# Pre-Qualification of Selecting Construction Project Contractors Using Health and Safety Criteria

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**Abstract:** Contractors, among other construction stakeholders, are vital in achieving the set goals of a project. Adequately engaging a capable contractor is an important task for a client. This study aims at determining the reasons for clients contending with contractors that are not committed to health and safety (H&S). The study was conducted through a literature review, a questionnaire was developed and distributed to 286 construction stakeholders in the Nigerian construction industry. Cronbach alpha was used to test the reliability of the questionnaire used for data collection. Mean scores (MSs) were adopted to determine the major factors that influence clients' selections and factor analysis was used to cluster variables of high inter-correlations. Findings from the survey reveal that H&S is not a clients' goal or a project value hence, H&S is not viewed as a vital pre-qualification criterion for contractor selection. This results in a poor checklist concerning contractors' quality assurance and inadequate verification of contractors' H&S history. Therefore, appointing non-compliant H&S contractors. The findings provide information on the influence clients have respecting H&S as a pre-qualification criterion and towards construction workers' H&S. This will enable construction stakeholders to make the right decision in the pre-qualification of contractors.

**Keywords**: Client, contractor, health and safety, influence, pre-qualification.

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## 1. Introduction

Adequately engaging a capable contractor to achieve a successful construction project is a major task for a client. Contractors, among other construction stakeholders, are vital in achieving the set goals for a project. These goals include working within the contract budgets, time, cost, desired quality, and health and safety (H&S). Thus, to achieve the desired goals Mshelbwala (2005) opine that construction stakeholders such as the contractor must undergo a process to determine their technical and managerial skills. According to Okorie et al. (2014), pre-qualification is an effective means of identifying the right contractor who satisfies the requirements set by the client in an effective and efficient manner. This determines the contractor's ability to bid for the project. Selecting a contractor for a construction project is a vital decision to make by a client since this decision determines the

outcome of the project. Russell and Skibniewski (1990) state that project goals such as H&S, cost, duration, desired quality, and risk reduction could be achieved. In the same vein, Okorie et al. (2014) explain that the process enables the client to assess the contractor's H&S management system, past H&S records, H&S training, insurance records, and employees' competencies.

Based on the information provided by these studies, workers' H&S practices could be improved by including H&S as a pre-qualification criterion. However, Musonda et al. (2009) opine that clients do not perceive H&S as important or address H&S in contract documentation and implementation. This suggests that clients focus mainly on cost and time objectives of construction projects. However, an increasing number of accidents on construction sites has led to a corresponding change in the costs of workers' compensation and litigation to clients (Huang and Hinze,

2006). Recent studies reveal that clients' requirements set the tone for a positive H&S influence to achieve the objective of zero fatalities (Huang and Hinze, 2006; Wu et al., 2016). Clients, as owners of a project, may finance the project and may end up being the users (Huang and Hinze, 2006). Therefore, clients have a compelling influence to ensure that all project stakeholders' comply with 'best' H&S practices. Besides, Smallwood (1998) describes clients' responsibilities to include H&S-based pre-qualification criteria; providing financial resources for H&S; scheduling H&S in the bidding process; including H&S contract documentation; and conducting periodic H&S audits. Therefore, clients' decision in selecting a contractor for a construction project influences the outcome of the project. Over the years contractor pre-qualification is based on subjective decisions and it involves uncertainties (Lam et al., 2001; Mohammed et al., 2017; Acheamfour et al., 2019). Acheamfour et al. (2019) further opine that contractors' pre-qualification models that considered clients' objectives only focused on cost, time, and quality as criteria for selection. Furthermore, associating the lowest bidder to a satisfactory project outcome is not the best practice. Insights on various pre-qualification criteria can have positive impacts on projects. Studies such as Nkata et al. (2017) reveal that contractor's past performance is the most significant criterion for contractors' selection and clients' selection of contractors that is influenced by the contractors' resources. In addition, Liu et al. (2018) identified fifty–two pre-qualification survey based on leading indicators of workers' best H&S performance. The study revealed that H&S management system elements such as hazard prevention were absent from contractors pre-qualification surveys. From the foregoing, it is important to investigate the reasons for projects experience accidents, delays, and stoppages while clients contend with non-compliant H&S contractors. This will enable stakeholders to appreciate the role clients play in implementing construction site H&S hence, making informed decisions when selecting contractors. The current study addresses the following research question what are the factors influencing clients' decisions in selecting contractors' using H&S as criteria.

## 2. Clients' H&S Influence on Pre-Qualification and Contractors' Appointment

Clients are individuals, corporate bodies, or government agencies that seek the services of others to execute construction projects to meet their needs (Okorie, 2014). The client may be a group or an individual, which may include other stakeholders. Therefore, clients have an influence on projects.

Wu et al. (2016) opine that the pre-qualification of contractors contributes to workers' H&S behaviour. The lack of conducting an H&S pre-qualification of contractors before the contractor's bid for the work will result in awarding contracts to contractors who are not competent. This results in accidents, fatalities, and injuries on construction sites.

Construction contracts are governed by legislation and regulations. These regulations provide a platform governed by ethical behaviour to achieve best practices in the procurement process. Procurement is a process of documentation for awarding contracts. The aim is to obtain qualified contractors who are suitable and experienced based on their performance and reputation for delivering the required service (Aje, 2012). The contract documents include drawings, specifications, and priced Bill of Quantities (BoQ). The contract is awarded to the successful contractor after a bid has been completed through a due process. For instance, Aje (2012) believes that the pre-qualification of contractors does not consider the impact of H&S. Therefore, contractors are reluctant to invest in H&S because of a misconception that H&S increases the project cost (Choudhry et al., 2016). The study reveals the notable influence contractors' pre-qualification has on construction duration and quality. However, Huang and Hinze (2006) assert that an effective contractors' pre-qualification process could aid an adequate construction of H&S implementation.

In Nigeria, the Public Procurement Act of 2007 governs sets the standards and develops the legal requirements for procuring and awarding contracts to contractors. It guarantees ethical behaviors such as transparency, value for money, fair competitiveness, and professionalism in the public procurement process. However, Elegbe (2014) observes that the Nigerian procurement process is faced with several challenges such as the lack of transparency, political influence, corruption, and unethical practices, which interfere with the outcome of the procurement process. He further mentions that the Act is not at par with international standards and lacks such policies that can address ethical issues. Furthermore, there is no mention of H&S as a pre-qualification criterion for contractors. This may be linked to unethical behaviour, poor project performance, and poor H&S practices of contractors (Okorie et al., 2014). The Procurement Act does not include H&S as a pre-qualification criterion; therefore, this could be responsible for non-consideration for H&S during the preparation of project estimates or at the pre-qualification phase of the procurement process.

When a client has taken the initiative to begin a project, considerations for workers' H&S should be paramount. As mentioned earlier, clients determine the H&S standards on site. According to Okorier et al. (2014), clients' H&S commitment influences the award of the contract and the appointment of a competent contractor, which is highly important for effective H&S management. Although some studies have been conducted on construction contractors' safety and health on construction sites, the factors influencing clients' decisions in selecting contractors that are H&S compliant at the pre-qualification stage remains unclear. Thus, the study seeks to investigate the factors influencing clients' decisions in selecting contractors at the pre-qualification stage using H&S as criteria.

## 3. Research Methods

The quantitative approach was employed in the study. The questionnaire survey was adopted to identify the reason for engaging contractors that are non-compliant with H&S. It was both self-administered and sent electronically. The questions emanated from surveys of related literature. A questionnaire covering the letter was drafted, which accompanied the copies of the questionnaire. In this, the aim of the research was briefly explained, and the respondents were ensured that the responses would be regarded as confidential. The five-point Likert scale was incorporated to examine how strongly the respondents agree or disagree with the statements provided on the Likert scale on the following scales: 1=minor extent, 2=near minor extent, 3=some extent, 4=near major extent, 5=major extent, then U = unsure, and DN= does not. The unsure scale placed the responses at the midpoint,

depicting that the response was neither certain as positive or uncertain as negative, therefore it was assumed as neutral (see appendix 1 for the questionnaire used in the study). The study sought to investigate the factors influencing clients' decisions in selecting contractors at the pre-qualification stage, by using H&S as criteria to determine the reasons for clients contending with contractors that were not committed to H&S.

The data was obtained by distributing questionnaires to construction professionals currently working in Nigeria. The sample consisted of 286 construction stakeholders; they include architects, builders, clients, construction project managers, engineers, and quantity surveyors within the Nigerian construction industry. The developed questionnaire was pre-tested and piloted with experienced construction professionals. Descriptive and inferential statistical analyses were conducted. Cronbach alpha was employed to test the reliability of the questionnaire used for data collection. The reliability coefficient for the instrument relating to the study was determined to be 0.74. This infers consistency in the instrument used. The Likert scale of 1 (minor extent) to 5 (major extent) was used to examine significant reasons for appointing non-compliant H&S contractors. Mean scores (MSs) for the data ranked to identify the significant reasons (see Table 1). Table 1 shows the influence of clients contributing to appointing contractors that are not H&S compliant.

The results of the analysis from part 1 of the questionnaire revealed that 38% of the respondents had masters' degrees, 27% Bachelor of Technology degrees, 21% Bachelor of Science degrees, 7% Diplomas, and 6% Ph.D. degrees. Male gender dominated by 79% and females were 21%. The respondents had a mean age of 41 and a mean of 10 years of work experience, which implies the respondents are mature and sufficiently experienced to respond to the questionnaire.

## 4. Analysis and Discussion of Findings

Table 1 presents the respondents' perceptions of the influence clients have in contributing to appointing non-compliant contractors to H&S. MSs were used to rank the 6 factors. It is notable that all the factors had mean scores > 3.40 and ≤ 4.20, this shows that the variables are moderately influenced to a near major influence with respect to engaging contractors that are not compliant with H&S practices on construction sites. Therefore, workers are exposed to unhealthy and unsafe work conditions.

Project cost, time and specified quality are given higher considerations when compared with H&S. Cost of project, specified quality, and project duration are afforded higher status than H&S, H&S is not a client criteria, not including H&S as a selection criterion for contractors' prequalification and H&S is not a project value, ranked first, second, third and fourth with MSs 3.84, 3.80, 3.73 and 3.63 respectively. In addition, inadequate verification of contractors' H&S history and inadequate verification of contractors' quality assurance ranked fifth and sixth with MSs 3.60 and 3.55 respectively. It is notable that all the factors were above the midpoint of 3.00, which implies that all the factors have a significant influence in contributing to appointing contractors who are not committed to H&S.

The following factors, namely cost, quality, and time, which had the most significant influence was afforded higher status than H&S. When the primary concern of the client is to have the project within budget, quality, and time, H&S is viewed as less important. The impact of not considering H&S as important leads to poor H&S management on construction sites. This has further ripple effects in delaying the completion of the projects owing to accidents that may lead to work stoppages, time overruns, and cost overruns.

### 4.1. Factor analysis

This method of analysis clusters variables of high inter-correlations (Ho, 2014). According to Ho (2014), the interpretation of variables based on the factor loading should range between 0.3-0.4. The results of Barlett's test of Sphericity and Kaiser Meyer Olkin (KMO) indicates that the samples are adequate for factor analysis (see Table 3). This study adopted a factor loading of 0.4 in the SPSS version 21 software. Two factors with eigenvalues greater than 1 were extracted through the principal component analysis accounting for a total variance of 64.75% (see Table 2). The factor matrix after rotation is shown in Table 3.

**Table 1.** The influence of clients contributing to appointing contractors that are not H&S compliant

| Factor / Issue | Unsure | Does not | Response (%) | | | | | MS | Rank |
|---|---|---|---|---|---|---|---|---|---|
| | | | Minor............................Major | | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | | |
| Cost of project, specified quality, and project duration are afforded higher status than H&S | 3.1 | 2.8 | 7.3 | 7.7 | 13.6 | 29.4 | 36.0 | 3.84 | 1 |
| H&S is not a client goal | 3.5 | 2.1 | 7.7 | 6.3 | 17.1 | 29.7 | 33.6 | 3.80 | 2 |
| Not including H&S as a selection criterion for contractors' prequalification | 4.2 | 1.7 | 10.1 | 16.1 | 17.5 | 29.7 | 22.7 | 3.73 | 3 |
| H&S is not a project value | 5.2 | 2.4 | 5.6 | 12.2 | 16.4 | 35.0 | 23.1 | 3.63 | 4 |
| Inadequate verification of contractors' quality assurance | 1.7 | 1.7 | 5.2 | 14.7 | 16.8 | 36.4 | 23.4 | 3.60 | 5 |
| Inadequate verification of contractors' H&S history | 4.9 | 2.1 | 8.7 | 12.2 | 16.8 | 30.1 | 25.2 | 3.55 | 6 |

**Table 2.** Total variance explained for extracted factors.

| Factor | Total | % of variance | Cumulative % |
|--------|-------|---------------|--------------|
| 1 | 2.652 | 44.205 | 44.205 |
| 2 | 1.233 | 20.542 | 64.747 |

Table 2 shows the total variance explained for extracted factors 1 and 2. The results suggest two factors (factor 1 and factor 2) with a total percentage variance of 44.205 and 20.542, respectively. Factor 1 consists of three factors, namely, (1) H&S is not a client goal, (2) H&S is not a client goal, and (3) cost of the project, specified quality, and project duration are afforded higher status with respect to H&S. All the factors have an MS above 3.00 and are ranked between first and fifth. Factor 2 consists of two factors: inadequate verification of contractors' quality assurance and inadequate verification of contractors' H&S history. The variables ranked between fifth and sixth with MSs above three.

**Table 3.** Factor analysis for appointing contractors that are not committed to construction H&S

| Factor / Issue | 1 | 2 |
|----------------|---|---|
| H&S is not a client goal | 0.738 | |
| H&S is not a project value | 0.779 | |
| Cost of the project, specified quality, and project duration are afforded higher status with respect to H&S | 0.679 | |
| Inadequate verification of contractors' quality assurance | | 0.534 |
| Inadequate verification of contractors' H&S history | | 1.046 |
| % of variance | 44.205 | 20.542 |

The two-clusters of variables are explained in Table 3. Three of the variables belong to factor 1 and two variables belong to factor 2. Factor 1 and factor 2 are named clients' poor understanding of construction H&S and poor H&S checklist respectively.

Factor 1: clients' poor understanding of H&S which consists of H&S is not a client goal, H&S is not projected significant, and cost of the project, specified quality, and project duration are afforded higher status than H&S.

Factor 2: poor H&S checklist which consists of inadequate verification of contractors' quality assurance and inadequate verification of contractors' H&S history.

**Factor 1: clients' poor understanding of H&S**

This factor consists of three variables, namely 'H&S is not a client goal,' 'H&S is not a project value,' and 'project cost, specified quality, and project duration are afforded higher status than H&S'. The three variables relate to how clients perceive the importance of H&S. This factor accounts for 44.21% of the total variance (see Table 2) that signifies its importance among other variables. 'H&S is not a clients' goal' has a high factor loading of 0.738. This implies that clients not having H&S as a goal will result in appointing contractors that are not H&S compliant. The variable, 'H&S is not a project value', has a high loading of 0.779 that also influences clients' attitudes towards H&S. This may be attributed to the belief that H&S imposes an additional cost on the project (Oney-Yazici and Dulaimi, 2015). In the same vein, Bahn (2005) explains that most H&S regulations in different countries place sole responsibility of site H&S on contractors. Hence, clients do not perceive any form of obligation to workers H&S during construction activities. This will enable the clients' team to engage contractors that are competent. Hence, workers will work in a safe work environment and adopt a safe work practice. In addition, contractors will ensure adequate H&S planning and implementation of construction H&S management systems.

Furthermore, affording a higher status to cost, quality, and time than H&S reflects negatively on workers' H&S (Zahoor et al., 2016). Ikpe et al. (2011) suggest cost benefits for compliance with H&S outweighs the cost of accidents by a ratio of approximately 3:1 (62% benefit gain to 38% benefit loss). The result also showed that job pressures, in particular, those imposed by budgetary constraints, adversely affect H&S performance. Clients focus more on profit maximisation and do not realise the effect that H&S may have on project deliverables until it is too late (Yilmaz and Celebi, 2015).

To eliminate this factor, the need for the government and professional bodies to create H&S awareness that will highlight the benefits such as cost to the overall success of a project. Also, developing and implementing policies that include clients as key players in addressing H&S will eliminate unhealthy and unsafe work practices.

**Factor 2: poor H&S checklist for contractors' pre-qualification**

Factor 2 consists of two statements such as inadequate verification of contractors' quality assurance and inadequate verification of contractors' H&S history. The factor has a variance of 20.542% (Table 2). The 'inadequate verification of contractors' H&S history' variable has the highest factor loading of 1.046. This reveals the importance of this variable in the pre-qualification of contractors. Verifying contractors' H&S history is an important step in engaging the right contractor. Studies such as Kirkcaldy et al. (1997) linked job stress to accident rates and poor work quality. Reluctance from clients to verify contractors' quality assurance and H&S history, as pre-qualification criteria result in contractors that are compliant with H&S practices during construction activities. According to Wachter et al. (2014), workers' behaviour, attitude, and training can be influenced positively when stakeholders such as clients are committed to H&S. Therefore, contractors are selected based on their quality performance and H&S history. This will promote competition among contractors to comply with H&S standards in terms of adequate H&S documentation, keeping records, and maintaining positive H&S acts during construction activities (Huang and Hinze, 2006).

**5. Conclusion**

A broad description of clients' H&S role in the construction process in Nigeria is explained. The research set out determining factors that influence workers' H&S practices in Nigerian construction. The findings reveal that 'project cost, specified quality, and project duration are afforded higher status than H&S' as indicated by the responded as the highest-ranked influence on workers'

H&S practice on construction sites. The second-ranked influence is 'H&S is not a client goal while 'inadequate verification of contractors' H&S history' ranked lowest. The result of factor analysis demonstrates the interrelationship amongst the six variables explored. The variables were categorised into two factors. The factors include clients' poor understanding of H&S; and poor H&S checklist for contractors' pre-qualification.

The results of the study indicate that the foremost of the factors relate to clients' poor understanding of construction H&S. It also provides insight on how H&S as a pre-qualification criterion contributes to project success. Clients' adequate understanding of H&S with respect to workers on construction sites will address variables such as H&S, not a client goal; H&S is not a project value; and cost, quality, and time being afforded higher status than H&S. The client, having informed knowledge and understanding of the advantages of H&S to wellbeing while at work, will enable considerations in improving the verification process of contractors' quality assurance and contractors' H&S history. This will foster H&S commitment from contractors and other construction stakeholders.

The results from the study conclude that clients' poor H&S understanding in the Nigerian construction industry lead to appointing contractors that are not committed to H&S on construction sites. These findings enhance our understanding of the significant factors that influence workers' H&S practice during construction activities on site. Also, the study results are expected to contribute information relevant to clients' engagement in construction projects. Hence, implementing adequate H&S funding at the planning phase and adequate monitoring to ensure contractors' compliance with project H&S plan. The most important limitation lies in the fact that studies which are based on questionnaire surveys are affected by low response rate and respondents being bias, therefore caution should be taken in making implications from the findings to a general population. However, the findings from the research can be effectively applied in other countries with comparable construction industry features. Further research is required for ethical decision making in Nigeria to improve construction H&S practices. The benefits of implementing ethical decisions, to encourage construction stakeholders to adopt H&S practices may be explored.

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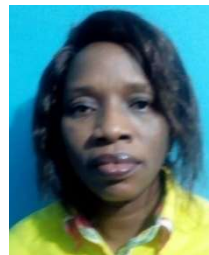
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## Appendix 1

The questionnaire survey was adopted to identify the reason for engaging contractors that are non-compliant with H&S. It was both self-administered and sent electronically. The questions emanated from surveys of related literature. A questionnaire covering letter was drafted, which accompanied the copies of the questionnaire. In this, the aim of the research was briefly explained, and the respondents were ensured that the responses would be regarded as confidential. The five-point Likert scale was incorporated to examine how strongly the respondents agree or disagree with the statements provided on the Likert scale on the following scales: 1 (Minor extent) to 5 (Major extent), (U = Unsure DN= Does not): (1) Minor extent, (2) Near minor extent, (3) Some extent, (4) Near major extent, and (5) Major extent. The unsure scale places the responses at the midpoint, depicting that the response is neither certain (positive) or uncertain (negative), therefore it is assumed as neutral (See appendix 1 for the questionnaire used in the study). The study seeks to investigate the factors influencing clients' decisions in selecting contractors at the pre-qualification stage using H&S as a criterion with the aim of determining the reasons for clients contending with contractors that are not committed to health and safety.

## SURVEY QUESTIONNAIRE

Please tick ( √ ) in a cell to indicate your response.

## PART 1: GENERAL INFORMATION

1. Please indicate your stakeholder group:

| Architect | | Engineer | |
|---|---|---|---|
| Construction manager | | Quantity surveyor | |
| Client | | Project manager | |
| Contractor | | Other (specify) | |

2. Please record your age:

_____ Years _____ Months

3. Please record your gender:

| Female | Male |
|--------|------|
|        |      |

4. Please record the length of time you have worked in construction.

_____ Years _____ Months

5. Please record the length of time your firm has been operating.

_____ Years _____ Months

6. Please record the Naira amount of your firm's average annual turnover.

Amount _____

**PART 2: CLIENTS' HEALTH AND SAFETY COMMITMENT**

On a scale of **1 (minor)** to **5 (major)**, to what extent do the following factors contribute to appointing contractors that are not committed to H&S? **(Please note the 'unsure' (U) and 'does not' (DN) options)**

| | Factor / Issue | U | DN | Minor……. Major | | | | |
|---|----------------|---|----|---|---|---|---|---|
| | | | | **1** | **2** | **3** | **4** | **5** |
| 3.1 | H&S is not a client goal | U | DN | 1 | 2 | 3 | 4 | 5 |
| 3.2 | H&S is not a project value | U | DN | 1 | 2 | 3 | 4 | 5 |
| 3.3 | Cost, quality, and time are afforded higher status than H&S | U | DN | 1 | 2 | 3 | 4 | 5 |
| 3.4 | Inadequate verification of contractors' quality assurance | U | DN | 1 | 2 | 3 | 4 | 5 |
| 3.5 | Inadequate verification of contractors' H&S history | U | DN | 1 | 2 | 3 | 4 | 5 |
| 3.6 | Not including H&S as a selection criterion for contractors' | U | DN | 1 | 2 | 3 | 4 | 5 |