS = 2.91) ranked 6th, and insurance policy (MS = 2.81) ranked 7th.

The remaining 13 (52%) of the criteria had their MS ranging from > 1.80 ≤ 2.60, which elaborates that the level of respondents' concurrence is between unimportant to somewhat important / somewhat important. The criteria in this cluster included Availability to execute the project (MS = 2.58), which ranked 13th, Type of performance bond (MS = 2.58) ranked 14th, and Construction method statement (MS = 2.47) ranked 15th. The least ranked criteria were the reputation of the contractor (MS = 2.18), Past relationship with other entities engaged within construction activities (MS = 2.15), and Location of home office (MS = 2.04). The least criteria ranked 23rd, 24th, and 25th respectively.

5.2.8 Hindrances of incorporating health and safety criterion in tender evaluation

Respondents were asked to indicate their level of agreement on the hindrance of incorporating H&S in tender evaluation; where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure.

The data in Table 5.13 indicates the hindrances of incorporating H&S criterion in the tender evaluation processes in terms of responses to a scale of 1 (strongly disagree) to 5 (strongly agree), and a MS ranging from 1.00 to 5.00. It should be noted that 23 of the 24 (96%) MSs outlined have a MS equal to or above the midpoint score of 3.00, thus the possibility of these factors hindering the effectiveness of incorporating H&S in tender evaluation.

It is apparent that 19 out of 24 (79%) of the hindrances had a MS ranging from > 3.40 ≤ 4.20, which alludes that the respondents' level of concurrence can be deemed to be between somewhat agree to agree/agree. The criteria in this range include corruption and unethical practices that hinder the effective incorporation of H&S in tender evaluation with a MS of 4.03, ranked 1st, followed by the client's H&S specification confine tenderers to fully explore elements of H&S with a MS of 3.93. The third-ranked factor was poor design of tender documents limits effective incorporation of H&S in tender evaluation with a MS of 3.90.

Adding on, the remaining 5 factors had MS in the category > 2.60 ≤ 3.40, which is deemed to between disagree to somewhat agree / somewhat agree. The least ranked factors in this category were H&S is expensive to be implemented with a MS of 3.15, tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S with a MS of 3.02, and safety law and regulations are impractical for construction contractors with a MS of 2.89, these factors were ranked 22nd, 23rd, and 24th respectively. Overall, the AMS for all the hindrances of tender evaluation is 3.42, which falls in the category of > 3.40 ≤ 4.20; this shows that the concurrence is between somewhat agree to agree/agree. This indicates that most of the factors hinder the effective incorporation of H&S criteria in tender evaluation.

Table 5. 13: Hindrances of incorporating H&S in tender evaluation

Hindrances	No.	Response (%) Never……..…. Always					MS	SD	Rank
		1	2	3	4	5			
Corruption and unethical practices hinder effective incorporation of H&S in tender evaluation	105			19.0	59.0	21.9	4.03	.64	1
Poor design of tender documents limits effective incorporation of H&S in tender evaluation	105		1.9	25.7	52.4	20.0	3.93	.80	2

Client's H&S specification Confine tenderers to fully explore elements of H&S	105		4.8	21.0	54.3	20.0	3.90	.77	3
The dominance of price time and quality restrict effective implementation of H&S in tender evaluation	105			32.4	49.5	18.1	3.86	.70	4
Insufficient or inconsistent policies, regulations, incentives and commitment by H&S governing bodies	105	1.9	9.5	33.3	39.0	16.2	3.83	.90	5
Lack of technical expertise of tender evaluation panel on H&S issues	105		2.9	29.5	54.3	13.3	3.78	.71	6
General limited knowledge of contractors to price H&S adequately	105		1.0	40.0	45.7	12.4	3.70	.78	7
Lack of expertise in H&S professionals	105		6.7	38.1	35.2	20.0	3.69	.87	8
Safety law and regulations are not adequately enforced; thus, disadvantaging those trying to implement them	105		6.7	35.2	44.8	13.3	3.65	.80	9
Lack of awareness, understanding, information, commitment, by both the employer and tenderers	105		5.7	36.2	45.7	12.4	3.65	.77	10
Insufficient integration and linkup of latest H&S guidelines and regulations prevailing in the industry	105	1.0	10.5	30.5	39.0	18.1	3.64	1.00	11
Insufficient or confusing guidance, tools, demonstrations of H&S procedures	105	1.0	5.7	27.6	41.0	24.8	3.58	.94	12
Lack of clients commitment and support of H&S	104	1.9	9.5	33.3	40.0	14.3	3.56	.98	13
Lack of client's understanding of the importance of H&S	105		13.3	37.1	30.5	19.0	3.55	.95	14
Client use of a generic H&S specification that does not meet project demands	105		8.6	37.1	42.9	10.5	3.55	.87	15
Insufficient research and development	105	1.9	12.4	34.3	38.1	13.3	3.49	.94	16
Competitive tendering without reference to H&S	105		8.6	42.9	41.0	6.7	3.47	.75	17
The nature of H&S for being in quantitative and qualitative form (H&S pricing and H&S method statement)	105		10.5	38.1	45.7	5.7	3.47	.76	18
Choice of procurement system have an effect in determining the level of incorporating H&S in tender evaluation	105		15.2	35.2	40.0	9.5	3.44	.87	19
Construction contractors lack H&S knowledge to implement proper H&S measures required	105	1.9	21.0	38.1	28.6	10.5	3.25	.97	20
General perception that adequately pricing H&S always leads to a higher tender sum	105	1.9	21.0	41.0	27.6	7.6	3.19	.97	21

H&S is expensive to be implemented	104	3.8	21.0	37.1	30.5	6.7	3.15	1.01	22
Tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S	104	2.9	29.5	36.2	22.9	7.6	3.02	1.02	23
Safety law and regulations are impractical for construction contractors	105	8.6	25.7	39.0	21.9	4.8	2.89	1.000	24

5.2.9 Clients perception regarding incorporating health and safety in tender evaluation

Respondents were asked to indicate their level of agreement on the client's perception for incorporating health and safety in tender evaluation; where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure.

Table 5. 14: Clients' perception of incorporating H&S in tender evaluation

	No.	Response (%)					**MS**	**SD**	**Rank**
		Never……..…Always							
		1	2	3	4	5			
Clients focus more on cost than H&S	105		1.0	7.6	43.8	47.6	4.38	.67	1
Clients focus more on quality than H&S	105			7.6	47.6	43.8	4.36	.75	2
Clients focus more on time than H&S	105		1.0	15.2	43.8	40.0	4.23	.74	3
Expert and experienced clients play a more active role in H&S activities of their projects	105	1.0	3.8	19.0	39.0	36.2	4.07	.98	4
It is fundamentally important for clients to obtain appropriate advice on the choice of H&S strategies and policies to use	105		3.8	28.6	39.0	28.6	3.92	.85	5
Client H&S agents can influence H&S during the design stage	105		2.9	27.6	49.5	20.0	3.87	.76	6
Clients attitude on H&S can influence the behaviour and attitudes of other parties on H&S	105		6.7	24.8	45.7	22.9	3.85	.85	7
Adequate client knowledge of H&S issues on construction projects influences teamwork and collaboration	105		3.8	35.2	43.8	16.2	3.72	.86	8
The lack of client understanding and ignorance of H&S process contributes to unsafe project delivery	105		9.5	28.6	41.9	19.0	3.71	.96	9
Clients are aware of the benefits of incorporating H&S in tender evaluation	104	1.0	3.8	35.2	43.8	14.3	3.68	.95	10
Cooperation of client in H&S issues is vital for safe delivery project	105		5.7	36.2	42.9	15.2	3.68	.80	11

Clients can positively influence H&S	105		11.4	32.4	42.9	13.3	3.58	.86	12
Clients understand H&S differently	105	1.0	21.0	35.2	38.1	4.8	3.54	.82	13
The lack of adequate client involvement in pretender H&S planning leads to poor implementation of H&S across the project lifecycle	105	3.8	7.6	36.2	41.0	11.4	3.49	.93	14
Client understands their role in terms of H&S to ensure the safe delivery of projects	105	1.0	11.4	36.2	44.8	6.7	3.45	.82	15
The level of client involvement in H&S planning is determined by their level of understanding H&S technicalities	105		10.5	43.8	38.1	6.7	3.42	.84	16
Client understands the importance of employing an H&S consultant during the project feasibility phase to be part of the project design team	105	1.0	16.2	37.1	35.2	9.5	3.37	.96	17
Clients can negatively influence H&S	105	2.9	14.3	40.0	37.1	5.7	3.29	.88	18
Clients treatment of H&S in tender evaluation is different	105	1.0	21.0	35.2	38.1	4.8	3.25	.875	19
Clients are adequately involved in the choice of project H&S strategies and policies	104	1.0	20.0	40.0	31.4	6.7	3.23	.92	20
Clients can identify hazards during the project feasibility phase	105	4.8	22.9	39.0	25.7	6.7	3.09	1.02	21
Clients tend to select H&S strategies and policies they are familiar with, which might not necessarily be the best	105	1.9	29.5	34.3	29.5	4.8	3.08	.93	22
Construction clients understand their roles and responsibilities in terms of H&S and adequately perform them	105	2.9	30.5	40.0	21.9	4.8	2.95	.91	23
Client interference is a hindrance to effective H&S implementation to achieve safe project success	104	9.5	28.6	33.3	23.8	3.8	2.84	1.06	24

One of the primary objectives of this research was to assess clients' perceptions regarding incorporating H&S in tender evaluation. To pursue this objective, several factors were identified, and the perception of built environment stakeholders relative to the importance of the factors was measured based on a 5-point Likert scale of 1 (strongly disagree) to 5 (strongly agree), and the MSs ranging between 1.00 and 5.00. It is apparent from Table 5.14 that 22 of the 24 (92%) MSs are greater than the midpoint 3.00, thus the respondents agree that clients appreciate the incorporation of H&S in tender evaluation.

The hierarchical rankings of client's perception of incorporating H&S in tender evaluation outlined in Table 5.14 indicate that clients focus more on cost than H&S with a MS of 4.38 was

the highest-ranked factor, closely followed by clients focus more on quality than H&S with a MS of 4.36. The third-ranked factor was clients focus more on time than H&S with a MS of 4.23. the MS of these factors ranged in the category > 4.20 ≤ 5.00, indicating that the perceptions can be deemed to be between agree to strongly agree / strongly agree. The least ranked factors were clients tend to select H&S strategies and policies they are familiar with, which might not necessarily be the best with a MS of 3.08, construction clients understand their roles and responsibilities in terms of H&S and adequately perform them with a MS of 2.95, and client interference is a hindrance to effective H&S implementation to achieve safe project success with a MS of 2.84, these criteria were ranked 22nd, 23rd, and 24th respectively. The least ranked factors fall in the category > 2.60 ≤ 3.40, which is deemed to be between disagree to somewhat agree / somewhat agree. The AMS of all the factors is 3.44 and it falls in the category of > 3.40 ≤ 4.20, indicating that the concurrence of the perception if deemed to be between somewhat agree to agree/agree

5.2.10 Aspects of health and safety that are incorporated in tender evaluation and their relative importance

5.2.10.1 Frequency of incorporation

Respondents were asked to indicate how often the aspects of H&S are incorporated in tender evaluation; where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = often, 5 = always, and U = Unsure.

Respondents were asked to indicate how often the aspects of H&S are incorporated in tender evaluation on a scale of 1 (never) to 5 (always), and a MS ranging between 1.00 and 5.00. The descriptive statistical analysis results in Table 5.15 revealed that 24 of 25 (96%) MSs are above the midpoint score of 3.00, which indicates that in general, the respondents concur that these aspects of H&S are incorporated in tender evaluation.

Notably, the hierarchical ranking of aspects in Table 5.15 shows that 4 out of 25 (16%) aspects of incorporating H&S in tender evaluation have MS in the range > 4.20 ≤ 5.00, indicating that these aspects level of incorporation is deemed to be between often to always / always. The factors in this category are contractor health and safety plan with a MS of 4.53, health and safety file with a MS of 4.30, contractor H&S training with MS of 4.27, and contractor health and safety equipment with MS of 4.22, and these aspects are ranked 1st, 2nd, 3rd, and 4th respectively.

More so, 20 out of 25 (80%) of the aspects are in the range > 3.40 ≤ 4.20, indicating that aspect incorporation is deemed to be between sometimes to often / often. The least ranked criteria

were demolition plan with a MS of 3.17 and incident recording and investigation with a MS of 2.92, which were ranked 24th and 25th respectively. The MS of these aspects is in the range > 2.60 ≤ 3.40, indicating that the level of incorporation of these aspects can be deemed to be between rarely to sometimes / sometimes. The AMS of all the aspects of incorporating H&S in tender evaluation is 3.71 and falls in the range > 3.40 ≤ 4.20; this indicates that the level of incorporation is deemed to be between

Table 5. 15: Frequency of incorporating H&S in tender evaluation

Aspects of H&S	No.	Response (%) Never…….. Always					MS	SD	Rank
		1	2	3	4	5			
Contractor health and safety plan	105		1.0	11.4	21.0	66.7	4.53	.74	1
Health and safety file	105	1.0		14.3	38.1	46.7	4.30	.78	2
Contractor H&S training	105	1.0	1.9	15.2	33.3	48.6	4.27	.86	3
Contractor Health and Safety Equipment	105		2.9	11.4	46.7	39.0	4.22	.76	4
Personal protective equipment (PPE)	105		2.9	19.0	3.81	40.0	4.15	.83	5
Waste management plan (WMP)	105	1.0	1.0	17.1	45.7	35.2	4.13	.80	6
Insurance cost	105		1.9	22.9	41.9	33.3	4.07	.80	7
Contractor H&S management structure	105		1.0	24.8	44.8	29.5	4.03	.77	8
Safe work method statement	105		1.0	25.7	44.8	28.6	4.01	.77	9
Workplace health and safety inspections plan	105		2.9	23.8	43.8	29.5	4.00	.81	10
Contractor Health and Safety Coordination	105		3.8	21.0	46.7	28.6	4.00	.81	11
Site security features	105		1.9	26.7	42.9	28.6	3.98	.80	12
Contractor H&S Study	104		2.9	23.8	46.7	25.7	3.96	.87	14
Fall protection plan	105		2.9	23.8	50.5	22.9	3.93	.76	13
Contractor risk assessment plan	105		2.9	24.8	53.3	19.0	3.89	.74	15
Contractor H&S Promotion plan	104	1.0	2.9	31.4	45.7	18.1	3.78	.89	16
H&S personnel structure	104	1.0	8.6	33.3	33.3	22.9	3.69	1.01	18
Environmental management plan (EMP)	105	1.0	7.6	31.4	43.8	16.2	3.67	.87	17
Contractor Injury History	105		12.4	32.4	39.0	16.2	3.59	.91	19
Emergency preparedness procedures and response	105		13.3	40.0	34.3	12.4	3.46	.88	20
Contractor remedial response to H&S	105		3.8	21.0	46.7	28.6	3.45	.81	21
H&S Signs and signals	105	4.8	14.3	28.6	38.1	14.3	3.43	1.05	22
Health and safety consultation	105	1.9	10.5	41.0	36.2	9.5	3.43	.93	23
Demolition plan	105	2.9	17.1	42.9	34.3	2.9	3.17	.85	24
Incident recording and investigation	104	7.5	29.5	31.4	23.8	6.7	2.92	1.09	25

5.2.10.2 Level of Importance

Respondents were asked to indicate the level of importance of each aspect of H&S when evaluating construction tenders; where 1 = Unimportant, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important, and U = Unsure.

The results, as shown in Table: 5.16, indicate the level of importance on aspects of H&S when evaluating construction contracts and they were based on a 5-point Likert scale of 1 (unimportant) to 5 (extremely important), and a MS with a minimum value of 1.00 and a maximum value of 5.00. All (100%) MSs in this section are above the midpoint score of 3.00, which indicates that in general, all the 25 aspects of H&S indicated in Table 5.16 are deemed important, and they should be incorporated in tender evaluation.

Table 5.16 shows that personal protective equipment (PPE) (4.46), contractor H&S training (4.42), contractor health and safety plan (4.40), and contractor H&S management structure (4.38) had the highest mean score. The MS of these aspects is in the range of > 4.20 ≤ 5.00, indicating that their level of importance can be deemed to be between very important to extremely important / extremely important. The rest of the aspects have MS that are in the range > 3.40 ≤ 4.20, indicating that the level of importance is deemed to be between important to very important / very important. Finally, the AMS of all the combined aspects is 3.56 and is in the range > 3.40 ≤ 4.20, this shows that the importance of H&S criteria is between important to very important / very important.

Table 5. 16: Level of the importance of H&S aspects in tender evaluation

Aspects of H&S	No.	Response (%) Never……..….Always					MS	SD	Rank
		1	2	3	4	5			
Personal protective equipment (PPE)	105			10.5	33.3	56.2	4.46	.68	1
Contractor H&S training	105	1.0	0.00	11.4	31.4	56.2	4.42	.77	2
Contractor health and safety plan	105	1.0		10.5	35.2	53.3	4.40	.75	3
Contractor H&S management structure	105		1.0	10.5	39.0	49.5	4.37	.71	4
H&S personnel structure	105		1.9	15.2	42.9	40.0	4.21	.77	5
Incident recording and investigation	105		2.9	15.2	44.8	37.1	4.16	.79	6
Health and safety file	105		1.0	21.9	38.1	39.0	4.15	.79	7
Emergency preparedness procedures and response	105		2.9	19.0	47.6	30.5	4.06	.78	8
Safe work method statement	105		1.9	23.8	41.9	32.4	4.05	.80	9
Contractor Health and Safety Equipment	105		1.9	22.9	44.8	30.5	4.04	.78	10
Site security features	105		1.9	23.8	46.7	27.6	4.00	.77	11
Contractor H&S Study	104		1.9	27.6	38.1	31.4	4.00	.91	12
Health and safety consultation	105		1.9	27.6	41.0	29.5	3.98	.81	13

Contractor risk assessment plan	105	1.0	2.9	21.0	49.5	25.7	3.96	.82	14
H&S Signs and signals	105		1.9	24.8	48.6	24.8	3.96	.76	15
Insurance cost	105		2.9	24.8	46.7	25.7	3.95	.79	16
Contractor Injury History	105		3.8	24.8	44.8	26.7	3.94	.82	17
Workplace health and safety inspections plan	105		1.0	26.7	51.4	21.0	3.92	.72	18
Waste management plan (WMP)	105		1.0	27.6	51.4	20.0	3.90	.71	19
Fall protection plan	105		10.5	31.4	34.3	23.8	3.90	.86	20
Contractor H&S Promotion plan	104		3.8	30.5	40.0	24.8	3.87	.91	21
Environmental management plan (EMP)	105		2.9	32.4	45.7	19.0	3.81	.77	22
Contractor Health and Safety Coordination	105		3.8	29.5	49.5	17.1	3.80	.76	23
Contractor remedial response to H&S	105		4.8	32.4	44.8	18.1	3.76	.80	24
Demolition plan	105		10.5	31.4	34.3	23.8	3.71	.95	25

5.3 CONSTRUCTION CLIENTS PERCEPTION OF INCORPORATING H&S IN TENDER EVALUATION

5.3.1 Research participation

The construction Clients' questionnaire was designed and sent to clients in the Western Cape province of South Africa. A total of 60 questionnaires were distributed; of the 60 questionnaires distributed 41 questionnaires, representing a response rate of 68.3%, were duly completed and returned as shown in Table 5.17

Table 5. 17: Questionnaire response rate

Questionnaire	Administered	Total Returned	Response rate
	N	N	%
Construction clients	60	41	**68.3%**

5.3.2 Profile of respondents

The first section of the questionnaire consists of questions seeking to acquire biographical information of the respondents. Biographical information such as gender, age, sector engaged, type of client, respondents' experience, and the number of projects commissioned was collected.

5.3.3.1 Respondents' Gender

Table 5.18 presents the gender of the respondents that participated in the survey for construction clients. 31.7% of the respondents were female, and 68.3% of the respondents

were males. This suggests that both genders participated in the survey but were not equally represented.

Table 5. 18: Gender of respondents

Gender	Frequency	Percent
Female	13	31.7
Male	28	68.3
Total	**41**	**100.0**

5.3.3.2 Age Group

Table 5.19 presents the age groups of the respondents that participated in the survey for construction clients. 2.4% of the respondents were below 25 years, 24.4% were between the age of 25 and 30 years, 41.5% were between the age of 31 and 40 years, 22% were between the age of 41 and 50 years, and 9.8% were between the age of 51 and 60 years. The distribution of table 5.19 shows that 73.3% of the respondents were 31 years and older, which means that the respondents had relevant maturity to participate in the survey.

Table 5. 19: Age Group

Age group	Frequency	Percent
Under 25 Years	1	2.4
25-30 Years	10	24.4
31-40 Years	17	41.5
41-50 Years	9	22.0
51-60 Years	4	9.8
Total	**41**	**100.0**

5.3.3.3 Sector

Table 5.20 depicts the sectors to which respondents of the study belong to. 26.8% of the respondents work in the public sector, and 73.2% of the respondents work in the private sector. Regardless of the majority of the respondents working in the private sector, both sectors are represented.

Table 5. 20: Sector of respondents

Sector	Frequency	Percent
Public Sector	11	26.8
Private Sector	30	73.2
Total	**41**	**100.0**

5.3.3.4 Type of client

Table 5.21 shows the nature of the client in the construction industry. 17.1% of the respondents are sporadic clients, 9.8% are once-off clients, 43.9% are perennial clients, and 29.3% are property developers. The diversity of clients' backgrounds allowed data to be drawn from different facets of the construction sector.

Table 5. 21: Type of client

Type of client	Frequency	Percent
Sporadic client	7	17.1
Once-Off Client	4	9.8
Perennial Client	18	43.9
Property Developer	12	29.3
Total	**41**	**100.0**

5.3.3.5 Experience of respondents

In table 5.22, the years of experience of the respondents are presented. The respondents' experience levels are as follows; respondents with less than 5 years of experience constituted 22% of the respondents, 41.5% of the respondents had 5 to 10 years of experience, and 36.6% of the respondents had experience over 10 years. The majority of the respondents, 78.1% had experience over 5 years, indicating that they are well knowledgeable.

Table 5. 22: Experience of respondents

Experience of respondents	Frequency	Percent
Less than 5 Years	9	22.0
5-10 Years	17	41.5
Over 10 years	15	36.6
Total	**41**	**100.0**

5.3.3.6 Number of projects commissioned

Table 5.23 shows that the survey participants have commissioned between one to fifteen projects annually. On average the survey participants commissioned 3.81 projects annually, this implies that the respondents had enough exposure and experience.

Table 5. 23: Project commissioned

Project commissioned	N	Minimum	Maximum	Mean
	41	1.00	15.00	3.81

5.3.4 Reliability testing

Table 5. 24: summary of reliability test

Section	Statement	Number of items	Cronbach's alpha coefficient
B	Client's H&S commitment	25	0.91
C	H&S Pre-construction activities	11	0.83
D	Clients' perception of incorporating H&S in tender evaluation	20	0.90
	Total questions	**56**	**(0.88)**

The scaled questions' reliability for the construction client's questionnaire was tested using Cronbach's alpha coefficient. Table 5.24 presents a summary of the reliability test for sections B, C, and D. The Cronbach's alpha coefficient for the overall questions was 0.88 (0.88) which meets the reliability test requirements.

5.3.5 Interpretation and definition of the scales

This section deals with the analysis of the data, as gathered from the construction client's questionnaire. The analysis of the various questions is listed according to the sequence followed in the questionnaire. The specific questions' various headings were: client's H&S commitment, health and safety pre-construction activities, and clients' perception of incorporating health and safety in tender evaluation.

Table 5. 25: Definition of the scales for construction client's questionnaires

Section	Mean score range	Meaning
B	$> 4.20 \leq 5.00$	Between very committed to extremely committed / extremely committed;
	$> 3.40 \leq 4.20$	Between committed to very committed / very committed;
	$> 2.60 \leq 3.40$	Between somewhat committed to committed/committed;
	$> 1.80 \leq 2.60$	Between not committed to somewhat committed / somewhat committed;
	≥ 1.00 ≤ 1.80	Between not committed to somewhat committed
C	$> 4.20 \leq 5.00$	Between often to always / always;
	$> 3.40 \leq 4.20$	Between sometimes to often / often;
	$> 2.60 \leq 3.40$	Between seldom to sometimes / sometimes;
	$> 1.80 \leq 2.60$	Between never to seldom / seldom;
	≥ 1.00 ≤ 1.80	Between never to seldom
D	$> 4.20 \leq 5.00$	Between very important to extremely important / extremely important;
	$> 3.40 \leq 4.20$	Between important to very important / very important;
	$> 2.60 \leq 3.40$	Between somewhat important to important/important;
	$> 1.80 \leq 2.60$	Between unimportant to somewhat important / somewhat important;
	≥ 1.00 ≤ 1.80	Between unimportant to somewhat important

Excluding inferential statistics used for testing postulated research hypotheses, all the Likert-scale type questions were deliberated based on the measurement scale indicated in Table 5.25. The analysis was centred mainly on the mean and the standard deviation. Given the descriptive nature of the results, the use of hierarchy noted with ordinal data was considered suitable for presenting the results.

5.3.6 Client's H&S commitment

Respondents were asked to indicate their level of commitment to H&S aspects; where 1 = Not committed, 2 = somewhat committed, 3 = committed, 4 = very committed, 5 = extremely committed, and U = Unsure.

The findings derived from the analysis of clients' H&S commitment on construction projects are tabularized in Table 5.26. The findings demonstrate the extent to which clients commit to the H&S aspects presented using a 5-point Likert scale ranging from 1 (not committed) to 5 (extremely committed), also the MSs with a minimum value of 1.00 and a maximum value of 5.00. It is evident that 24 of the 25 factors have MSs above midpoint 3.00, indicating that construction clients are committed to these factors in their construction projects.

From the findings, it is observed that personal protective equipment (PPE) (4.34), health and safety file (4.24), and contractor health and safety plan (4.00) are the highest-ranked factors respectively. This implies that construction clients are keen on having a solid plan on PPE, H&S plan, and H&S file as these aspects directly impact workers' well-being on a daily basis and, if they are not properly addressed, are considered detrimental. Effective implementation of these factors alludes to the project's smooth progression and guaranteed workers' safety on site. The AMS of all the factors is 3.68, and it falls in the range > 3.40 ≤ 4.20, this shows that the commitment of clients to be between committed to very committed / very committed

Table 5. 26: Clients H&S commitment

Aspects of H&S	No.	Response (%) Not committed……very committed					MS	SD	Rank
		1	2	3	4	5			
Personal protective equipment (PPE)	41	0.0	0.0	14.6	36.6	48.8	4.34	0.73	1
Health and safety file	41	0.0	0.0	14.6	46.3	39	4.24	0.70	2
Contractor health and safety plan	41	0.0	7.3	22.0	34.1	36.6	4.00	0.95	3
Contractor Health and Safety Equipment	41	0.0	2.4	31.7	34.1	31.7	3.95	0.87	4
Contractor Injury History	41	0.0	7.3	19.5	43.9	29.3	3.95	0.89	5
Waste management plan (WMP)	41	2.4	4.9	19.5	48.8	24.4	3.88	0.93	6
Contractor H&S training	41	0.0	7.3	24.4	41.5	26.8	3.88	0.90	7
Site security features	41	0.0	4.9	26.8	43.9	24.4	3.88	0.84	8

Environmental management plan (EMP)	41	2.4	2.4	24.4	46.3	24.4	3.88	0.90	9
H&S Signs and signals	41	2.4	0.0	29.3	46.3	22.0	3.85	0.85	10
H&S personnel structure	41	2.4	2.4	29.3	43.9	22.0	3.81	0.90	11
Contractor risk assessment plan	41	2.4	7.3	22.0	48.8	19.5	3.76	0.94	12
Insurance cost	41	2.4	4.9	34.1	36.6	22.0	3.71	0.96	13
Contractor Health and Safety Coordination	41	0.0	4.9	39.0	41.5	14.6	3.66	0.794	14
Safe work method statement	41	0.0	9.8	31.7	43.9	14.6	3.63	0.86	15
Contractor H&S management structure	41	0.0	7.3	36.6	41.5	14.6	3.63	0.83	16
Incident recording and investigation	41	2.4	12.2	26.8	48.8	9.8	3.51	0.93	17
Workplace health and safety inspections plan	41	4.9	12.2	34.1	31.7	17.1	3.44	1.07	18
Emergency preparedness procedures and response	41	2.4	9.8	39.0	39.0	9.8	3.44	0.90	19
Contractor H&S Study	41	0.0	12.2	48.8	26.8	12.2	3.39	0.86	20
Fall protection plan	41	4.9	14.6	39.0	24.4	17.1	3.34	1.09	21
Contractor remedial response to H&S	41	2.4	19.5	34.1	31.7	12.2	3.32	1.01	22
Health and safety consultation	41	4.9	17.1	36.6	24.4	17.1	3.32	1.11	23
Contractor H&S Promotion plan	41	4.9	14.6	39.0	36.6	4.9	3.22	0.94	24
Demolition plan	41	12.6	22.0	36.6	19.5	9.8	2.93	1.15	25

5.3.7 H&S pre-construction activities

Respondents were asked to indicate the extent of their involvement in H&S related activities. Where 1= never; 2= seldom; 3=sometimes; 4= often; 5=always, and U=Unsure.

The findings obtained from the analysis of H&S pre-construction activities, as displayed in Table 5.27, demonstrate how clients are involved in H&S related activities using a 5-point Likert scale ranging from 1 (Never) to 5 (Always). The MSs had a minimum value of 1.00, a maximum value of 5.00, and a mid-point value of 3.0. It is apparent that all factors have MSs above midpoint 3.0, indicating that the H&S pre-construction activities are performed in most projects.

Table 5.27 indicates that approval of H&S specification (4.20), assessment of the contract to be engaged for the project in relation to H&S (e.g. JBCC, NEC) (4.07), and selection of H&S consultant (3.95) had the highest mean scores. This implies that the selection of contractual obligations is of paramount importance to the direction of H&S on a project and must be conclusive before the commencement of the project. The engagement of the right framework regarding contractual obligation and selection of a competent H&S consultant increases the chances of safe project delivery. The AMS of all the activities is 3.75, and it falls in the range $> 3.40 \leq 4.20$, this shows that client involvement in H&S pre-construction activities are determined to be between sometimes to often / often.

Table 5. 27: H&S Pre-Construction activities

Pre-Construction activities	No.	Response (%) Never…… Always					MS	SD	Rank
		1	2	3	4	5			
Approval of H&S specification	41			19.5	41.5	39.0	4.20	0.75	1
Assessment of the contract to be engaged for the project in relation to H&S (e.g. JBCC, NEC)	41	0.0	4.9	19.5	39.0	36.6	4.07	0.88	2
Selection of H&S consultant	41	0.0	9.8	19.5	36.6	34.1	3.95	0.97	3
Assessment of the procurement strategy to be engaged in relation to project H&S (e.g. traditional or design and build)	41	0.0	4.9	29.3	36.6	29.3	3.90	0.89	4
Health and safety planning for the project	41	0.0	7.3	24.4	46.3	22.0	3.83	0.86	5
Establishing a risk assessment of the project.	41	2.4	9.8	24.4	34.1	29.3	3.78	1.06	6
Outlining the duties and responsibilities of the H&S consultant	41	2.4	12.2	19.5	36.6	29.3	3.76	1.16	7
Establishing project brief for incorporating H&S	41	0.0	4.9	39.0	36.6	19.5	3.71	0.84	8
Providing the health and safety consultant with the necessary information of the project	41	2.4	17.1	24.4	29.3	24.4	3.49	1.25	9
Preparation and application of H&S requirements	41	4.9	14.6	36.6	31.7	12.2	3.32	1.04	10
Assessing the impact of the project on H&S	41	9.8	14.6	31.7	31.7	12.2	3.22	1.15	11

5.3.8 Clients' perception of incorporating health and safety in tender evaluation

Respondents were asked to indicate the extent of importance of clients' perception on incorporating health and safety in tender evaluation. Where 1 = unimportant, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important, and U = Unsure.

This section examines the client's perception of incorporating H&S criterion in tender evaluation. The respondents' perceptions were measured using a Likert scale, dimensioned from 1 (unimportant) to 5 (extremely important). The findings derived from the analysis of the client's perception displayed in Table 5.28 indicate that 19 out of the 20 factors yielded MSs above 3.00, suggesting that these 19 factors have more significance in influencing clients' perception of incorporating H&S in tender evaluation.

Table 5.28 shows that clients must ensure that they appoint a contractor who is well versed with H&S (4.20), expert and experienced clients play a more active role in H&S of their projects (3.88), and clients' understanding of the H&S systems influences their level of involvement on construction projects (3.85) had the highest mean scores. This implies that clients who

understand the construction regulations and the importance of H&S will proactively go the extra mile and also engage a contractor who is competitive in terms of H&S. Having clients who are aware of the importance of H&S on a project guarantees a safe project. The average mean score for all the factor was 3.40 and falls in the range > 2.60 ≤ 3.40, this shows that clients' perception of incorporating H&S in tender evaluation can be deemed to be between somewhat important to important/ important

Table 5. 28 Clients' perception of incorporating H&S in tender evaluation

Perceptions	No.	Response (%) Never……..…….. Always					MS	SD	Rank
		1	2	3	4	5			
Clients must ensure that they appoint a contractor who is well versed with H&S	41	0.0	4.9	14.6	36.6	43.9	4.20	0.87	1
Expert and experienced clients play a more active role in H&S of their projects	41	0.0	4.9	24.4	48.8	22.0	3.88	0.81	2
Clients' understanding of the H&S systems influences their level of involvement on construction projects	41	0.0	12.2	24.4	29.3	34.1	3.85	1.04	3
Client understanding of the construction process contributes to safe project delivery	41	0.0	7.3	26.8	39.0	26.8	3.85	0.91	4
Adequate client knowledge of construction projects influences teamwork and collaboration	41	0.0	12.2	24.4	36.6	26.8	3.78	0.99	5
H&S planning is a very important part of a construction project and clients need to be actively involved	41	2.4	7.3	29.3	31.7	29.3	3.78	1.04	6
It is important for clients to obtain appropriate advice on the choice of H&S process, systems, and method to be used for the project	41	2.4	12.2	31.7	24.4	29.3	3.73	1.10	7
The success of a project is linked to the extent of client involvement and client control in their projects	41	2.4	12.2	24.4	36.6	24.4	3.68	1.06	8
It is important for construction clients to understand their roles of H&S to ensure the safe delivery of projects	41	2.4	12.2	31.7	24.4	29.3	3.66	1.11	9
Clients allocate adequate resources for H&S	41	2.4	9.8	29.3	36.6	22.0	3.66	1.02	10
Clients have the ability to influence and change the H&S attitudes, behaviours, and procedures of other parties	41	2.4	12.2	34.1	31.7	19.5	3.54	1.03	11
Client satisfaction is linked to adequate client involvement in their projects	41	2.4	22.0	22.0	31.7	22.0	3.49	1.14	12

Client influences H&S of a project in the design stage	41	4.9	9.8	31.7	41.5	12.2	3.46	1.00	13
Clients should have the right to choose H&S procedures, processes, and method they want to use	41	0.0	9.8	41.5	31.7	14.6	3.44	1.03	14
Construction clients understand their roles and responsibilities and adequately perform them	41	4.9	17.1	26.8	31.7	19.5	3.44	1.14	15
The level of client involvement in H&S issues is affected by the level of client understanding of technicalities	41	7.3	9.8	31.7	39.0	12.2	3.39	1.07	16
Clients are adequately involved in the choice of H&S procedures and planning	41	2.4	17.1	39.0	29.3	12.2	3.32	0.99	17
Clients must retain maximum authority to exercise maximum control of the procurement process	41	4.9	9.8	31.7	31.7	17.1	3.32	1.29	18
Clients fully understand the risks involved under various procurement methods	41	4.9	17.1	39.0	26.8	12.2	3.24	1.04	19
Clients duties and responsibilities of H&S must not be limited to statutory duties	41	9.8	17.1	34.1	24.4	9.8	2.93	1.29	20

5.4 Factor Analysis

5.4.1 Identifying the extent H&S criterion is incorporated in tender evaluation.

One of the study's main objectives was to ascertain the extent to which H&S criterion is incorporated in tender evaluation. A total of 25 criteria were assessed to determine the underlying factors. Factor analysis was conducted to reduce and categorise the criteria into factors that can be incorporated in tender evaluation. It is also an opportunity to assess the factors' convergent validity; hence, the principal components analysis (PCA) was adopted as the method of extraction.

5.4.1.1 K.M.O Adequacy and Bartlett’s Sphericity Test.

There are three main steps in conducting FA, and the first step according to Simpeh (2018:185) is to test the suitability of the study data for FA. . Therefore, to test the suitability on the extent to which H&S criterion is incorporated in tender evaluation, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity were conducted. Table 5.29 shows the findings of KMO and Bartlett’s test Sphericity. The adequacy of sampling is tested through KMO, while the strength of the relationship among variables is assessed through Bartlett’s test of sphericity. Ul Hadia, Abdullah and Sentosa (2016:216) indicated that the value of KMO ranges between 0 and 1, with 0,60 regarded as the minimum accepted value

for good analysis. Also, the level of significance for Bartlett's test will be $p < 0.05$ for FA to be considered appropriate. The test presented in Table 5.29 shows a KMO value of 0.8242 which is above the required minimum value of 0.6 and less than 1. The Bartlett's Sphericity value $p = 0.000$ (i.e. $p < 0.05$). The findings indicate that FA could be conducted with the data.

Table 5. 29: KMO and Bartlett's Test

Test		**Value**	**Remark**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.8242	Significant and adequate for PCA
Bartlett's Test of Sphericity	Approx. Chi-Square	926.654	Significant and adequate for PCA
	Df	300	
	Sig.	.000	

5.4.1.2 Principal components factors identifying the extent to which H&S criterion is incorporated in tender evaluation

According to Taherdoost, Sahibuddin, and Jalaliyoon (2014:376), after establishing the research data's suitability using the KMO and Bartlett's test, factor extraction must be conducted. This process helps determine the smallest number of factors to retain, based on the construct's contribution since not all factors are to be kept. To determine the factors to retain, an analysis was initiated through the application of the principal component analysis (PCA) analysis tool on the SPSS version 26.

The application of PCA established that six components under this category had eigenvalues greater than one. These components represent 58.84% of the total variance of the 24 features criteria, as shown in Table 5.30. The values presented in Table 5.30 and Figure 5.3 shows a clear break after the sixth component. Furthermore, varimax rotation was adopted to aid the interpretation of the six components, with results showing that the first six components have a number of loadings above 0.3 on the component matrix (Table 5.31).

Table 5. 30: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.193	28.770	28.770	7.193	28.770	28.770	4.776
2	2.435	9.738	38.508	2.435	9.738	38.508	3.033
3	1.597	6.387	44.895	1.597	6.387	44.895	2.235
4	1.223	4.894	49.789	1.223	4.894	49.789	1.843

5	1.171	4.684	54.473	1.171	4.684	54.473	1.484
6	1.091	4.363	58.835	1.091	4.363	58.835	1.338
7	.936	3.744	62.580				
8	.874	3.497	66.076				
9	.862	3.448	69.525				
10	.835	3.338	72.863				
11	.764	3.055	75.918				
12	.746	2.984	78.902				
13	.650	2.600	81.502				
14	.607	2.427	83.929				
15	.525	2.100	86.029				
16	.505	2.021	88.051				
17	.477	1.909	89.959				
18	.438	1.754	91.713				
19	.391	1.563	93.276				
20	.368	1.471	94.747				
21	.344	1.378	96.125				
22	.309	1.237	97.361				
23	.243	.970	98.332				
24	.226	.904	99.236				
25	.191	.764	100.000				

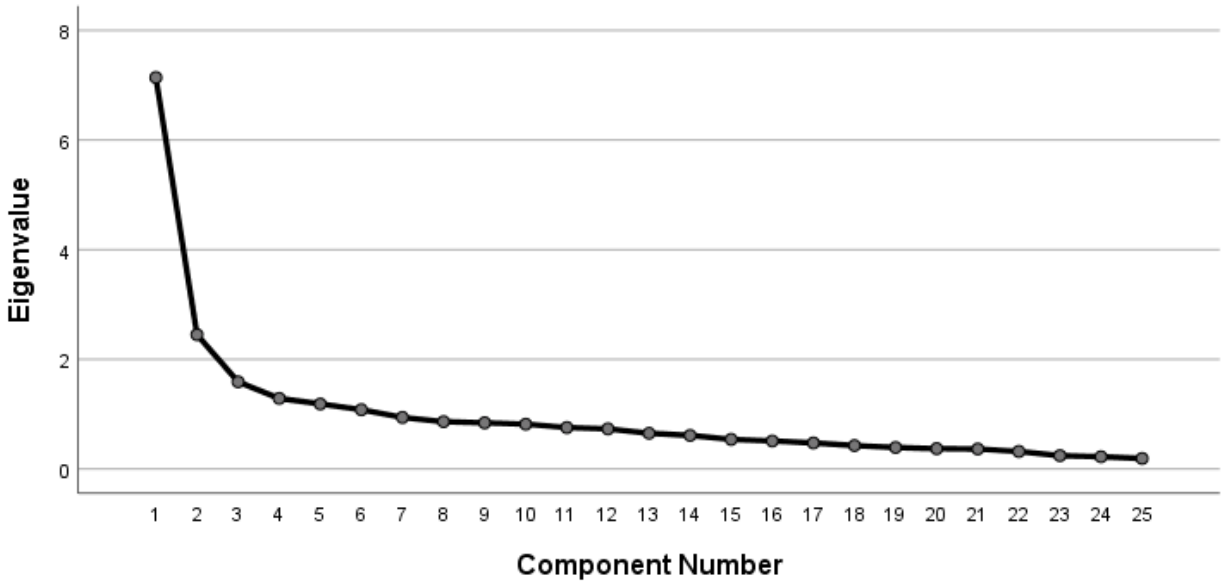

Figure 5. 3: Scree Plot for identifying the extent H&S criterion is incorporated in tender evaluation

The interpretation of these findings, in reference to the loadings pattern of the criteria that are assessed in tender evaluation in comparison with H&S, discloses that criteria relating to the technical competence and experience of contractors converge at component 1. Management capability converges at component 2. Project efficiency and management capability converge at component 3, quality and insurance policy converge at component 4, financial stability and experience converge at component 5, and technical capacity converges at component 6.

- Component 1: Technical competence and experience

In terms of factor inter-correlation, eleven criterions are determined to be under technical competence and experience. The factors under component 1 are Ethical behaviour and fair dealing (0.663), Location of the home office (0.661), Type of performance bond (0.657), Availability to execute the project (0.649), Productivity improvement procedures and awareness (0.608), Familiarity with local working culture and regulatory authorities (0.578), Construction method statement (0.572), References for previous work complete (0.546), Qualification and experience of professional technical staffs (0.536), Environmental protection (0.510), Past relationship with other entities engaged within construction activities (0.491).

- Component 2: Management capability

The second component is comprised of six features: Availability of technical expertise (0.809), Size of the company (0.593), Availability of equipment (0.563), The reputation of the contractor (0.533), Engineering co-ordination (0.513), and Previous records of claims and litigation (0.481)

- Component 3: Project efficiency and management capability

The third component includes three features: Project completion time (0.838), Cost of project completion (0.771), and Management capability to plan, organize and control the project (0.592)

- Component 4: Quality and insurance policy

The fourth component is comprised of two features: The actual quality achieved for similar works (0.848), and Insurance policy (0.533)

- Component 5: Financial stability and experience

The fifth component constitutes two features: Financial stability and the ability to execute the project (0.861). and Experience demonstrated through previous projects (0.563)

- Component 6: Technical capacity

The sixth component includes one feature: Technical capacity of the contractor to execute the project (0.723)

Table 5. 31: Component Matrix

Rotated Component Matrix[a]						
Variables	Component					
	1	2	3	4	5	6
Ethical behaviour and fair dealing.	.663					
Location of home office	.661					
Type of performance bond	.657					
Availability to execute the project	.649					
Productivity improvement procedures and awareness	.608					
Familiarity with local working culture and regulatory authorities	.587					
Construction method statement	.572					
References for previous work complete	.546					
Qualification and experience of professional technical staffs	.536					
Environmental protection	.510					
Past relationship with other entities engaged within construction activities	.491					
Availability of technical expertise		.809				
Size of the company		.593				
Availability of equipment		.563				
The reputation of the contractor		.533				
Engineering co-ordination		.513				
Previous records of claims and litigation		.481				
Projects completion time			.838			
Cost of project completion			.771			
Management capability to plan, organize and control the project			.592			
The actual quality achieved for similar works				.848		
Insurance policy				.533		
Financial stability and the ability to execute the project					.861	
Experience demonstrated through previous projects					.563	
Technical capacity of the contractor to execute the project						.723

5.4.2 Determining the hindrances against the incorporation of health and safety criterion in tender evaluation.

This section presents a factorial analysis of the hindrances militating against the incorporation of H&S in tender evaluation. In this case, 24 variables were assessed to determine the underlying factors of the hindrances of incorporating H&S in tender evaluation. The analysis

procedure applied is similar to the one adopted in subsection 5.4.1, where variables impacts were examined using a PCA analysis tool in SPSS version 26.

The analysis of the results shows that the KMO measure of the sampling adequacy was 0.692, which was greater than the recommended 0.6, this signifies that the sample was good for factor analysis. The Bartlett Test of Sphericity was 524.946, and the associated significance level was 0.000. both of the tests support FA to be conducted with the data, and these could allow the data to be grouped into a smaller set of underlying factors. The results are presented in Table 5.32

Table 5. 32: KMO and Bartlett's Test

Test		**Value**	**Remark**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.692	Significant and adequate for PCA
Bartlett's Test of Sphericity	Approx. Chi-Square	524.946	Significant and adequate for PCA
	Df	276	
	Sig.	0.000	

The application of PCA established that eight components under this category had eigenvalues greater than one. These components represent 60.93% of the total variance of the 24 features criteria, as shown in Table 5.33. The values presented in Table 5.34 and Figure 5.4 shows a clear break after the eighth component. Furthermore, varimax rotation was adopted to aid the interpretation of the eight components, with results showing that the first eight components have several loadings above 0.030 on the component matrix (Table 5.34).

Table 5. 33: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.287	17.863	17.863	4.287	17.863	17.863	2.431
2	2.075	8.644	26.507	2.075	8.644	26.507	2.053
3	1.806	7.524	34.031	1.806	7.524	34.031	1.876
4	1.565	6.520	40.551	1.565	6.520	40.551	1.750
5	1.411	5.880	46.431	1.411	5.880	46.431	1.720
6	1.235	5.147	51.578	1.235	5.147	51.578	1.687
7	1.203	5.013	56.591	1.203	5.013	56.591	1.605
8	1.041	4.336	60.927	1.041	4.336	60.927	1.500
9	.921	3.836	64.763				

10	.905	3.769	68.532				
11	.839	3.495	72.028				
12	.805	3.353	75.381				
13	.770	3.208	78.589				
14	.652	2.717	81.305				
15	.617	2.569	83.874				
16	.555	2.312	86.187				
17	.549	2.289	88.476				
18	.500	2.084	90.559				
19	.476	1.982	92.541				
20	.444	1.850	94.390				
21	.404	1.681	96.072				
22	.344	1.433	97.505				
23	.326	1.358	98.862				
24	.273	1.138	100.000				

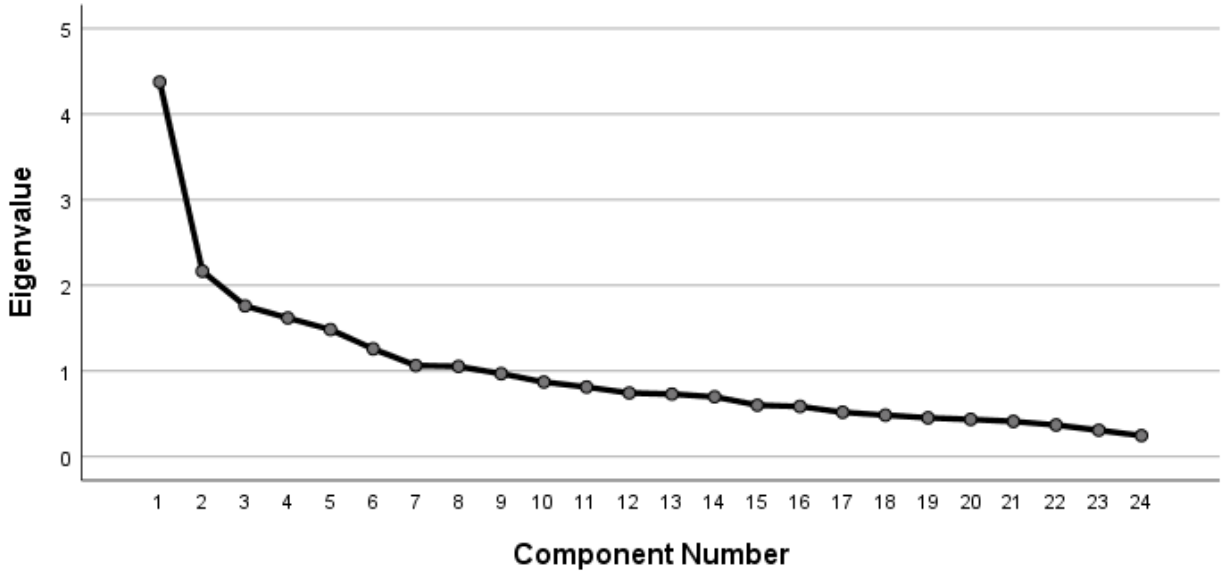

Figure 5. 4: Scree Plot for determining the hindrances against the incorporation of health and safety criterion in tender evaluation

The interpretation of these findings, in reference to the loadings pattern of the features that hinder the incorporation of H&S aspects in tender evaluation, discloses that ambiguity in the design of tender documentation is the variable that converges at component 1, and others such as the perception that H&S is expensive to implement converges at component 2, preference of other criteria converge at component 3, lack of H&S knowledge converge at component 4, lack of client commitment and corrupt activities converge at component 5, poor implementation of safety law and regulation at component 6, lack of expertise converge at component 7, and insufficient resources converges at component 8.

* Component 1: Ambiguity in the design of tender documentation

Under the first component of inter-correlation, five features are related to ambiguity in tender documentation design. The features are client's H&S specification confine tenderers to fully explore elements of H&S (0.699), insufficient or inconsistent policies, regulations, incentives and commitment by H&S governing bodies (0.660), lack of awareness, understanding, information, commitment, by both the employer and tenderers (0.510), insufficient or confusing guidance, tools, demonstrations of H&S procedures (0.499), and lack of clients commitment and support of H&S (0.441).

* Component 2: Perception that H&S is expensive to implement

The second component includes four features: H&S is expensive to be implemented (0.726), general perception that adequately pricing H&S always leads to a higher tender sum (0.595), tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S (0.555), and construction contractors lack H&S knowledge to implement proper H&S measures required (0.536).

* Component 3: Preference of other criteria

The third component is comprised of three features including choice of procurement system have an effect in determining the level of incorporating H&S in tender evaluation (0.724), the dominance of price time and quality restrict effective implementation of H&S in tender evaluation (0.602), and competitive tendering without reference to H&S (0.525).

* Component 4: Lack of H&S knowledge

The fourth component consists of three features including poor design of tender documents limits effective incorporation of H&S in tender evaluation (0.799), general limited knowledge of contractors to price H&S adequately (0.685), and the nature of H&S for being in quantitative and qualitative form (H&S pricing and H&S method statement) (0.360).

* Component 5: Lack of client commitment and corrupt activities

The fifth component is comprised of three features: Lack of client's understanding of the importance of H&S (0.769), corruption and unethical practices hinder effective incorporation of H&S in tender evaluation (0.652), and client use of a generic H&S specification that does not meet project demands (0.460).

* Component 6: Poor implementation of safety law and regulation

The sixth component constitutes three factors: Safety law and regulations are impractical for construction contractors (0.765), safety law and regulations are not adequately enforced; thus, disadvantaging those trying to implement them (0.501), and lack of expertise in H&S professionals (0.455).

* Component 7: Lack of expertise

The seventh component includes a lack of technical expertise of the tender evaluation panel on H&S issues (0.799).

* Component 8: Insufficient resources

The eighth component constitutes two factors: Insufficient integration and linkup of latest H&S guidelines and regulations prevailing in the industry (0.811), and insufficient research and development (0.527).

Table 5. 34: Component Matrix

	Component							
	1	2	3	4	5	6	7	8
Client's H&S specification Confine tenderers to fully explore elements of H&S	.699							
Insufficient or inconsistent policies, regulations, incentives and commitment by H&S governing bodies	.660							
Lack of awareness, understanding, information, commitment, by both the employer and tenderers	.510							
Insufficient or confusing guidance, tools, demonstrations of H&S procedures	.499							
Lack of clients commitment and support of H&S	.441							
H&S is expensive to be implemented		.726						
General perception that adequately pricing H&S		.595						

always leads to a higher tender sum								
Tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S		.555						
Construction contractors lack H&S knowledge to implement proper H&S measures required		.536						
Choice of procurement system have an effect in determining the level of incorporating H&S in tender evaluation			.724					
The dominance of price time and quality restrict effective implementation of H&S in tender evaluation			.602					
Competitive tendering without reference to H&S			.525					
Poor design of tender documents limits effective incorporation of H&S in tender evaluation				.799				
General limited knowledge of contractors to price H&S adequately				.685				
The nature of H&S for being in quantitative and qualitative form (H&S pricing and H&S method statement)				.360				
Lack of client's understanding of the importance of H&S					.769			
Corruption and unethical practices hinder effective incorporation of H&S in tender evaluation					-.652			
Client use of a generic H&S specification that does not meet project demands					.460			
Safety law and regulations are impractical for construction contractors						.765		
Safety law and regulations are not adequately enforced; thus, disadvantaging those trying to implement them						.501		
Lack of expertise in H&S professionals						.455		
Lack of technical expertise of tender evaluation panel on H&S issues							.799	
Insufficient integration and linkup of latest H&S guidelines and regulations prevailing in the industry								.811
Insufficient research and development								.527

5.5 Chapter summary

This chapter presented the results of data analysis for this study, two data sets were analysed. The first data set was obtained from construction practitioner's questionnaires and was analysed in Section 5.2, and the second data set was obtained from the construction client's questionnaires, which were analysed in Section 5.3. The chapter presented an introduction, and on both sections of the construction practitioners and construction clients, background information, reliability test, and interpretation and definitions of data scales were presented. Section 5.2 for construction practitioners further presented analysis of motives of incorporating H&S in tender evaluation, H&S criterion in comparison with other aspects of tender evaluation, hindrances of incorporating H&S criterion in tender evaluation, clients' perception regarding the incorporation of H&S in tender evaluation, and aspects of H&S that are incorporated in tender evaluation and their relative importance. Section 5.3 for construction clients presented clients' H&S commitment, H&S preconstruction activities, and clients' perception of incorporating H&S in tender evaluation. Finally, the chapter presented a factor analysis conducted on determining the hindrances against incorporating H&S criterion in tender evaluation and identifying the extent H&S criterion is incorporated in tender evaluation. The statistical analysis techniques required to test and validate the hypotheses are discussed in the subsequent chapter.

CHAPTER SIX

HYPOTHESIS TESTING AND DISCUSSION OF FINDINGS

6.1 Introduction

This chapter is dedicated to testing five hypotheses of the study and discussions thereof. The hypotheses tested in this section mainly focused on the motives of including H&S criterion in tender evaluation, the extent H&S is incorporated in tender evaluation, the hindrances against the incorporation of H&S in tender evaluation, and the important aspects of H&S that must be assessed in tender evaluation. The ANOVA test was performed to determine any statistical difference in concurrence of the respondents according to the sector they are engaged in, this was tested in hypotheses 2, 3, 4, and 5. The paired t-test sample was used to determine the statistical difference between the means in hypothesis 1. The hypothesis tested for this *study are:*

Hypothesis 1: There is no statistically significant difference between the mean rankings on the motives of including H&S criterion in tender evaluation.

Hypothesis 2: There is no statistically significant difference between public and private sector on the motives (time, quality, and cost) of including H&S criterion in tender evaluation.

Hypothesis 3: There is no significant difference between the perception of public and private sector regarding the extent to which H&S is incorporated in tender evaluation.

Hypothesis 4: There is no statistically significant difference in the agreement of public and private sector on the hindrances against the incorporation of H&S criterion in tender evaluation.

Hypothesis 5: There is no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners.

6.2 Agreement of respondents according to their sector and the motives of incorporating H&S criterion in tender evaluation.

6.2.1 Hypothesis 1 Ranking the motives of incorporating H&S criterion in tender evaluation

The hypothesis is as follows: There is no statistically significant difference between the mean rankings on the motives of including H&S criterion in tender evaluation.

Table 6. 1: Ranking the motives of incorporating H&S in tender evaluation.

Motives of incorporating H&S in tender evaluation	**Mean**	**SD**	**Rank**
Impact on time	3.95	0.41	1
H&S cost implications	3.81	0.33	2
Impact on quality	3.65	0.42	3

Table 6.1 reports the mean rankings of the motives of incorporating H&S criterion in tender evaluation to achieve safe project delivery. It is shown that 'impact on time' ranked the highest with a MS of 3.95, followed by 'H&S cost implications' with a MS of 3.81, and 'impact on quality was ranked the least with a MS of 3.65. Furthermore, a paired sample test was performed to assess any statistical difference between the motives of incorporating H&S in tender evaluation. Table 6.2 shows a statistically significant difference between paired samples ($p = 0.00$). The significance level was accepted based on a standard value $p < 0.05$ (Hsu & Lachenbruch, 2005:2) throughout the study. Therefore, the assumption that there is no significant difference between mean rankings on the motives of including H&S criterion in tender evaluation can be rejected. The hypothesis suggests that there is no consistency and predictability of scores between the impact on time, H&S cost implications, and impact on quality (Gravetter & Wallnau, 2009:614). Typically, the mean ranking is sustained and did not happen by chance.

Table 6. 2: Paired samples test on H&S motives

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Dev	Std. Error Mean	95% CI of the Difference				
					Lower	Upper			
Pair 1	cost - time	-0.14	.38	.04	-0.21	-0.07	-3.78	104	.000
Pair 2	cost - quality	0.16	.43	.04	0.08	0.24	3.80	104	.000
Pair 3	time - quality	0.30	.41	.04	0.22	0.38	7.37	104	.000

6.2.2 Hypothesis 2: *There is no statistically significant difference between public and private sector on the motives (time, quality, and cost) of including H&S criterion in tender evaluation.*

6.2.2.1 Construction sectors' perception and cost motives of incorporating of H&S in tender evaluation

An ANOVA test was performed to establish whether there is no significant difference between participants' perceptions across construction sectors and cost motivating the incorporation of H&S criterion in tender evaluation. Table 6.3, Table 6.4, and Table 6.5 indicates that there is no statistically significant difference across construction sectors regarding cost motivating the incorporation of H&S criterion in tender evaluation: F (2, 102) = 0.115, p = 0.892, and the calculated eta squared effect of size was small with a value of 0.002

Table 6. 3: Construction sectors' statistics and cost motives on incorporating H&S in tender evaluation

Construction sector	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Public Sector	29	3.7897	.32988	.06126	3.6642	3.9151	3.10	4.90
Private sector	68	3.8214	.33289	.04037	3.7408	3.9020	3.00	4.90
Both	8	3.7875	.29001	.10253	3.5450	4.0300	3.30	4.30
Total	105	3.8101	.32648	.03186	3.7469	3.8732	3.00	4.90

Table 6. 4: Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
.076	2	102	.927

Table 6. 5: ANOVA on construction sectors and cost motives of incorporating H&S in tender evaluation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.025	2	.012	.115	.892
Within Groups	11.060	102	.108		
Total	11.085	104			

Calculation of effect of size for the ANOVA test

$$Eta\ Squared = \frac{Sum\ of\ Squares\ Between\ Groups}{Total\ Sum\ of\ Squares}$$

Guidelines for interpreting the values have been proposed by Cohen (1988) as reported in Pallant (2011:247) as follows: 0.01 = small effect, 0.06 = medium effect; and 0.14 = large effect.

$$Eta\ Squared = \frac{0.025}{11.085} = 0.002$$

6.2.2.2 Construction sectors' perception and time motives of incorporating of H&S in tender evaluation

An ANOVA was undertaken to explore if there is no significant difference in respondents' agreement according to their sector and time as a motivator to incorporate H&S criterion in tender evaluation. It is evident from Table 6.6, Table 6.7, and Table 6.8 that there was no statistically significant difference across the construction sectors: F (2, 102) = 0.32, p = 0.730, and the calculated eta squared effect of size was small with a value of 0.01

Table 6. 6: Construction sectors' statistics and time motives on incorporating H&S in tender evaluation

Construction sector	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Public Sector	29	3.9589	.30431	.05651	3.8432	4.0747	3.43	4.86
Private sector	68	3.9328	.44116	.05350	3.8260	4.0396	2.00	5.00
Both	8	4.0536	.51755	.18298	3.6209	4.4863	3.29	4.71
Total	105	3.9492	.41156	.04016	3.8696	4.0289	2.00	5.00

Table 6. 7: Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1.374	2	102	.258

Table 6. 8: ANOVA on construction sectors and time motives of incorporating H&S in tender evaluation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.108	2	.054	.315	.730
Within Groups	17.507	102	.172		
Total	17.616	104			

Calculation of effect of size for the ANOVA test

$$Eta\ Squared = \frac{Sum\ of\ Squares\ Between\ Groups}{Total\ Sum\ of\ Squares}$$

$$Eta\ Squared = \frac{0.108}{17.616} = 0.01$$

6.2.2.3 Construction sectors' perception and quality motives of incorporating of H&S in tender evaluation

To test whether there is no significant difference in respondents' agreement according to their sector and quality as a motivator to incorporate H&S criterion in tender evaluation. The ANOVA test revealed no significant difference between participants' perception across construction sectors: F (2, 102) = 0.51, p = 0.602. the results of these tests are reported in Table 6.9, Table 6.10, and Table 6.11. The calculated eta squared effect of size was small with a value of 0.01

Table 6. 9: Construction sectors' statistics and quality motives on incorporating H&S in tender evaluation

Construction sector	N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Public Sector	29	3.5862	0.37697	0.07000	3.4428	3.7296	2.67	4.33
Private sector	68	3.6814	0.42000	0.05093	3.5797	3.7830	2.67	5.00
Both	8	3.6458	0.61359	0.21694	3.1329	4.1588	3.00	4.67
Total	105	3.6524	0.42310	0.04129	3.5705	3.7343	2.67	5.00

Table 6. 10: Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1.547	2	102	.218

Table 6. 11: ANOVA on construction sectors and time motives of incorporating H&S in tender evaluation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.184	2	.092	.510	.602
Within Groups	18.433	102	.181		
Total	18.617	104			

Calculation of effect of size for the ANOVA test

$$Eta\ Squared = \frac{Sum\ of\ Squares\ Between\ Groups}{Total\ Sum\ of\ Squares}$$

$$Eta\ Squared = \frac{0.184}{18.617} = 0.01$$

6.2.2.4 Discussions with respect to motives affecting the incorporation of H&S criterion in tender evaluation

Table 6.12 presents a summary of the null hypothesis relative to respondents' agreement according to the sector they are engaged in and the motives of incorporating H&S criterion in tender evaluation. It is shown there was no statistically significant difference in the agreement of respondents according to their sector of engagement and the motives of incorporating H&S in tender evaluation since the significance level for all the motives is $p > 0.05$. Therefore, the null hypothesis stating that there is no statistically significant difference in the agreement of respondents according to their sector and identified motives affecting the incorporation of H&S criterion in tender evaluation cannot be rejected. Impliedly private and public sector share the same views on the motives of incorporating H&S in tender evaluation regardless of their different backgrounds. While findings reveal that H&S is motivated the same in both sectors, private sector is more profit-driven hence they value price and on the other hand, public sector focuses on service delivery.

Table 6. 12: perception on the motives of incorporating H&S criterion in tender evaluation

Motives of incorporating H&S criterion in tender evaluation	**Professionals perception (sig.)**
H&S impact on cost	0.892
H&S impact on time	0.730
H&S impact on quality	0.602

6.3 The extent to which H&S criterion is incorporated in tender evaluation

6.3.1 Hypothesis 3: Agreement of respondents according to their sector and the extent of incorporating H&S criterion in tender evaluation

The hypothesis is as follows: There is no significant difference between the perception of public and private sector clients regarding the extent to which H&S is incorporated in tender evaluation.

6.3.1.1 Construction sectors' perception and the extent H&S is incorporated in tender evaluation

An ANOVA test was performed to establish whether there is no significant difference between participants' perceptions across construction sectors and the extent to which H&S is incorporated in tender evaluation in comparison with other criteria for tender evaluation. Table 6.13 indicates no statistically significant difference across construction sectors regarding the extent of incorporating H&S criterion in tender evaluation. From the 25 listed criteria of tender evaluation in Table 6.13, 23 of the criteria have a significant level above 0.05. Only the cost of project completion and Insurance policy, both with significant p = 0.011 had a significant level below 0.05. Therefore, the null hypothesis stating that there is no statistically significant difference in the agreement of respondents according to their sector and the extent H&S is incorporated in tender evaluation cannot be rejected. Regardless of different objectives and systems of operations, both sectors have the same perception of the extent H&S is incorporated in tender evaluation. While findings indicate that H&S is incorporated in tender evaluation, both the public and private sectors only assess a proposed H&S plan that is non-conclusive on determining tenderers' H&S competencies.

Table 6. 13: ANOVA on construction sectors and the extent H&S criterion is incorporated in tender evaluation

Criteria for tender evaluation		Sum of Squares	df	Mean Square	F	Sig.
Projects completion time	Between Groups	3.707	2	1.853	2.419	.094
	Within Groups	78.141	102	.766		
	Total	81.848	104			
Cost of project completion	Between Groups	6.891	2	3.445	4.739	.011
	Within Groups	74.157	102	.727		
	Total	81.048	104			
Management capability to plan, organize and control the project	Between Groups	2.259	2	1.130	1.768	.176
	Within Groups	65.169	102	.639		
	Total	67.429	104			
Experience demonstrated through previous projects	Between Groups	.449	2	.225	.328	.721
	Within Groups	69.779	102	.684		
	Total	70.229	104			
Financial stability and the ability to execute the project	Between Groups	1.793	2	.896	1.352	.263
	Within Groups	67.598	102	.663		
	Total	69.390	104			
Technical capacity of the contractor to execute the project	Between Groups	.608	2	.304	.582	.561
	Within Groups	52.738	101	.522		
	Total	53.346	103			
The reputation of the contractor	Between Groups	1.973	2	.986	1.052	.353
	Within Groups	95.589	102	.937		
	Total	97.562	104			
References for previous work complete	Between Groups	2.497	2	1.249	1.438	.242
	Within Groups	88.550	102	.868		
	Total	91.048	104			
	Between Groups	.614	2	.307	.317	.729

Past relationship with other entities engaged within construction activities	Within Groups	98.948	102	.970		
	Total	99.562	104			
Previous records of claims and litigation	Between Groups	.478	2	.239	.266	.767
	Within Groups	90.868	101	.900		
	Total	91.346	103			
Size of the company	Between Groups	.123	2	.062	.084	.920
	Within Groups	75.210	102	.737		
	Total	75.333	104			
Availability of technical expertise	Between Groups	1.313	2	.656	1.097	.338
	Within Groups	60.447	101	.598		
	Total	61.760	103			
Availability of equipment	Between Groups	1.008	2	.504	.673	.513
	Within Groups	76.421	102	.749		
	Total	77.429	104			
Familiarity with local working culture and regulatory authorities	Between Groups	.703	2	.352	.410	.665
	Within Groups	87.487	102	.858		
	Total	88.190	104			
Construction method statement	Between Groups	2.074	2	1.037	1.289	.280
	Within Groups	82.059	102	.805		
	Total	84.133	104			
Qualification and experience of professional technical staffs	Between Groups	.048	2	.024	.028	.972
	Within Groups	86.942	102	.852		
	Total	86.990	104			
Type of performance bond	Between Groups	.268	2	.134	.137	.872
	Within Groups	99.294	102	.973		
	Total	99.562	104			
Availability to execute the project	Between Groups	4.005	2	2.002	1.708	.186
	Within Groups	119.55	102	1.172		
	Total	123.562	104			
Location of home office	Between Groups	.486	2	.243	.218	.804
	Within Groups	113.362	102	1.111		
	Total	113.848	104			
Productivity improvement procedures and awareness	Between Groups	.800	2	.400	.426	.654
	Within Groups	95.714	102	.938		
	Total	96.514	104			
Engineering co-ordination	Between Groups	2.965	2	1.482	1.924	.151
	Within Groups	78.597	102	.771		
	Total	81.562	104			
The actual quality achieved for similar works	Between Groups	4.467	2	2.234	1.982	.143
	Within Groups	114.923	102	1.127		
	Total	119.390	104			
Environmental protection	Between Groups	2.965	2	1.482	1.830	.166
	Within Groups	82.597	102	.810		
	Total	85.562	104			
Ethical behaviour and fair dealing.	Between Groups	.516	2	.258	.239	.788
	Within Groups	109.999	102	1.078		
	Total	110.514	104			
Insurance policy	Between Groups	8.939	2	4.469	4.688	.011
	Within Groups	97.252	102	.953		
	Total	106.190	104			

6.4 Hindrances against the incorporation of H&S criterion in tender evaluation

6.4.1 Hypothesis 4: agreement of respondents according to their sector and the hindrances of incorporating H&S in tender evaluation

The hypothesis is as follows: There is no statistically significant difference in the agreement of public and private sector on the hindrances against the incorporation of H&S criterion in tender evaluation.

6.4.1.1 Construction sectors' perception and the hindrances of incorporating H&S in tender evaluation

An ANOVA test was performed to explore if there is no significant difference between participants' perceptions across construction sectors and the hindrances of incorporating H&S criterion in tender evaluation. It is evident from Table 6.14 that there is no statistically significant difference in the construction sector and the hindrances of incorporating H&S criterion in tender evaluation. All the 24 hindrances listed in Table 6.14 have significant levels above 0.05, determining that there is a significant difference. The null hypothesis stating that there is no statistically significant difference in the agreement of respondents according to their sector and the hindrances of incorporating H&S criterion in tender evaluation cannot be rejected. The private and public sector agree on the hindrances of incorporating H&S in tender evaluation besides having different systems of operations. While the findings articulate that both sectors face corruption challenges, it is important to note that corruption is more rampant in the public sector than in the private sector.

Table 6. 14: ANOVA on construction sectors and the hindrance of incorporating H&S criterion in tender evaluation

		Sum of Squares	df	Mean Square	F	Sig.
Corruption and unethical practices hinder effective incorporation of H&S in tender evaluation	Between Groups	.707	2	.353	.854	.429
	Within Groups	42.208	102	.414		
	Total	42.914	104			
The dominance of price time and quality restrict effective implementation of H&S in tender evaluation	Between Groups	2.416	2	1.208	2.544	.084
	Within Groups	48.441	102	.475		
	Total	50.857	104			
Poor design of tender documents limits effective incorporation of H&S in tender evaluation	Between Groups	2.255	2	1.127	2.287	.107
	Within Groups	50.278	102	.493		
	Total	52.533	104			
General limited knowledge of contractors to price H&S adequately	Between Groups	.285	2	.142	.293	.747
	Within Groups	49.563	102	.486		
	Total	49.848	104			
Competitive tendering without reference to H&S	Between Groups	.760	2	.380	.675	.511
	Within Groups	57.374	102	.562		
	Total	58.133	104			
Client's H&S specification Confine tenderers to fully explore elements of H&S	Between Groups	1.500	2	.750	1.267	.286
	Within Groups	60.348	102	.592		
	Total	61.848	104			
	Between Groups	.478	2	.239	.473	.624

Lack of technical expertise of tender evaluation panel on H&S issues	Within Groups	51.484	102	.505		
	Total	51.962	104			
Client use of a generic H&S specification that does not meet project demands	Between Groups	1.314	2	.657	1.036	.358
	Within Groups	64.648	102	.634		
	Total	65.962	104			
The nature of H&S for being in quantitative and qualitative form (H&S pricing and H&S method statement)	Between Groups	.921	2	.461	.794	.455
	Within Groups	59.212	102	.581		
	Total	60.133	104			
Lack of client's understanding of the importance of H&S	Between Groups	2.846	2	1.423	1.593	.208
	Within Groups	91.116	102	.893		
	Total	93.962	104			
Tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S	Between Groups	3.669	2	1.834	1.945	.148
	Within Groups	95.245	101	.943		
	Total	98.913	103			
Choice of procurement system have an effect in determining the level of incorporating H&S in tender evaluation	Between Groups	2.052	2	1.026	1.381	.256
	Within Groups	75.796	102	.743		
	Total	77.848	104			
H&S is expensive to be implemented	Between Groups	2.564	2	1.282	1.392	.253
	Within Groups	92.975	101	.921		
	Total	95.538	103			
Construction contractors lack H&S knowledge to implement proper H&S measures required	Between Groups	1.582	2	.791	.841	.434
	Within Groups	95.980	102	.941		
	Total	97.562	104			
Insufficient or inconsistent policies, regulations, incentives and commitment by H&S governing bodies	Between Groups	1.208	2	.604	.736	.482
	Within Groups	83.706	102	.821		
	Total	84.914	104			
Safety law and regulations are not adequately enforced; thus, disadvantaging those trying to implement them	Between Groups	.360	2	.180	.280	.756
	Within Groups	65.602	102	.643		
	Total	65.962	104			
Lack of awareness, understanding, information, commitment, by both the employer and tenderers	Between Groups	.672	2	.336	.559	.573
	Within Groups	61.290	102	.601		
	Total	61.962	104			
General perception that adequately pricing H&S always leads to a higher tender sum	Between Groups	1.748	2	.874	1.031	.360
	Within Groups	86.442	102	.847		
	Total	88.190	104			
Lack of clients commitment and support of H&S	Between Groups	1.630	2	.815	.957	.388
	Within Groups	86.024	101	.852		
	Total	87.654	103			
Lack of expertise in H&S professionals	Between Groups	1.902	2	.951	1.264	.287
	Within Groups	76.727	102	.752		
	Total	78.629	104			
Insufficient integration and linkup of latest H&S guidelines and regulations prevailing in the industry	Between Groups	.992	2	.496	.567	.569
	Within Groups	89.256	102	.875		
	Total	90.248	104			
Safety law and regulations are impractical for construction contractors	Between Groups	1.539	2	.769	.761	.470
	Within Groups	103.090	102	1.011		
	Total	104.629	104			

Insufficient or confusing guidance, tools, demonstrations of H&S procedures	Between Groups	1.123	2	.562	.633	.533
	Within Groups	90.439	102	.887		
	Total	91.562	104			
Insufficient research and development	Between Groups	2.355	2	1.177	1.336	.267
	Within Groups	89.874	102	.881		
	Total	92.229	104			

6.5 Important aspects of health and safety that should be incorporated in tender evaluation.

6.5.1 Hypothesis 5: agreement of respondents according to their sector and the important aspects of H&S that must incorporated in tender evaluation

The hypothesis is as follows**:** There is no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners.

6.5.1.1 Construction sectors' perception and important aspects of H&S that must be incorporated in tender evaluation

An ANOVA test was conducted to ascertain if there is no statistically significant difference between the construction sectors and the important aspects of H&S evaluated in tender evaluation. It is evident from the aspects of H&S listed in Table 6.15, that there is no statistically significant difference in construction sectors and the important aspects of H&S assessed in tender evaluation. 24 of the 25 aspects listed had a significant value above 0.05. The only aspect with a significant level under 0.05 was Contractor remedial response to H&S with a significant value of p = 0.02. The null hypothesis stating that there is no statistically significant difference in the agreement of respondents according to their sector and important aspects of H&S that must be assessed in tender evaluation cannot be rejected. Impliedly private and public sector share the same views on the important aspects of H&S that must be assessed in tender evaluation without considering their background and objectives. While findings show that both sectors value H&S, the private sector is accustomed to prioritising profits and quality.

Table 6. 15: ANOVA on construction sectors and aspects of H&S that must be assessed in tender evaluation

		Sum of Squares	df	Mean Square	F	Sig.
Contractor health and safety plan	Between Groups	2.934	2	1.467	2.659	.075
	Within Groups	56.266	102	.552		
	Total	59.200	104			
Contractor H&S training	Between Groups	.245	2	.123	.204	.816
	Within Groups	61.316	102	.601		

	Total	61.562	104			
Contractor H&S management structure	Between Groups	.171	2	.085	.167	.847
	Within Groups	52.343	102	.513		
	Total	52.514	104			
Contractor risk assessment plan	Between Groups	.044	2	.022	.032	.968
	Within Groups	69.803	102	.684		
	Total	69.848	104			
Emergency preparedness procedures and response	Between Groups	.059	2	.030	.048	.954
	Within Groups	63.598	102	.624		
	Total	63.657	104			
Incident recording and investigation	Between Groups	.807	2	.403	.649	.525
	Within Groups	63.441	102	.622		
	Total	64.248	104			
H&S personnel structure	Between Groups	.502	2	.251	.420	.658
	Within Groups	60.889	102	.597		
	Total	61.390	104			
Personal protective equipment (PPE)	Between Groups	1.089	2	.544	1.182	.311
	Within Groups	46.968	102	.460		
	Total	48.057	104			
Health and safety consultation	Between Groups	.102	2	.051	.076	.927
	Within Groups	67.860	102	.665		
	Total	67.962	104			
Safe work method statement	Between Groups	1.591	2	.796	1.245	.292
	Within Groups	65.171	102	.639		
	Total	66.762	104			
Workplace health and safety inspections plan	Between Groups	1.367	2	.684	1.340	.266
	Within Groups	52.023	102	.510		
	Total	53.390	104			
Contractor Injury History	Between Groups	.151	2	.076	.111	.895
	Within Groups	69.506	102	.681		
	Total	69.657	104			
H&S Signs and signals	Between Groups	.014	2	.007	.012	.988
	Within Groups	59.833	102	.587		
	Total	59.848	104			
Site security features	Between Groups	.140	2	.070	.115	.891
	Within Groups	61.860	102	.606		
	Total	62.000	104			
Insurance cost	Between Groups	.084	2	.042	.066	.936
	Within Groups	64.678	102	.634		
	Total	64.762	104			
Contractor H&S Study	Between Groups	.495	2	.248	.360	.699
	Within Groups	69.505	101	.688		
	Total	70.000	103			
Contractor remedial response to H&S	Between Groups	4.954	2	2.477	4.069	.020
	Within Groups	62.093	102	.609		
	Total	67.048	104			
Contractor Health and Safety Coordination	Between Groups	.100	2	.050	.084	.920
	Within Groups	60.700	102	.595		
	Total	60.800	104			
Contractor Health and Safety Equipment	Between Groups	.342	2	.171	.274	.761
	Within Groups	63.506	102	.623		
	Total	63.848	104			
Contractor H&S Promotion plan	Between Groups	.885	2	.443	.628	.536
	Within Groups	71.230	101	.705		
	Total	72.115	103			
Environmental management plan (EMP)	Between Groups	.160	2	.080	.131	.877
	Within Groups	62.031	102	.608		
	Total	62.190	104			
	Between Groups	.092	2	.046	.089	.915

Waste management plan (WMP)	Within Groups	52.956	102	.519		
	Total	53.048	104			
Health and safety file	Between Groups	1.938	2	.969	1.554	.216
	Within Groups	63.623	102	.624		
	Total	65.562	104			
Fall protection plan	Between Groups	.364	2	.182	.242	.786
	Within Groups	76.684	102	.752		
	Total	77.048	104			
Demolition plan	Between Groups	3.690	2	1.845	2.097	.128
	Within Groups	89.739	102	.880		
	Total	93.429	104			

6.6 Discussion of findings in the context of the literature review

6.6.1 Motives for incorporating H&S criterion in tender evaluation

The motives of incorporating H&S criterion in the tender evaluation were examined in the literature review under three subsections: impact of H&S on cost, the impact of H&S on time, and impact of H&S on quality. From the findings, time, cost, and quality variables are important motivators for H&S to be incorporated in tender evaluation, primarily because these are key factors that directly influence the behavior of H&S on a project. Concerning the impact of H&S on project cost, the three top-ranked motives demonstrated greater influence on motivating the incorporation of H&S in tender evaluation. These motives were well annotated H&S structures eliminate the possibility of contract price adjustment with a MS of 4.04, this finding is corroborated by Pouliakas and Theodossiou (2013:192) who articulated that if H&S is not monitored, it increases the firms' budget devoted to H&S and ultimately the project cost. The second-ranked motive was adequate H&S investment entails low-cost spending on compensating incidents caused by disability and early retirement with a MS of 3.99. The third-ranked factor was adequate H&S budget entails a lower cost of accidents on a project with a MS of 3.97. The second and third motives were supported by Lin and Mills (2001:137), they concur that poor performance of H&S structures is due to inadequate cost and resources having been allocated. Additionally, findings derived by the impact of H&S on time show that the three top-ranked motives influence the inclusion of H&S in tender evaluation. The top-ranked motives in this subsection were Good H&S performance assist in terms of delivering construction projects on time with a MS of 4.16, avoiding serious accidents and fatalities prevent suspension of construction work and ultimately project delays with a MS of 4.11, and avoiding accidents prevents production disruptions and ultimately prevents extension of time with a MS of 4.04. These findings are supported by a study conducted by Lai, Liu and Ling (2011:1020), the study revealed that good H&S practices improve project efficiency, which ultimately improves project safe delivery.

Furthermore, findings emanating from the analysis of the impact of H&S on quality reveals the dominance of the top two ranked motives having a greater influence on motivating the inclusion of H&S in tender evaluation. The first ranked motive was good practices of H&S are associated with injury-free projects with a MS of 4.09. This was buttressed by Smallwood (2002:219), who indicated that total quality includes the overall H&S of every worker, and for total quality to be achieved, there must be zero accidents. The second-ranked motive was the constructability of a project that has an impact on H&S with a MS of 3.79, Gambatese (2000:659) elaborated that when designers are assessing constructability, one of the fundamental check is ensuring construction worker safety.

6.6.2 The extent to which H&S criterion is incorporated in tender evaluation

The extent to which H&S criterion is incorporated in tender evaluation was determined by comparing the importance of delivering projects efficiently between H&S criterion and other tender evaluation criteria. The findings indicate that four criteria yielded a MS above the midpoint of 3.00. The first ranked criterion was cost of project completion with a MS of 4.10, the second-ranked criterion was project completion time with a MS of 4.04, the third-ranked criterion was management capability to plan, organize and control the project with a MS of 3.71, and finally, the actual quality achieved for similar works criterion was ranked fourth, and it had a MS of 3.59.

To support these findings, Idrus (2011:1358) elucidates that cost, standard of quality, and time performance must be among the most important criteria used to select contractors for projects. A study of the relative importance of tender evaluation and contractor selection conducted by Watt (2010:51) revealed that the top-ranked criteria deemed important in tender evaluation were cost and management expertise.

Exploratory factor analysis was performed at the second stage to categorize the factors into smaller groups. The EFA factors were grouped into six components: technical competence and experience, management capability, project efficiency and management capability, quality and insurance policy, financial stability and experience, and technical capacity. Related studies conducted by El-khalek, Aziz, Remon, Morgan and Enas (2019:217), (Grzyl, Beata, Apollo, Magdalena, Urbańska, Emilia, Kristowski and Adam (2018:2), and Chou, Chen, Yavuz and Khoso (2017:4) also determined that technical capability, financial stability, cost, quality, contractor knowledge, management capability, reputation, and time are criterion that should always be considered in tender evaluation.

6.6.3 Hindrances against the incorporation of H&S criterion in tender evaluation

The assessment of the hindrances that limit the incorporation of H&S criterion in tender evaluation demonstrated that 23 out of 24 hindrances yielded a MS above 3.00. This means that these hindrances are significant impediments affecting the inclusion of H&S criterion in tender evaluation exercise. The top-ranked hindrances were corruption, and unethical practices hinder effective incorporation of H&S in tender evaluation, client's H&S specification confine tenderers to explore elements of H&S fully, poor design of tender documents limits effective incorporation of H&S in tender evaluation, and the dominance of price, time and quality restrict effective implementation of H&S in tender evaluation. The range of MSs obtained lies within the mean score range > 3.40 ≤ 4.20, graded 'between somewhat agree to agree/ agree'.

The most significant hindrance militating against the incorporation of H&S criterion in tender evaluation is corruption and unethical practices. To buttress the findings, Graycar (2019:168) concur that there is a prevalence of corruption and unethical practices in tender evaluation. In addition, Graycar (2019:168) stressed that most construction projects are vulnerable to a cover-up of safety breaches. Another critical barrier is the restrictive nature of client's H&S specification. Similar to the findings of this study, Deacon (2017) found that using a H&S specification as a standard of providing information of H&S that is used in tender evaluation is not adequate as it restricts and limits tenderers to express their ability of H&S practices fully. The dominance of price, time, and quality in tender evaluation probably reflects that these parameters are considered more important than other criteria, hence the lack of attention to the H&S criterion during the tender evaluation process. This aligns with Umeokafor (2017:480) assertion who indicates that the tendering process of construction projects, mostly those procured through the traditional route, give more attention to price, time, and quality over H&S.

EFA was performed to determine the underlying group militating against the inclusion of H&S criterion in tender evaluation. This is represented by eight critical factors: Ambiguity in the design of tender documentation, perception that H&S is expensive to implement, preference of other criteria, lack of H&S knowledge, lack of client commitment and corrupt activities, poor implementation of safety law and regulation, lack of expertise, and insufficient resources.

6.6.4 Construction client's perception on the relevance of incorporating H&S criterion in construction tender evaluation.

6.6.4.1 Construction practitioners view on client's perception of H&S relevance in tender evaluation

Findings accumulated from the descriptive analysis of construction practitioners regarding the perception of construction clients on the relevance of incorporating H&S in tender evaluation indicates that 22 out of 24 factors have MS above 3.00. Among the most ranked factors are clients focus more on cost than H&S, clients focus more on quality than H&S, and clients focus more on time than H&S with each of them yielding a MS of 4.38, 4.32, and 4.23 respectively. The top 3 factors fall within the MS range of > 4.20 ≤ 5.00, indicating that respondents' degree of concurrence is deemed to be between agree to strongly agree / strongly agree'. Regarding previous studies conducted by Aliakbarlou, Wilkinson and Costello (2018:1007) and Mohammadi, Tavakolan and Khosravi (2018:282), time, cost, and quality were considered as important client values, whilst H&S criterion was considered less important in the tender adjudication process. The importance of time, cost, and quality have been ranked highest by construction practitioners as factors that construction clients perceive as the most important in tender evaluation.

6.6.4.2 Construction client's precipitation on relevance of H&S in tender evaluation

The client's perception regarding the importance of H&S in tender evaluation was assessed under three categories, which are client's H&S commitment, H&S pre-construction activities, and H&S pre-construction activities.

6.6.4.2.1 Client's H&S commitment

The findings drawn from the analysis of clients H&S commitment indicates that 24 of the 25 H&S aspects yielded a MS above 3.00, a result indicating that clients are committed to these aspects of H&S. The top-ranked aspects consisted of personal protective equipment (PPE) with a MS of 4.34 followed by health and safety file with a MS of 4.24. The MSs of these aspects fall in the range > 4.20 ≤ 5.00, determined as 'between very committed to extremely committed / extremely committed.' With reference to a study by Kuswati (2018:107), clients in relation to the importance of PPE, do not only have insight and awareness, they should also conduct evaluations, make action plans, and build commitment to adequate implementation of PPE. Williams, Hamid and Misnan (2018:82) maintain that it is the client and its agents' responsibility to make sure that the contractor has a H&S file and monitor the file regularly.

6.6.4.2.2 H&S pre-construction activities

The study evaluates the perception of construction clients on H&S pre-construction activities, these activities affect the assessment of H&S during tender evaluation. The first ranked

activity revealed that clients consider approval of H&S specification with a MS of 4.20 as the most significant pre-construction activity and should always be assessed. Like the findings of this study, Smallwood, (2020:185) specifies that H&S specifications are important in the South African regulations. Clients are required to provide H&S specifications that address risk assessments and include their H&S requirements. The second-ranked finding revealed that clients always value the assessment of the contract to be engaged for the project in relation to H&S (e.g. JBCC, NEC) with a MS of 4.07. In support of this finding, Chen *et al*. (2018) attest that one of the client's important obligations is implementing a solid and sound contract. The third-ranked finding was the selection of H&S consultants with a MS of 4.00, this is corroborated by Smallwood and Deacon (2020:380) and Oke, Aigbavboa and Mosima (2017:155). For instance, Smallwood and Deacon (2020:380) stressed that for project fluidity, the clients must appoint agents, and one of the important agents that must be appointed is the H&S consultant.

6.6.4.2.3 Clients' perception of incorporating H&S in tender evaluation

With regard to the evaluation of construction clients' perceptions on the incorporation of H&S criterion in tender evaluation, clients must ensure that they appoint a contractor who is well versed with H&S was ranked first with a MS of 4.12. This finding affirms Shabangu (2017:39) assertion that a client must ensure that the principal contractor to be appointed is competent and knowledgeable in terms of H&S and possess adequate resources to carry out the works safely. The second-ranked factor was expert and experienced clients play a more active role in H&S of their projects with a MS of 3.88. This supports the opinions of Lingard, Wakefield and Walker (2020:5) that the greater clients' experience entails greater familiarity and participation in procedures of work safety. The third-ranked finding revealed that Clients' understanding of the H&S systems influences their involvement in construction projects with a MS of 3.85 is highly perceived as important. In a similar vein, Umeokafor (2017:473) buttresses that the understanding of the client's involvement in H&S leads to better implementation of H&S laws and regulations. On the contrary, Lingard, Oswald and Le (2019:7) argue that H&S is not the client's responsibility only as it requires expertise in every area of the project.

6.6.5 Important aspects of H&S that should be incorporated in tender evaluation.

This section presents the findings of aspects of H&S that are incorporated in tender evaluation, the findings are based on the frequency of incorporating H&S aspects in tender evaluation and the level of importance of the aspects of H&S in tender evaluation.

6.6.5.1 Frequency of incorporation

The study evaluated the frequency of incorporating H&S aspects in tender evaluation. The descriptive analysis revealed that contractor health and safety plan with a MS of 4.53 has the highest frequency of incorporation in tender evaluation. This is seconded by Cheaitou, Larbi

and Al (2019:3) who revealed that contractor selection is distinguished into three aspects; one of the aspects outlines H&S plan as an important element to assess contractor capability to execute the project safely. The study also found that Health and Safety File with a MS of 4.53 has a greater frequency of being incorporated in the tender. This finding is supported by Hosny, Ibrahim and Elmalt (2019:355) outline that H&S file as an element among factors affecting the quality of tender documents, and the outlined factors should be considered in tender evaluation exercises. Contractor H&S training was the third factor that is perceived to have greater frequency with a MS of 4.27. This is corroborated by Young, Seidu, Nganga, Robinson and Ebohon (2019:1) who stressed the need for mandatory inclusion of H&S in tender evaluation, especially aspects such as H&S training and education. However, (Darabont, Antonov and Bejinariu (2017:7) argue that contractors' experience in implementing H&S management systems should be given more consideration as a technicality of appointing contractors.

6.6.5.2 Level of importance

In respect of the perception of construction practitioners on the level of importance of H&S aspects in tender evaluation, personal protective equipment (PPE) with a MS of 4.46 was deemed a highly important aspect of H&S to be incorporated in tender evaluation. This finding is buttressed by Mwombeki (2005:778), who maintains that PPE effectively safeguards the health of workers and must be assessed before the project commences. The second-ranked factor deemed important was contractor H&S training with a MS of 4.42. *Ng (2005:1348)* supported this by outlining H&S training among the top six elements in a framework for evaluating construction contractors' safety performance. The third-ranked finding was contractor health and safety plan with a MS of 4.40. In concurence, Watt, Kayis and Willey (2009:) ranked H&S as the third most important criterion for tender evaluation, and safety plan was outlined as the second important aspect under H&S criterion. However, Mahmoudi, Ghasemi, Mohammadfam and Soleifam (2014:125) argued that risk assessment and management and leadership and commitment, are the most important aspects to assess and promote H&S performance.

6.7 Summary

This chapter discussed the testing of the hypothesis, together with the findings generated from the survey in the context of the literature review discussed in Chapter 2. With regard to hypothesis 1, there is no statistically significant difference between the mean rankings on the motives of including H&S criterion in tender evaluation, an analysis of the mean rankings was conducted, and a paired sample T-test was used to test if the mean rankings did not happen by chance. Hypothesis 2 shows no statistically significant difference between public and private

sectors on the motives (time, quality, and cost) of including H&S criterion in tender evaluation was tested using ANOVA. The ANOVA test revealed that the perceptions of both public and private sector clients do not differ regarding the motives of incorporating H&S criterion in tender evaluation, hence the hypothesis was supported. Hypothesis 3, there is no significant difference between the perception of public and private clients regarding the extent H&S is incorporated in the tender evaluation was tested using, suggesting that the hypothesis cannot be rejected. The fourth hypothesis tested hindrance against the incorporation of H&S in tender evaluation using ANOVA. From the test, results indicate that there is no statistically significant difference in the hindrance of incorporating H&S in tender evaluation based on the sector under which a construction practitioner is engaged; hence, the hypothesis is accepted. The fifth hypothesis tested the significance difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners. This hypothesis was tested using ANOVA. The results generated indicate no significant difference in the level of importance of H&S aspects included in tender evaluation; Therefore, the hypothesis is supported.

The discussion of findings in the context of literature review indicated that the results of the study and literature are in concurrence regarding the motives of incorporating H&S criterion in tender evaluation. The impact of H&S on time, cost, and quality are deemed important by both this study and the body of literature. Also, the discussion of findings established that the literature and the findings of the study were similar as both elucidated that time, cost, and quality are highly ranked as compared to H&S. The findings drawn from this study established that aspects such as corruption, the dominance of price criterion and the rigidity of H&S regulation hinder the effective incorporation of H&S in tender evaluation, this was similar in the findings and the body of knowledge. With regards to clients' perception on the incorporation of H&S criteria in tender evaluation, it was revealed in both the findings and the literature that construction practitioners deem clients to be more inclined to price, quality, and time frame as top priority criteria for evaluating tenders. In terms of clients' perception of H&S criterion in tender evaluation, it was established that clients are committed to PPE and H&S file. In pre-construction activities, clients consider the approval of H&S specification and the contract's assessment to be engaged for the project in relation to H&S as important.

Regarding the construction clients' perceptions on the incorporation of H&S criterion in tender evaluation, clients deem the appointment of a contractor who is well-versed with H&S and that expert and experienced clients play a more active role H&S of their projects as important. All elements of clients' perception were similar in the findings and the literature. Finally, based on the important aspects of H&S that should be incorporated in tender evaluation, frequency of incorporating H&S criterion in tender evaluation and the most important aspects of H&S that

should be incorporated in the tender evaluation were discussed. Both the findings and the literature concurred that contractor H&S plan, H&S File, and contractor H&S training has the highest frequency of being incorporated in tender evaluation. The findings and the literature established that PPE, contractor H&S training, and contractor H&S plan are important aspects that should be incorporated in tender evaluation.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the conclusion drawn from the results in relation to the objectives of the study. This chapter also discusses the limitations of the study, practical implications, study recommendations, and suggested areas for further research about the effective incorporation of H&S criterion in tender evaluation. As outlined in the previous chapters, the study aims to assess strategies for effectively incorporating H&S criterion in tender evaluation to attain safe project delivery. The outlined objectives in achieving the aim include the following:

1. To investigate what motivate the inclusion of health and safety criterion in tender evaluation.
2. To identify extent to which health and safety criterion is incorporated in tender evaluation.
3. To determine the hindrances militating against the incorporation of health and safety criterion in tender evaluation.
4. To investigate the extent to which construction clients perceive the relevance of incorporation of health and safety in tender evaluation.
5. To assess the most important aspects of health and safety that should be incorporated in tender evaluation.

7.2 Achievement of objectives of the study

The concept of effectively incorporating H&S criterion in tender evaluation encompasses eliminating injuries and fatalities on construction sites, delivering projects within the stipulated budget, fostering safety culture for the project, executing the project within the specified timeframe, and help to Achieve the determined quality for the project. The objectives of the study are firmly in line with effectively incorporating H&S in tender evaluation.

7.2.1 Motives for the inclusion of H&S criterion in tender evaluation

To achieve this objective, a comprehensive literature review was conducted to identify the motives of effectively incorporating H&S criterion in tender evaluation as found in other studies. Coupled with this was an analysis of construction practitioner's perceptions regarding the motives of incorporating H&S in tender evaluation obtained through the distribution of survey questionnaires.

From the literature review, the motives for incorporating H&S in tender evaluation were identified as H&S impact on project cost, H&S impact on time, and H&S impact on project quality. Relative to H&S impact on the project cost, the findings from the literature determined that incorporating H&S in tender evaluation allows for proper H&S budgeting, prevents accident-related cost, and ultimately prevents exceeding the contract sum. In line with H&S impact on time, the findings from the literature established that good H&S practice reduces production pressure and ultimately, construction delays. Finally, the findings from the literature regarding H&S impact on quality elucidates that the prevalence of good H&S practices is associated with good quality of workmanship, and it minimises reworks on the project.

The findings from the survey analysis supported the findings from the literature. The most significant motive classified under the H&S impact on cost was that well-annotated H&S structures eliminate contract price adjustment. It was then followed by adequate H&S investment entails low-cost spending on compensating incidents caused by disability and early retirement, and adequate H&S budget entails a lower cost of accidents on a project. Regarding H&S impact on time, the most ranked factors were good H&S performance assist in delivering construction projects on time. It was followed by avoiding serious accidents and fatalities prevent suspension of construction work, and ultimately project delays, and avoiding accidents prevents production disruptions, and ultimately prevents extension of time. Finally, the highly significant findings drawn from the H&S impact on quality were good practices of H&S is associated with injury-free projects, constructability of a project has an impact on H&S, and well-managed H&S improves the quality of work on construction projects.

7.2.2 The extend H&S criterion is incorporated in tender evaluation

The second objective of the study identified criteria for tender evaluation, the criteria identified were compared with H&S criterion to establish the relative importance of tender evaluation in tender evaluation. This objective was achieved by reviewing literature and findings from the administration of a survey questionnaire to construction practitioners.

From the literature, the criteria that are used in tender evaluation are numerous and diverse, but the most prevailing and ranked factors were established to be the capacity of the contractor to execute the project, cost, time, quality, financial capabilities, and management capabilities. These factors were deemed to have more significance in tender evaluation over H&S.

The findings from the survey distribution supported the findings from the review of the literature. The most ranking factors from the descriptive analysis of construction practitioner's perception on the extent H&S criterion is incorporated in the tender evaluation were the cost of project completion, project completion time, and management capability to plan, organize and control

the project. Also, to better achieve this objective, the criteria were ranked and categorised, and this was achieved through an EFA. Based on the PCA results, the features were narrowed down and grouped into the following six factors, namely technical competence and experience, management capability, project efficiency and management capability, quality and insurance policy, financial stability and experience, and technical capacity.

7.2.3 Hindrances against the incorporation of health and safety criterion in tender evaluation

The study's third objective was to identify the hindrances against the effective incorporation of H&S in tender evaluation. A synthesis of literature and findings from interviews and findings from construction practitioners survey questionnaire was used to achieve this objective.

The literature findings established that hindrance to effective incorporation of H&S in tender evaluation is corruption and contractor management capabilities. Concerning corruption, aspects such as bribery, extortion, embezzlement, nepotism, patronage systems, fraud, kickback schemes, false invoices, and inflated prices were among the major forms of corruption that limit effective incorporation of H&S criterion in tender evaluation. Environment management system and risk management were singled out as the most prevailing hindrances of H&S criterion in tender evaluation under contractor management capabilities.

The review of the literature supports the findings from the survey. The hindrances that highly limit H&S in tender evaluation were outlined as corruption, and unethical practices. Adding on poor design of tender documents limits effective incorporation of H&S in tender evaluation, and client's H&S specification confine tenderers to fully explore elements of H&S. the qualitative findings complemented the quantitative findings. The qualitative findings revealed that H&S is not adequately and sufficiently assessed in tender evaluation due to the system that tenderers are required to submit a H&S plan that answers to a H&S specification. This system has loopholes because the H&S that is used is usually generic, and also this system limit tenderers to express their competence due to following a guideline of the H&S specification. It was also established that H&S consultants are mostly given treatment that is different from other consultants in terms of fees and stage of appointment.

Adding on the findings, the EFA categorised the hindrances into eight factors, namely Ambiguity in design of tender documentation, Perception that H&S is expensive to implement, Preference of other criteria, Lack of H&S knowledge, Lack of client commitment and corrupt activities, Poor implementation of safety law and regulation
Lack of expertise, Insufficient resources.

7.2.4 The extent to which construction clients perceive the relevance of incorporation of H&S in tender evaluation

The fourth objective aimed to establish how construction clients perceive the relevance of incorporating H&S criterion in tender evaluation. A systematic review of the literature was conducted to identify clients' perception on incorporating H&S criterion in tender evaluation to achieve this objective. Coupled with this were findings obtained from the analysis of the survey questionnaires and interviews conducted.

The literature established that construction clients are keen on evaluating construction tenders based on the lowest bidder. Other criteria that clients consider during the evaluation of tenders are time, quality, and previous experience. With regard to H&S in tender evaluation, construction clients are aware of its significance on the project. Still, they do not deem it to be a critical element to be incorporated in tender evaluation.

The survey of construction practitioners indicates that the most ranked aspects that construction clients perceive to be important in tender evaluation are clients focus more on cost than H&S, clients focus more on quality than H&S, and clients focus more on time than H&S. Thus, these findings concur with the findings from the literature review. Adding on, the findings from the survey of construction client's H&S commitment on aspects of H&S established that the most important aspects of H&S are personal protective equipment (PPE), health and safety file, and contractor health and safety plan. The findings obtained from construction clients' questionnaire surveys relative to H&S pre-construction activities determined the most ranked pre-construction activities as approval of H&S specification, assessment of the contract to be engaged for the project in relation to H&S (e.g. JBCC, NEC), and selection of H&S consultant. Finally, the client's perception on incorporating H&S in tender evaluation obtained from the survey revealed the most ranked perceptions as clients must ensure that they appoint a contractor who is well versed with H&S, and expert and experienced clients play a more active role in H&S of their projects.

The qualitative findings revealed that `public clients are knowledgeable and more proactive of H&S issues than private sector clients. Private sector clients are more inclined to criteria such as quality, price, time, and experience. Regardless of public sector clients having traits of preferring price as the most valuable criterion, they do not compromise the value of H&S on a project; hence they make sure that tenderers adhere to the demands of H&S, and also that a H&S consultant is appointed for the project,

7.2.5 Most important aspects of health and safety that should be incorporated in tender evaluation

This objective examines the importance of various aspects of H&S and the frequency of incorporating these aspects in tender evaluation. The findings were obtained through the review of the literature and a survey questionnaire distributed to construction practitioners.

The literature findings established that aspects such as H&S plan, PPE, contractor injury history, and safe work method statements are deemed important and are included more frequently in evaluating H&S during tender evaluation. Adding on, the survey findings ranked aspects such as contractor H&S plan, H&S file, and contractor H&S training to be the most important aspects. The findings established that the most incorporated aspects are PPE, contractor H&S training, and contractor health and safety plan regarding the frequency of incorporating aspects in tender evaluation.

7.3 Conclusions relative to research hypotheses

Hypothesis 1: There is no statistically significant difference between the mean rankings on the motives of including H&S criterion in tender evaluation.

The motives of incorporating H&S criterion in tender evaluation were classified as: H&S impact on cost, H&S impact time, and H&S impact on quality. The motives influencing the incorporation of H&S in tender evaluation were ranked in the following descending order: H&S impact on time (3.95; 1st), H&S impact on cost (3.81; 2nd), and H&S impact on quality (3.65; 3rd). A paired sample test was performed to establish that the mean rankings did not happen by chance; the test revealed a statistically significant difference between the perception of private sector clients and public sector clients on the motives of incorporating H&S criterion in tender evaluation. Therefore, the hypothesis (H!) of no significant difference in the mean ranking and the motives of incorporating H&S in tender evaluation is not supported.

Hypothesis 2: There is no statistically significant difference between public and private sector on the motives (time, quality, and cost) of including H&S criterion in tender evaluation.

The one-way between-groups ANOVA was carried out to examine if there is no statistically significant difference in agreement of respondents according to their sector of engagement and the motives of including H&S criterion in tender evaluation. There is no statistical significance difference in the perception of construction sectors and the motives (cost on H&S implications, time on H&S implications, and quality implication on H&S) of incorporating H&S criterion in tender evaluation. This implies that the construction sector in South Africa,

irrespective of the background, has similar opinions regarding cost, time and quality impacting H&S being included in tender evaluation.

Hypothesis 3: There is no significant difference between the perception of public and private sector regarding the extent H&S is incorporated in tender evaluation

The findings obtained from the testing of hypothesis 3 show no statistically significant difference at the $p < 0.05$ level of the perception of the public and private sectors regarding the extent to which H&S is incorporated in tender evaluation. This is justified by the results demonstrating that 22 criteria for tender evaluation had a statistically significant difference above a threshold of 0.05. Only two criteria for tender evaluation had a significant difference below the threshold of 0.05. This implies that both the private sector and the public sector within the South African built environment, irrespective of their background and systems of operation, have similar opinions regarding the extent H&S is included in evaluating construction tenders.

Hypothesis 4: There is no statistically significant difference in the agreement of public and private sector on the hindrances against the incorporation of H&S criterion in tender evaluation.

The findings attained from the testing of hypothesis 4 show no statistically significant difference at the $p < 0.05$ level in the agreement public and private sector on the hindrances against the incorporation of H&S criterion in tender evaluation. The ANOVA results achieved from testing this hypothesis show that all the hindrances of incorporating H&S in tender evaluation have a statistically significant difference above the point 0.05 which determines if there is a statistical difference or not. This implies that both the private and the public sector in the construction sector, regardless of their differing objectives, face the same hindrances of effectively incorporating H&S criterion in tender evaluation.

Hypothesis 5: There is no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector (public and private sector) of construction practitioners.

The one-way between-groups ANOVA was carried out to examine if there is no statistically significant difference in the level of importance of H&S aspects incorporated in tender evaluation and the sector of construction practitioners. It was established that there is no statistically significant difference in the perception of practitioners and the important aspects of H&S incorporated in tender evaluation. This implies that construction practitioners, regardless of their sector and professional affiliation, have similar opinions regarding the important aspects of H&S that should be incorporated in construction tender evaluation.

7.5 Limitations

The study was conducted in the Western Cape province of South Africa and was limited to construction professionals and construction clients as it was believed that such respondents as selected are well capacitated and equipped to provide sought information and make inferences for the population. Another limitation of the study was the poor participation rate, which was a presumptive known fact of the construction industry. The low response rate was due to respondents having stringent schedules, which affected the questionnaires' timely completion. The COVID-19 pandemic contributed to the low response rate as many of the respondents were not active during the data collection period. Some of the questionnaires were returned incomplete and some unattended, which resulted in obtaining inadequate information. Time constraint to complete the entire study program was another limitation encountered.

7.6 Practical implications and recommendations

Based on the conclusions as discussed above and the value of the study to the construction industry, the recommendations are as follows:

i. Construction clients must insist on the appointment of a H&S consultant in the project conception together with other agents; the H&S consultant must be given access to control the H&S aspects of the project and also advise the client regarding H&S, including the appointment of a contractor who is competent in terms of H&S practices.

ii. The H&S consultant on behalf of the client, must compile the H&S specification that best fits the project in question rather than using a generic H&S specification from other projects. Also, the H&S consultant must allow some degree of flexibility in the H&S specification which will then encourage H&S tenderers to display creativity with H&S. Tenderers in response to the H&S specification must submit a conclusive H&S plan for evaluation rather than a proposed H&S plan and appointment of a tenderer must be based on a conclusive H&S plan.

iii. Assessment of H&S in tender evaluation must not be based on the proposed H&S plan as it is non-conclusive to determine the competitiveness of a tenderer to display quality H&S execution. Rather an evaluation of H&S must be based on quantitative and qualitative structures. The quantitative H&S aspect should focus on quantifiable aspects of H&S and their pricing, and the qualitative H&S aspects should focus on H&S method statements that elucidate how H&S will be implemented on the project.

iv. The tender evaluation process in the South Africa construction industry must not be dominated by price criterion rather, the MCDM process must be effected and must give considerable weight to H&S as every project is prone to a deficit of H&S.

7.7 Contribution to the body of knowledge

The study consisted of a deductive approach that formulated hypotheses based on established theories, typically, inclusion criteria. The knowledge gap was lack of evidence in terms of the statistically significant difference of construction sector on the motives of including H&S criterion in tender evaluation, the extent H&S is incorporated in tender evaluation, hindrances militating against the incorporation of H&S criterion in tender evaluation, and the level of importance of H&S aspects incorporated in tender evaluation to achieve safe project delivery.

The two theories explored in this study were inclusion criteria theory and the theory of relative importance. While these theories are used to select and incorporate criteria of tender evaluation, they do not provide a framework for including H&S criterion and its importance in evaluating public and private sector tenderers. However, the current research went further by assessing how H&S criteria can be incorporated in tender evaluation in accordance with both the private sector and public sector. For example, the literature on the motives of incorporating H&S criterion in tender evaluation reveals that impact on price, time, and quality have great influence. The findings of this research concur with the literature but have revealed that time has the greatest impact of motivating the incorporation of H&S in tender evaluation followed by cost and quality. It is believed that the most valued criteria of tender evaluation are price, cost, and quality. However, the study divulges that cost of project completion, projects completion time, and management capability to plan, organize and control the project are deemed more important in comparison to H&S. While the literature on the hindrances of incorporating H&S in tender evaluation suggest that clients' lack of understanding of construction procedures, clients' lack of interest in H&S, client abrogating H&S responsibilities to agents, corruption, and contractor management systems are the main hindering factors to incorporate H&S in tender evaluation effectively. The findings from the literature do not deviate much from the findings of this study. The study found out that corruption, poor design of tender documents, and the restriction of clients' H&S specifications hinder effective incorporation of H&S criterion in tender evaluation.

Previous studies confirm that both public and private sector clients perceive criteria such as management capability, cost, previous experience, time, and quality with relative importance. However, the perception of clients on the importance of H&S criterion in evaluating tenders is not clear. The current findings reveal that both public and private sector clients perceive H&S criterion together with H&S pretender variables with relative importance equally to the magnitude of time, cost, and quality. The H&S regulations state that the contractor should submit a H&S plan that answers the H&S specification that is made available for tender by the client, failure to do that, the tenderer will be deemed non-responsive and disqualified for further

assessment. The current study indicates that aspects of H&S such as H&S training, PPE, and contractor H&S management structure must always be evaluated together with H&S plan during tender evaluation, and they must be given greater attention in awarding the tender.

7.8 Areas for future research

Given that the current study is confined within the Western Cape Province, the relevance of this research should be extended to a national level because the perception of construction practitioners and clients across all the nine provinces in South Africa may differ. This effect will extract a wider perspective in terms of incorporating H&S criterion in tender evaluation nationally, but not limited to the Western Cape Province. Further study should focus on weighting and combining quantitative H&S and qualitative H&S for effective incorporation in tender evaluation. Other recommended areas for future research areas should be based on integrating H&S culture in evaluating H&S criterion to ensure effective delivery of construction project in a safe environment.

7.9 Chapter summary

This chapter discusses the concluding parts of the entire study by integrating the findings logically to fathom appropriate recommendations to support the South African construction industry to be equipped with effective incorporation of H&S criterion in evaluating construction tenders. The areas integrated include aspects such as the motives of including H&S criterion in tender evaluation, the extent H&S criterion is incorporated in tender evaluation, hindrances of incorporating H&S in tender evaluation, and the perception of construction clients on incorporating H&S criterion in tender evaluation. Furthermore, the discussion was extended to the importance of H&S criterion that should be incorporated in tender evaluation.

An exploratory study was conducted in the early stages of the study before conducting the research survey. The exploratory study included registered construction practitioners with the aim of helping in formulating the strategy and questions used in the survey. The field data gathering was done using an online survey distributed to construction practitioners and clients in the Western Cape Province of South Africa. Subsequently, the data was captured using SPSS version 26 to compute descriptive statistics (mean rankings), and inferential statistics: parametric (ANOVA, T-test), and the Factor Analysis statistical tests. The data analysis covered all research objectives, and the interpretation thereof provided a meaningful basis upon which the conclusions were drawn. The validity of the results was explained, indicating that the findings may be generalised in the South African construction industry context. The schedule of tested hypotheses highlighted areas noted with a statistically significant difference between mean rankings as a signal for further attention. The results drawn from the exploratory

study and the survey showed a strong relationship. The contributions to the body of knowledge were highlighted, demonstrating which gaps in knowledge were addressed. The findings revealed that H&S is of paramount importance when evaluating tenders and must always be incorporated as a major determining factor for awarding private and public construction projects. Recommendations were made suggesting approaches for evaluating H&S criterion in tender evaluation to improve the broad outlook of H&S in the construction industry. Also, areas of further research were proposed.

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Appendix A

Faculty of Engineering and The Built Environment
Department of Construction
Management and Quantity Surveying
P.O. Box 1906, Bellville 7535, South Africa

Date: 19/02/2020

Dear Sir / Madam,

RE: PARTICIPATION IN A SURVEY

You are invited to participate in a research survey entitled **"The effectiveness of incorporating health and safety criterion in construction tender evaluation."** It is a research study undertaken by a Master's student towards fulfilling a Master of Construction degree in the Department of Construction Management and Quantity Surveying at the Cape Peninsula University of Technology. Participants of this survey are construction practitioners who have experience in tender evaluation procedures.

Please answer each question carefully. The survey takes about 20 minutes to complete. All information obtained from participants will be kept strictly confidential and will be only used for research purposes.

Thanking you in anticipation of your response.

Declaration by participant:

I (Name and Surname) ……. agree to participate in this study and I am aware that no compensation will be provided for participating.

Signature …… Date ……/……/2020

Please complete the survey and return to:

Email: tendainht@gmail.com Mobile: 063 331 5211

Yours faithfully,

Tendai Elvis Nyanhete

QUESTIONNAIRE

SECTION A: PROFILE OF RESPONDENT

Please mark the appropriate box with 'X'.

1.1 Please indicate your gender

☐ Female ☐ Male

1.2 Please indicate your age group

☐ Under 25 years ☐ 41 – 50 years
☐ 25 – 30 years ☐ 51 – 60 years
☐ 31 – 40 years ☐ Over 60 years

1.3 Please indicate your highest formal qualification.

☐ Matric certificate ☐ Postgraduate diploma
☐ Diploma ☐ Masters degree
☐ Bachelor degree ☐ Doctorate degree
☐ Honours degree ☐ Other ……

1.4 In what sector do you work?

☐ Public sector ☐ Both
☐ Private sector

1.5 How long have you been involved in the construction industry?

☐ Less than 5 years ☐ Over 10 years
☐ 5 – 10 years

1.6 Which of the following best describes your profession?

☐ Architect ☐ Quantity Surveyor
☐ Engineer ☐ Health and safety consultant
☐ Project Manager ☐ Other ……

1.7 Have you been part of a tender evaluation panel on any construction project before?

Yes ☐ No ☐

1.8 In the tender evaluation exercise you were involved, was H&S criterion part of criteria evaluated to award the tender?

Yes ☐ No ☐

1.9 Taking reference to one project you were part of the tender evaluation panel, what was the percentage of H&S cost to the overall tender price

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SECTION B: 2. MOTIVES OF INCORPORATING HEALTH AND SAFETY CRITERION IN TENDER EVALUATION

2. As a construction practitioner, please indicate by means of an X in the appropriate box the extent to which you agree with the following statements relating to motives of incorporating H&S criterion in tender evaluation; Where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure. Please mark 1 box in each row.

Item	Motives of incorporating H&S in tender evaluation	1	2	3	4	5	U
	H&S cost implications	1	2	3	4	5	U
2.1	Well annotated H&S structures eliminate the possibility of contract price adjustment	1	2	3	4	5	U
2.2	Adequate H&S budget entails a lower cost of accidents on a project	1	2	3	4	5	U
2.3	Good management of H&S results in low insurance premiums	1	2	3	4	5	U
2.4	Good accident management prevents disruptions in production, this alludes to positive cost saving	1	2	3	4	5	U
2.5	Good H&S practices entail low staff turnover which allows great saving in terms of replacement and training cost	1	2	3	4	5	U
2.6	Low accident rate is associated with quality work and this allows cost-saving in terms of reworks and corrective works	1	2	3	4	5	U
2.7	Good H&S practices entail the minimum occurrence of legal implications on a project which results in positive cost saving	1	2	3	4	5	U
2.8	Good H&S practices allows a saving in terms of social cost	1	2	3	4	5	U
2.9	Adequate H&S investment entails low cost spending on compensating incidents caused by disability and early retirement	1	2	3	4	5	U
2.10	Strict scrutiny of H&S during tender evaluation facilitate adequate pricing of H&S for construction projects	1	2	3	4	5	U
	Impact on time	**1**	**2**	**3**	**4**	**5**	**U**
2.11	Avoiding accidents prevents production disruptions and ultimately prevents extension of time	1	2	3	4	5	U
2.12	Good H&S performance assist in terms of delivering construction projects on time	1	2	3	4	5	U
2.13	Avoiding serious accidents and fatalities prevent suspension of construction work and ultimately project delays	1	2	3	4	5	U
2.14	Avoiding accidents prevent the adoption of overtime to recover lost time	1	2	3	4	5	U
2.15	Good time management avoids production pressure, and this has a positive impact on project H&S						
2.16	Avoiding overtime and long working hours prevents burnout and fatigue in workers and this keeps them healthy and safe						
2.17	Maintaining the project in a good timeframe prevents straining of workers and occurrence of H&S incidents						
	Impact on quality	**1**	**2**	**3**	**4**	**5**	**U**
2.18	Well managed H&S improves the quality of work on construction projects	1	2	3	4	5	U
2.19	Avoiding accidents prevents reworks	1	2	3	4	5	U
2.20	constructability of a project has an impact on H&S	1	2	3	4	5	U
2.21	Design can influence H&S practices	1	2	3	4	5	U
2.22	Price of H&S directly impact the quality of work	1	2	3	4	5	U
2.23	Good practices of H&S is associated with injury-free projects	1	2	3	4	5	U

SECTION C: 3. THE EXTENT TO WHICH HEALTH AND SAFETY CRITERION IS INCORPORATED IN TENDER EVALUATION COMPARED WITH OTHER CRITERIA

3. As a construction practitioner please indicate by means of an X in the appropriate box the importance of health and safety criterion when incorporated in tender evaluation in comparison with other criteria of tender evaluation; where 1 = Unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure. Please mark 1 box in each row.

Item	Elements of tender evaluation versus health and safety criterion	1	2	3	4	5	U
3.1	Projects completion time	1	2	3	4	5	U
3.2	Cost of project completion	1	2	3	4	5	U
3.3	Management capability to plan, organize and control the project	1	2	3	4	5	U
3.4	Experience demonstrated through previous projects	1	2	3	4	5	U
3.5	Financial stability and the ability to execute the project	1	2	3	4	5	U
3.6	Technical capacity of the contractor to execute the project	1	2	3	4	5	U
3.7	The reputation of the contractor	1	2	3	4	5	U
3.8	References for previous work complete	1	2	3	4	5	U
3.9	Past relationship with other entities engaged within construction activities	1	2	3	4	5	U
3.10	Previous records of claims and litigation	1	2	3	4	5	U
3.11	Size of the company	1	2	3	4	5	U
3.12	Availability of technical expertise	1	2	3	4	5	U
3.13	Availability of equipment	1	2	3	4	5	U
3.14	Familiarity with local working culture and regulatory authorities	1	2	3	4	5	U
3.15	Construction method statement	1	2	3	4	5	U
3.16	Qualification and experience of professional technical staffs	1	2	3	4	5	U
3.17	Type of performance bond	1	2	3	4	5	U
3.18	Availability to execute the project	1	2	3	4	5	U
3.19	Location of home office	1	2	3	4	5	U
3.20	Productivity improvement procedures and awareness	1	2	3	4	5	U
3.21	Engineering co-ordination	1	2	3	4	5	U
3.22	The actual quality achieved for similar works	1	2	3	4	5	U
3.23	Environmental protection	1	2	3	4	5	U
3.24	Ethical behaviour and fair dealing.	1	2	3	4	5	U
3.25	Insurance policy	1	2	3	4	5	U

SECTION D: 4. HINDRANCES OF INCORPORATING HEALTH AND SAFETY CRITERION IN TENDER EVALUATION

4. As a construction practitioner, please indicate by means of an X in the appropriate box the extent to which you agree with the following statements relating to hinderance of incorporating H&S in tender evaluation; Where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure. Please mark 1 box in each row

Item	Hindrances of incorporating H&S in tender evaluation	1	2	3	4	5	U
4.1	Corruption and unethical practices hinder effective incorporation of H&S in tender evaluation	1	2	3	4	5	U
4.2	The dominance of price time and quality restrict effective implementation of H&S in tender evaluation	1	2	3	4	5	U
4.3	Poor design of tender documents limits effective incorporation of H&S in tender evaluation	1	2	3	4	5	U
4.4	General limited knowledge of contractors to price H&S adequately	1	2	3	4	5	U
4.5	Competitive tendering without reference to H&S	1	2	3	4	5	U
4.6	Client's H&S specification Confine tenderers to fully explore elements of H&S	1	2	3	4	5	U
4.7	Lack of technical expertise of tender evaluation panel on H&S issues	1	2	3	4	5	U
4.8	Client use of a generic H&S specification that does not meet project demands	1	2	3	4	5	U
4.9	The nature of H&S for being in quantitative and qualitative form (H&S pricing and H&S method statement)	1	2	3	4	5	U
4.10	Lack of client's understanding of the importance of H&S	1	2	3	4	5	U
4.11	Tenderers are not given sufficient time to adequately prepare and respond to the requirements of H&S	1	2	3	4	5	U
4.12	Choice of procurement system have an effect in determining the level of incorporating H&S in tender evaluation	1	2	3	4	5	U
4.13	H&S is expensive to be implemented	1	2	3	4	5	U
4.14	Construction contractors lack H&S knowledge to implement proper H&S measures required	1	2	3	4	5	U
4.15	Insufficient or inconsistent policies, regulations, incentives and commitment by H&S governing bodies	1	2	3	4	5	U
4.16	Safety law and regulations are not adequately enforced; thus, disadvantaging those trying to implement them	1	2	3	4	5	U
4.17	Lack of awareness, understanding, information, commitment, by both the employer and tenderers	1	2	3	4	5	U
4.18	General perception that adequately pricing H&S always leads to a higher tender sum	1	2	3	4	5	U
4.19	Lack of clients commitment and support of H&S	1	2	3	4	5	U
4.20	Lack of expertise in H&S professionals	1	2	3	4	5	U
4.21	Insufficient integration and linkup of latest H&S guidelines and regulations prevailing in the industry	1	2	3	4	5	U
4.22	Safety law and regulations are impractical for construction contractors	1	2	3	4	5	U
4.23	Insufficient or confusing guidance, tools, demonstrations of H&S procedures	1	2	3	4	5	U
4.24	Insufficient research and development	1	2	3	4	5	U

SECTION EF: 5. CLIENTS PERCEPTION REGARDING INCORPORATING HEALTH AND SAFETY IN TENDER EVALUATION

5. As a construction practitioner please indicate by means of an X in the appropriate box the extent to which you agree with the following statements relating to client's perception on incorporating health and safety in tender evaluation; Where 1 = strongly disagree 2 = disagree, 3 = somewhat agree, 4 = agree, 5 = strongly agree, and U = Unsure. Please mark 1 box in each row

Item	Clients' perception of incorporating H&S in tender evaluation	1	2	3	4	5	U
5.1	Clients focus more on time than H&S	1	2	3	4	5	U
5.2	Clients focus more on cost than H&S	1	2	3	4	5	U
5.3	Clients focus more on quality than H&S	1	2	3	4	5	U
5.4	Clients understand H&S differently	1	2	3	4	5	U
5.5	Clients treatment of H&S in tender evaluation is different	1	2	3	4	5	U
5.6	Clients are aware of the benefits of incorporating H&S in tender evaluation	1	2	3	4	5	U
5.7	Clients can positively influence H&S	1	2	3	4	5	U
5.8	Clients can negatively influence H&S	1	2	3	4	5	U
5.9	Client understands the importance of employing an H&S consultant during the project feasibility phase to be part of the project design team	1	2	3	4	5	U
5.10	Client H&S agents can influence H&S during the design stage	1	2	3	4	5	U
5.11	Clients can identify hazards during the project feasibility phase	1	2	3	4	5	U
5.12	Client understands their role in terms of H&S to ensure the safe delivery of projects	1	2	3	4	5	U
5.13	Cooperation of client in H&S issues is vital for safe delivery project	1	2	3	4	5	U
5.14	The level of client involvement in H&S planning is determined by their level of understanding H&S technicalities	1	2	3	4	5	U
5.15	Clients attitude on H&S can influence the behaviour and attitudes of other parties on H&S	1	2	3	4	5	U
5.16	Clients are adequately involved in the choice of project H&S strategies and policies	1	2	3	4	5	U
5.17	Adequate client knowledge of H&S issues on construction projects influences teamwork and collaboration	1	2	3	4	5	U
5.18	Clients tend to select H&S strategies and policies they are familiar with, which might not necessarily be the best	1	2	3	4	5	U
5.19	Expert and experienced clients play a more active role in H&S activities of their projects	1	2	3	4	5	U
5.20	Construction clients understand their roles and responsibilities in terms of H&S and adequately perform them	1	2	3	4	5	U
5.21	The lack of client understanding and ignorance of H&S process contributes to unsafe project delivery	1	2	3	4	5	U
5.22	Client interference is a hindrance to effective H&S implementation to achieve safe project success	1	2	3	4	5	U
5.23	The lack of adequate client involvement in pretender H&S planning leads to poor implementation of H&S across the project lifecycle	1	2	3	4	5	U
5.24	It is fundamentally important for clients to obtain appropriate advice on the choice of H&S strategies and policies to use	1	2	3	4	5	U

SECTION F: 6. ASPECTS OF HEALTH AND SAFETY THAT ARE INCORPORATED IN TENDER EVALUATION AND THEIR RELATIVE IMPORTANCE

6a.) As a construction practitioner please indicate by means of an X in the appropriate box how often the aspects listed below are incorporated in tender evaluation; where 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = often, 5 = always, and U = Unsure. Please mark 1 box in each row.

And

6b.) the level of importance of each aspect of H&S has when evaluating construction tenders; where 1 = Unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure. Please mark 1 box in each row.

		6a.) frequency of incorporation						**6b.)** Level of Importance					
Item	**Aspects of H&S**	**1**	**2**	**3**	**4**	**5**	**U**	**1**	**2**	**3**	**4**	**5**	**U**
6.1	Contractor health and safety plan	1	2	3	4	5	U	1	2	3	4	5	U
6.2	Contractor H&S training	1	2	3	4	5	U	1	2	3	4	5	U
6.3	Contractor H&S management structure	1	2	3	4	5	U	1	2	3	4	5	U
6.4	Contractor risk assessment plan	1	2	3	4	5	U	1	2	3	4	5	U
6.5	Emergency preparedness procedures and response	1	2	3	4	5	U	1	2	3	4	5	U
6.6	Incident recording and investigation	1	2	3	4	5	U	1	2	3	4	5	U
6.7	H&S personnel structure	1	2	3	4	5	U	1	2	3	4	5	U
6.8	Personal protective equipment (PPE)	1	2	3	4	5	U	1	2	3	4	5	U
6.9	Health and safety consultation	1	2	3	4	5	U	1	2	3	4	5	U
6.10	Safe work method statement	1	2	3	4	5	U	1	2	3	4	5	U
6.11	Workplace health and safety inspections plan	1	2	3	4	5	U	1	2	3	4	5	U
6.12	Contractor Injury History	1	2	3	4	5	U	1	2	3	4	5	U
6.13	H&S Signs and signals	1	2	3	4	5	U	1	2	3	4	5	U
6.14	Site security features	1	2	3	4	5	U	1	2	3	4	5	U
6.15	Insurance cost	1	2	3	4	5	U	1	2	3	4	5	U
6.16	Contractor H&S Study	1	2	3	4	5	U	1	2	3	4	5	U
6.17	Contractor remedial response to H&S	1	2	3	4	5	U	1	2	3	4	5	U
6.18	Contractor Health and Safety Coordination	1	2	3	4	5	U	1	2	3	4	5	U
6.19	Contractor Health and Safety Equipment	1	2	3	4	5	U	1	2	3	4	5	U
6.20	Contractor H&S Promotion plan	1	2	3	4	5	U	1	2	3	4	5	U
6.21	Environmental management plan (EMP)	1	2	3	4	5	U	1	2	3	4	5	U
6.22	Waste management plan (WMP)	1	2	3	4	5	U	1	2	3	4	5	U
6.23	Health and safety file	1	2	3	4	5	U	1	2	3	4	5	U
6.24	Fall protection plan	1	2	3	4	5	U	1	2	3	4	5	U
6.25	Demolition plan	1	2	3	4	5	U	1	2	3	4	5	U

Appendix B

Faculty of Engineering and the Built Environment
Department of Construction
Management and Quantity Surveying
P.O. Box 1906, Bellville 7535, South Africa

Date: 19/02/2020

Dear Sir / Madam,

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Please answer each question carefully. The survey takes about 12 minutes to complete. All information obtained from participants will be kept strictly confidential and will be only used for research purposes.

Thanking you in anticipation of your response.

Declaration by participant:

I (Name and Surname) …….. agree to participate in this study and I am aware that no compensation will be provided for participating.

Signature …… Date ……/……/2020

Please complete the survey and return to:

Email: tendainht@gmail.com Mobile: 063 331 5211

Yours faithfully,

Tendai Elvis Nyanhete

QUESTIONNAIRE

SECTION A: 1. PROFILE OF RESPONDENT

Please mark the appropriate box with 'X'.

1.1 Please indicate your gender

☐ Female ☐ Male

1.2 Please indicate your age group

☐ Under 25 years ☐ 41 – 50 years

☐ 25 – 30 years ☐ 51 – 60 years

☐ 31 – 40 years ☐ Over 60 years

1.3 Which sector are you in?

Public sector	Private sector

1.4 What type of client are you?

☐ Sporadic client ☐ Perennial client

☐ Once-off client ☐ Property developer

1.5 On average how many construction projects do you commission yearly

…….....

1.6 How long have you been involved in the construction industry?

☐ Less than 5 years ☐ Over 10 years

☐ 5 – 10 years

SECTION B: 2. CLIENT'S H&S COMMITMENT

2. As a construction client please indicate by means of an X in the appropriate box your level of commitment with regard to the following aspects of H&S on your projects; where 1 = Not committed, 2 = somewhat committed, 3 = committed, 4 = very committed, 5 = extremely committed, and U = Unsure. Please mark 1 box in each row.

Item	Aspects of H&S	1	2	3	4	5	U
2.1	Contractor health and safety plan	1	2	3	4	5	U
2.2	Contractor H&S training	1	2	3	4	5	U
2.3	Contractor H&S management structure	1	2	3	4	5	U
2.4	Contractor risk assessment plan	1	2	3	4	5	U
2.5	Emergency preparedness procedures and response	1	2	3	4	5	U
2.6	Incident recording and investigation	1	2	3	4	5	U
2.7	H&S personnel structure	1	2	3	4	5	U
2.8	Personal protective equipment (PPE)	1	2	3	4	5	U
2.9	Health and safety consultation	1	2	3	4	5	U
2.10	Safe work method statement	1	2	3	4	5	U
2.11	Workplace health and safety inspections plan	1	2	3	4	5	U
2.12	Contractor Injury History	1	2	3	4	5	U
2.13	H&S Signs and signals	1	2	3	4	5	U
2.14	Site security features	1	2	3	4	5	U
2.15	Insurance cost	1	2	3	4	5	U
2.16	Contractor H&S Study	1	2	3	4	5	U
2.17	Contractor remedial response to H&S	1	2	3	4	5	U
2.18	Contractor Health and Safety Coordination	1	2	3	4	5	U
2.19	Contractor Health and Safety Equipment	1	2	3	4	5	U
2.20	Contractor H&S Promotion plan	1	2	3	4	5	U
2.21	Environmental management plan (EMP)	1	2	3	4	5	U
2.22	Waste management plan (WMP)	1	2	3	4	5	U
2.23	Health and safety file	1	2	3	4	5	U
2.24	Fall protection plan	1	2	3	4	5	U
2.25	Demolition plan	1	2	3	4	5	U

SECTION C: 3. H&S PRE-CONSTRUCTION ACTIVITIES

3. As a construction client indicate the extent of your involvement in H&S related activities listed below using the 5-point scale; Where 1= never; 2= seldom; 3=sometimes; 4= often; 5=always, and U=Unsure.

	Pre-construction H&S Activities	1	2	3	4	5	U
3.1	Establishing project brief for incorporating H&S	1	2	3	4	5	
3.2	Selection of H&S consultant	1	2	3	4	5	
3.3	Outlining the duties and responsibilities of the H&S consultant	1	2	3	4	5	
3.4	Providing the health and safety consultant with the necessary information of the project	1	2	3	4	5	
3.5	Health and safety planning for the project	1	2	3	4	5	
3.6	Approval of H&S specification	1	2	3	4	5	
3.7	Establishing a risk assessment of the project.	1	2	3	4	5	
3.8	Preparation and application of H&S requirements	1	2	3	4	5	
3.9	Assessing the impact of the project on H&S	1	2	3	4	5	
3.10	Assessment of the procurement strategy to be engaged in relation to project H&S (e.g. traditional or design and build)	1	2	3	4	5	
3.11	Assessment of the contract to be engaged for the project in relation to H&S (e.g. JBCC, NEC)	1	2	3	4	5	

SECTION D: 4. CLIENTS' PERCEPTION OF INCORPORATING HEALTH AND SAFETY IN TENDER EVALUATION

4. Please indicate by means of an X in the appropriate box the extent of importance of the following statements; Where 1 = unimportant, 2 = somewhat important, 3 = equally important, 4 = very important, 5 = extremely important, and U = Unsure. Please mark 1 box in each row.

Item	Clients' perception of incorporating H&S in tender evaluation	1	2	3	4	5	U
4.1	Clients' understanding of the H&S systems influences their level of involvement on construction projects	1	2	3	4	5	U
4.2	H&S planning is a very important part of a construction project and clients need to be actively involved	1	2	3	4	5	U
4.3	Clients should have the right to choose H&S procedures, processes, and method they want to use	1	2	3	4	5	U
4.4	It is important for construction clients to understand their roles of H&S to ensure the safe delivery of projects	1	2	3	4	5	U

4.5	It is important for clients to obtain appropriate advice on the choice of H&S process, systems, and method to be used for the project	1	2	3	4	5	U
4.6	Clients must retain maximum authority to exercise maximum control of the procurement process	1	2	3	4	5	U
4.7	Client satisfaction is linked to adequate client involvement in their projects	1	2	3	4	5	U
4.8	The level of client involvement in H&S issues is affected by the level of client understanding of technicalities	1	2	3	4	5	U
4.9	Clients have the ability to influence and change the H&S attitudes, behaviors, and procedures of other parties	1	2	3	4	5	U
4.10	Clients are adequately involved in the choice of H&S procedures and planning	1	2	3	4	5	U
4.11	Clients fully understand the risks involved under various procurement methods	1	2	3	4	5	U
4.12	Adequate client knowledge of construction projects influences teamwork and collaboration	1	2	3	4	5	U
4.14	Expert and experienced clients play a more active role in H&S of their projects	1	2	3	4	5	U
4.15	The success of a project is linked to the extent of client involvement and client control in their projects	1	2	3	4	5	U
4.16	Client understanding of the construction process contributes to safe project delivery	1	2	3	4	5	U
4.17	Construction clients understand their roles and responsibilities and adequately perform them	1	2	3	4	5	U
4.18	Clients duties and responsibilities of H&S must not be limited to statutory duties	1	2	3	4	5	U
4.19	Clients must ensure that they appoint a contractor who is well versed with H&S	1	2	3	4	5	U
4.20	Clients allocate adequate resources for H&S	1	2	3	4	5	U
4.21	Client influences H&S of a project in the design stage	1	2	3	4	5	U