



# Multi-criteria Evaluation for Award of Construction Projects in Bangladesh

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## **Multi-criteria Evaluation for Award of Construction Projects in Bangladesh**

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### **Abstract**

The construction sector in Bangladesh serves as a catalyst for attracting domestic and foreign investment, facilitating infrastructure development, and enhancing the overall quality of life for its citizens. Despite its significant contributions to the economy, the construction industry faces challenges such as regulatory hurdles, environmental concerns, and issues related to safety and quality standards. The best way to reduce uncertainties and maximize the chances of project success is the tender stage in construction projects where project owners evaluate and choose the most suitable contractor for the job. Contrary to Traditional Low Bid (TLB) based solely on cost, multi-criteria procurement considers a broader range of criteria beyond just price when selecting contractors for construction projects. Under this approach, contractors are evaluated based on their qualifications, technical expertise, past performance, proposed methodologies, and overall value proposition. While cost remains an important factor, it is balanced with considerations of quality, innovation, sustainability, contractor's past performances and risk management. Therefore, this study aimed at finding the most relevant criteria for selection of best contractor at project award stage. Through a thorough literature review, a total of 10 most relevant criteria were retrieved which consist of a further 29 sub-criteria. A structured questionnaire was distributed to experienced professionals in the construction industry to determine the effect of each sub-criteria on project success on a Likert scale of 1 to 5. Calculations were performed on responses retrieved and data was analyzed using Weighted Average (WA), and Comparative Importance Index (CII). Results show that Project Control, Quality, and Compliance of Regulations and Standards are most significant evaluation criteria. Furthermore, all 29 sub-criteria were rearranged in descending order of severity and were classified into three categories namely Most Critical, Moderately Significant and Least Important sub-criteria with 11, 10 and 8 sub-criteria respectively.

### **Keywords/tags**

Project Award, Multi-criteria Evaluation, Construction Project, Contractor Selection, Best Value Selection.

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## Abbreviations

TLB	Traditional Low Bid
MCE	Multi-criteria Evaluation
MCI	Mean Comparative Evaluation
CII	Comparative Importance Index
WAM	Weighted Average Methode

# 1 Introduction

The construction industry is an important sector of the country's economy in Bangladesh. It is a vital source of the country's Gross Domestic Product (GDP). Approximately, construction comprises 7 to 8 percent of the nation's GDP and remains one of the leading sources of national economic growth. Given the fast pace of urbanization and infrastructural growth in the nation, the demand for complex building projects is increasing. It, in turn, allows for boosting investments and creating jobs across numerous domains. The building of residential apartments and commercial buildings, networks of transportation, and plants will remain vital sources of the Bangladesh construction industry and the whole country's progress.

Additionally, the construction sector in Bangladesh is instrumental in boosting domestic and foreign investments, enhancing crucial infrastructure development, and improving the overall quality of life among the residents of the country. Given the government's commitment to the development of the sector through the development of new roads, power plants, bridges, ports, and other infrastructure projects, there are high prospects for further growth and innovation. The sector's contribution to GDP not only demonstrates its economic importance but also shows how critical the sector is in enhancing people's quality of life through the provision of housing, transport, and other essential amenities. Besides, employment opportunities that emanate from the rapidly expanding industry are instrumental in boosting income generation and reducing poverty. Despite the enormous benefits that arise from the sector's development, it is prone to several challenges. For instance, there are conflicts associated with regulations, poor adherence to safety and quality standards, and challenges related to the environment. To address these challenges and enhance long-term growth, it is incumbent upon the government, industry players, and policymakers to create a conducive environment that supports growth and promotes sustainability. Although policy formulation at the government level may be time-consuming, project stakeholders, especially the clients, can support the successful and timely realization of the intended project goals.

The tender stage in construction projects is the best way to reduce uncertainties and maximize the chances of project success. The careful selection of contractors is vital for the project's success. The tender stage is the main stage where project owners can choose and evaluate the most suitable contractor for the job. The traditional low-bid procurement for construction projects is where the contractors are evaluated by their bid price, namely, the lowest bidder gets the job. Low-bid

procurement is simple, and it seems that it is cost-effective. Selecting low bids can lead to various issues such as compromised quality, project delays, and disputes. Contractors make low bids for projects, manage to secure the work, and then proceed to cut corners on materials, work, and project management to keep costs low. These cut corners may end up with poor-quality project results, more change orders, and increased overall costs in the long run. It also downplays a contractor's experience, the quality of work done, and the contractor's ability to provide value-added services.

However, multi-criteria procurement, or best value procurement, means that other qualities in addition to price should be taken into account when awarding construction contracts. Under this approach, criteria include qualifications, technical expertise, performance in past projects, methods proposed for this job, and how it all adds up. While price still matters, the balance of checking both quality and adequacy is also essential. This approach in procurement contracts aims to maximize the overall benefits of a project. It means that such projects are more likely to meet stakeholder expectations and public policy goals. The basic question is how to choose the best contractors. The result of this multi-criteria approach is improved project performance, together with overall public and stakeholder satisfaction, that will bring real benefits for decades ahead.

## **2 Research Design**

### **2.1 Research Problem**

It is high costs and slow progress in performance that cause construction projects to go over budget or schedule. Over time, the quality of work deteriorates, leading to the wastage of client funds. The unsatisfactory situation is a consequence of a lack of planning and an inadequate preliminary examination of bidders before the project award, which is normally based on the traditional low bid. In fact, lessons learned from past experiences demand that the decision process be carefully evaluated, with factors other than the lowest bid taken into account in the evaluation of contractors, such as expertise, performance over time, and the number of key personnel. Therefore, this study will explore what elements must be considered before project award and the weightage that should be given to each of them in the evaluation of tenders.



## 2.2 Research Objectives

Most construction projects are experiencing cost overruns and delays, leading to reduced quality. This issue stems from inadequate planning and evaluation of bidders prior to awarding the project. To address these problems, it's essential to implement a thorough evaluation process. This process should not focus solely on the lowest bid but should also consider multiple factors such as the contractors' expertise, past performance, and the number of key personnel. Therefore, this study aims to seek the answers to the following research questions:

1. For a successful project delivery in the construction sector of Bangladesh, what are the relevant elements to consider at the project award phase?
2. How much important is each one of the elements identified above, in comparison to other elements, and which factors should be prioritized in decision-making?

## 2.3 Limitations of the Scope

This study was carried out in Bangladesh and primarily focuses on the Bangladeshi construction industry. However, the literature review shows a close resemblance with adjacent countries in the region such as India, Pakistan, Myanmar, Bhutan, and Nepal. Therefore, the literature review was carried out for these countries in particular and for all other markets in general to obtain a bigger picture of the situation. Likewise, the findings of the study could also be applied to similar construction markets mentioned above.

## 2.4 Research Environment

The construction industry in Bangladesh must urgently adopt multi-criteria evaluation (MCE) practices due to various existing challenges. Currently, this industry relies on traditional low-bid procurement methods. Often projects turn out suboptimal in outcome, which means time and cost overruns and disputes—almost always due to contractors putting in as low a bid as possible, trading off excellence for the cheapest price.

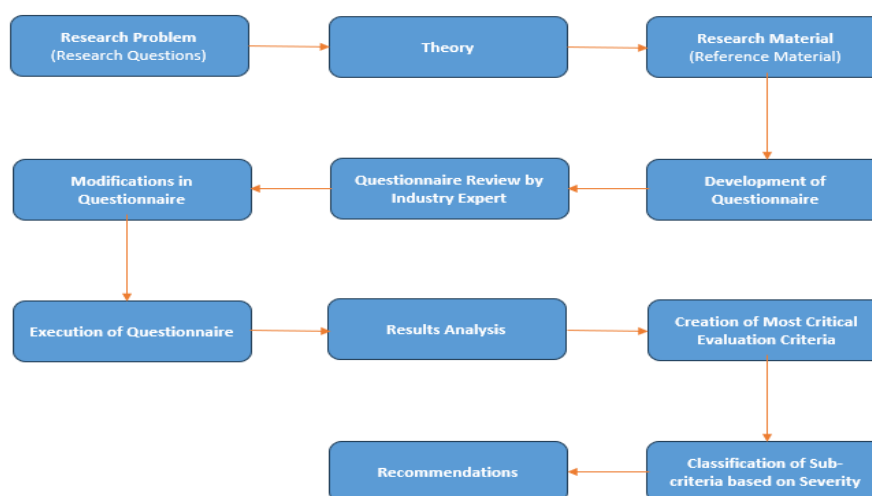
Moreover, a lack of transparency in the procurement process can breed corruption and inefficiency problems, which in turn lead to a lack of public trust in these fields. With Bangladesh's increasing investment in infrastructure construction, there is growing recognition for procurement methods such as not only emphasizing price but, more importantly, quality and innovation for future sustainability. There are also other factors such as resource constraints, skilled labor shortages, and critical lack of infrastructure in Bangladeshi construction, which underscore the importance of adopting MCE practices. Consequently, public and private sector organizations' limited technical capacity and resources can limit the efficient delivery of projects or hinder innovative solutions to them.

Again, the absence of standardized processes, best practices, and performance metrics makes it hard to evaluate, let alone compare, the worth of various contractors; this in turn adds to inefficiency and weakens chances for improvement.

Bangladesh can meet these challenges effectively by taking adopting comprehensive MCE principles and methodologies, thus breaking new ground for turning construction performance and stakeholder satisfaction into success stories.

## 2.5 Research Methodology

The systematic approach for this study consists of six phases which have been illustrated in below figure 1.



**Figure 1** Research Process

## **2.6 Sources of Information**

Most of the information and literature for this research was retrieved from open sources available across the internet. Among others, Google Scholar was utilized to review previous studies on the subject by various researchers. Theseus was also used to review theses published by fellow students to understand the research process and chronological order. Furthermore, the study has used any piece of relevant information available on the internet.

## **3 Literature Review**

### **3.1 Concept of Multi-criteria Evaluation**

Multi-criteria evaluation in construction project procurement refers to an approach that prioritizes the overall value delivered by a contractor or supplier rather than simply focusing on the lowest cost. It emphasizes the importance of considering factors such as quality, performance, innovation, and long-term outcomes when selecting contractors or suppliers for construction projects. In essence, this procurement aims to maximize the value proposition for the project owner by selecting the contractor or supplier who offers the best combination of quality, price, and performance.

In most cases, the lowest bidder gets the job. But this way of buying things takes into account both tangible and intangible factors that affect the project's success. This method takes into account the fact that picking contractors or suppliers based only on price can lead to poor work, hidden costs, and project delays. Multi-criteria procurement, on the other hand, looks for the contractor or supplier who can offer the most value overall by taking into account things like dependability, expertise, knowledge, and the ability to meet the project's goals both cheaply and successfully.

The new idea of evaluating based on more than one factor has made contractors more competitive, as they all want to make their work better than their competitors. The quality of each contractor could be different. In this case, the customer would rather have the best project at the set price. This helps to meet users' needs and make the experience more enjoyable. While a project may not be able to meet all quality standards, it may still be priced fairly. So, it makes sense to think about costs and time when making choices (Herbsman et al., 1995).

Multi-criteria evaluation, or MCE, tries to get the most out of a business deal by putting together the right contracts. With MCE, the customer can pick a proposal that isn't the cheapest but has more benefits, which helps them decide if the extra cost is worth it (Zhang, 2004). Depending on the type of contract, price or something else may be more important. When there aren't many risks and clear needs, price is the most important factor. But when there are unclear standards, high labour costs, or big risks in contracts, other factors become more important (Mickaliger, 2001).

The goal of multi-criteria evaluation (MCE) is to put up the best contracts for a business deal. People who use MCE can pick a proposal that might not be the cheapest but has more benefits if the extra cost is worth it (Zhang, 2006). Depending on the type of contract, price or something else could come first. When there aren't many risks and clear needs, price is the most important factor. Still, other things are more important in contracts with unclear standards, high labour costs, or big risks (Mickaliger, 2001).

### **3.1.1 Advantages**

Multi-criteria evaluation (MCE) promotes better project outcomes by fostering competition, encouraging innovation, and ensuring that the selected contractor is best equipped to deliver a successful project. Benefits include those listed below:

- i. Price alone is not as important in judging proposals as overall quality and value. Contractors are encouraged by this to focus on offering excellent materials and workmanship.
- ii. It is encouraged of contractors to offer original ideas that could raise efficiency, lower costs, or enhance sustainability and so add value to the project.
- iii. Multi-criteria assessment allows for a more comprehensive assessment of the risks associated to a project. Contractors can recommend ways to lower these risks, which could lead to a more smooth project completion process and maybe avoid costly delays or disputes.
- iv. Contractors are motivated to demonstrate their ability to meet project objectives on time and within budget as well as their prior success in finishing projects.

- v. Considering factors other than only initial cost, multi-criteria evaluation promotes the choice of contractors who can provide long-term value through their expertise, dependability, and commitment to client satisfaction.
- vi. Using multi-criteria evaluation makes decision-making easier by providing freedom to select the best contractor for a certain project while considering the particular needs and conditions of that project.

### 3.1.2 Challenges

The use of MCE for building project awarding has numerous advantages as well as disadvantages. High levels of stakeholder involvement, transparent evaluation criteria, open procurement procedures, and the fair application of best value selection in construction project awards are all necessary. Here is a list of some of the more challenging tasks.

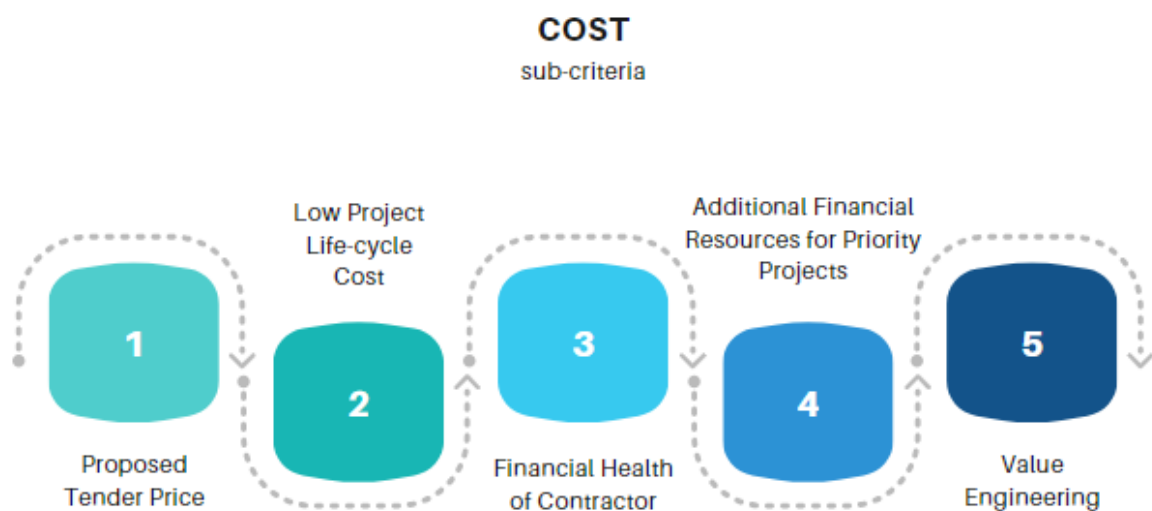
- ❖ When evaluation criteria other than price are applied to proposals, the process becomes subjective. If different evaluators have different interpretations of the qualitative criteria, decisions cannot be made consistently.
- ❖ Comparing proposal evaluation with alternative criteria to traditional low-bid selection methods entails additional steps and takes more time. As a result, additional administrative labour and resources might be needed.
- ❖ Prejudice or favouritism may be directed towards specific contractors, especially if the evaluation criteria are opaque or closed. This could lessen the perception of unfairness in the selection process.
- ❖ If MCE focuses more emphasis on criteria other than price, smaller or less experienced contractors might be less inclined to submit a bid. This could change the dynamics of the market by lowering the number of bidders and decreasing competition.
- ❖ It can be challenging to measure innovation, quality, and past performance while maintaining objectivity. Assessors may find it challenging to fairly compare and assess proposals as a result.
- ❖ If contractors believe they were unfairly singled out or subjected to discrimination during the selection process, they have the right to sue MCE. Transparency, justice, and adherence to procurement laws are necessary to reduce legal risks.

- ❖ Even though it should ultimately offer you more value, the best value option occasionally costs more up front than the lowest offer. If the client is under strict financial constraints, this could be a problem.

## 4 Evaluation Criteria a Project Wise

### 4.1 Project Cost

Cost is still one of the most important MCE criteria, and in traditional low-bid systems, it is the only factor used to decide who gets the project.



**Figure 2** Cost Related Sub-criteria

#### 4.1.1 Proposed Tender Price

When hiring a contractor for a project, one of the main things they look at is the suggested tender price. This is how much money the contractor thinks they will need to finish the job. Clients usually choose the lowest bid prices as long as they meet the project requirements and fit within their budget. The suggested tender price gives clients an idea of how much the whole project will cost, taking into account things like labour, materials, equipment, and general running costs.

Researchers have talked a lot about how important the suggested tender price is when choosing which building projects to award. Studies done in the last 20 years (Jones, 2012) show that clients choose a contractor based on the lowest bid price. It is very important to know that the proposed

tender price should not be the only thing that is thought about. To make sure the project is finished successfully, clients also look at the contractor's technical skills, experience, and past work. The studies that have already been mentioned show how important it is to find a good balance between cost and the overall quality and value that the contractor offers.

#### **4.1.2 Low Project Life-cycle Cost**

Project life-cycle costing examines all costs that emerge during the project in addition to the initial construction costs. When selecting which construction projects to award, several researchers have emphasized the require for low project life-cycle costs. They underlined that concentrating only on the initial construction expenses could result in increased expenses later on (Smith, 2010). The clients want to work with contractors who can provide affordable options for upkeep, running, and eventually closing down or demolishing the building.

Clients are aware of the fact that choosing inexpensive solutions throughout a project can result in significant long-term savings. Generally speaking, contractors will recommend materials or designs that are long-lasting, resource-efficient, and easy to maintain. This strategy ensures that not just at the beginning of the project, the client's money will be worthwhile. Low project life-cycle costs enable clients to make wise choices that will maximize their investments and save them money over time.

#### **4.1.3 Financial Health of Contractor**

Checking the contractor's skills and financial stability is important to make sure they can finish the job. (Jones, 2013) stressed how important it is to take contractors' finances into account when giving out building projects. People want to know that the contractor they hire has the money and resources to finish the job on time and without any problems or delays.

Clients usually look at a contractor's credit history, ability to bond, and financial statements to get an idea of how financially stable they are. They look at things like cash flow, profitability, liquidity, and solvency to see if the contractor can keep their end of the deal. A contractor is more likely to finish a job on time, under budget, and to the required quality standards if they are in good financial

shape. In order to lower the chance of project delays or failures, clients put a lot of weight on choosing contractors who are financially stable and reliable.

#### **4.1.4 Additional Financial Resources for Priority Projects**

Giving priority projects more funding when building projects are awarded is crucial to achieving significant objectives or meeting pressing needs. This entails allocating additional funds or budgetary space to projects deemed essential or significant (Smith, 2012). Clients may prioritize certain projects based on factors such as government requirements, community needs, economic impact, or strategic importance.

Contractors may choose to allocate more funds to priority projects in order to expedite completion, enhance quality, or circumvent issues such as insufficient funding. These resources consist of extra cash, grants, targeted funding initiatives, and collaborating with external organizations, among other things. Contractors who allocate additional funds to projects that are given top priority demonstrate their dedication to achieving objectives and satisfying stakeholders' needs. Under this approach, significant projects will undoubtedly receive the funding they require to be successful, which is beneficial to the project overall.

#### **4.1.5 Value Engineering**

Value engineering is a crucial component in ensuring that projects generate the highest return on investment. Value engineering is a process that thoroughly analyzes all aspects of a project to identify opportunities for reducing costs without compromising project goals, output, or quality. This method (Chan et al., 2008) is the most effective way to achieve optimal balance between performance, quality, and cost. It optimizes customers' financial investments by maximizing profits and reducing unnecessary expenses.

During the value engineering process, interdisciplinary teams consisting of engineers, architects, contractors, and other stakeholders meticulously evaluate project designs, materials, processes, and specifications. Generating novel ideas and alternative solutions enables them to expedite and enhance the achievement of the project's objectives. Value engineering often entails challenging assumptions, exploring novel concepts, and compiling a list of options that will yield the greatest

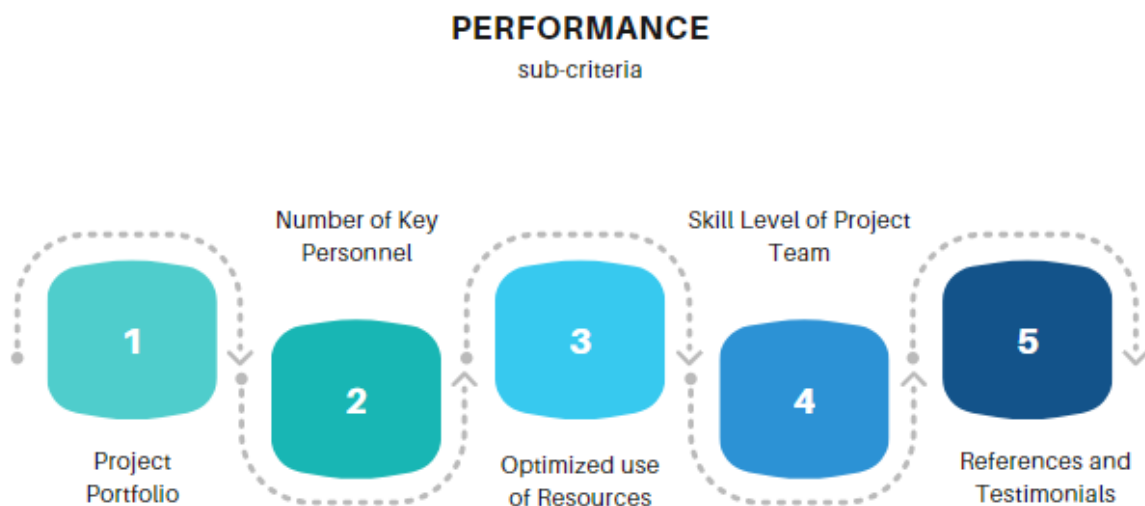


cost savings. Value engineering employs diverse perspectives and specialized knowledge throughout the project lifecycle to identify opportunities for improvement and enhanced productivity.

Value engineering has the ability to significantly reduce project costs without compromising on quality or functionality. Enhanced procedures, minimizing waste, and incorporating state-of-the-art materials and technology can all contribute to achieving project objectives while staying within budget constraints. Value engineering promotes creativity and continuous improvement of construction techniques, leading to the adoption of best practices and advancements in the industry. Value engineering assists clients by fulfilling their requirements and delivering projects that exceed their expectations in terms of value and performance.

## 4.2 Performance

Performance has a direct effect on how well and how happy everyone involved in a project is (Smith, 2009). Performance means that the contractor can finish the job as needed, on time, on budget, and to the quality standards that were set. People who hire contractors want to work with those who have finished projects successfully in the past and met or surpassed performance standards.



**Figure 3** Performance Related Sub-criteria

### **4.2.1 Project Portfolio**

Among the first things considered when awarding construction projects is the contractor's prior work. The contractor's prior work is fully described in the project portfolio (Smith, 2005; Jones, 1995), together with the kinds of projects they completed, their difficulty, and their quality. To determine if a contractor is qualified for the position they are applying for, many times they peruse their project portfolio.

Clients can determine how successfully a contractor fulfilled project specifications, adhered to timetables, and stayed within budget by reviewing their portfolio of completed projects. Contractors demonstrate their versatility and ability to address a wide range of construction issues with a wide range of finished projects. Furthermore, demonstrating to the client that the selected contractor possesses the necessary equipment and expertise to finish the jobs, a strong project portfolio increases client confidence. As such, the project portfolio is a helpful instrument that clients can use to assist them in selecting which building projects to award.

### **4.2.2 Number of Key Personnel**

People like project managers, engineers, architects, and other experts are often called "key personnel" because of how important they are to a project's planning, execution, and management. Clients often think about the number and quality of key employees to gauge the contractor's ability to manage and organize the project.

To finish construction projects on time and according to plans, you need a sufficient number of highly qualified key personnel. Contractors with enough seasoned professionals on staff to handle the project's demands are the ones that consumers seek out. The contractors' ability to assemble strong teams of key personnel shows that they care about the project's success and can manage all of its components.

### **4.2.3 Optimized use of Resources**

Construction project awards should give resource optimization top priority, claims Smith (2006). Furthermore covered in Jones (1998) were techniques for optimizing resource use in project

allocation in the building sector. Using their resources wisely is essential for the contractor. The objectives of resource optimization are to lower waste and boost output by using machinery, people, and materials as efficiently as possible. Clients prefer contractors that show effective resource optimization because of the benefits on project quality, timeliness, and cost-effectiveness.

Contractors that manage their resources well can complete jobs on schedule, within budget, and without compromising quality. Contractors with methods to reduce resource waste, streamline processes, and boost output are sought for by clients. Contractors can increase output, cut costs, and raise the general performance of the project by optimizing the resources at their disposal.

#### **4.2.4 Skill Level of Project Team**

Success or failure on a construction project is directly proportional to the level of expertise of the contractor's project team. When you assemble a championship-caliber sports team, you want nothing less than the best from every member. Hiring top talent is the same way. Professionals in the fields of engineering, architecture, and project management bring a wealth of knowledge and expertise to any endeavor. When contractors consistently demonstrate high levels of skill and competence within their project teams, clients choose them. The timeliness, quality, and success of a construction project are all affected by the team's level of training. Faster work, better results, and less setbacks are all possible when contractors have teams of competent workers. Companies that invest in their employees' future success by supporting various training and education programs are highly regarded by their clients.

#### **4.2.5 References and Testimonials**

Smith (2008) advises clients to check references and testimonials of possible contractors in order to determine their dependability and reliability. The most often used kinds of references are those from partners or former clients who attest to the contractor's dependability and output. Clients that are happy with a service provider leave testimonials that emphasize their positive experiences. Testimonials and references contain crucial details about the contractor's dependability, track record, and capacity to finish projects. Clients frequently use them to confirm the contractor's claims and assess if they are qualified for the work. When consumers find good references and

testimonials, they can relax knowing they chose a contractor wisely. If there are no recommendations or if they see negative recommendations, customers could be dubious.

### 4.3 Quality

In projects, quality factors are crucial since they determine how long the project lasts and how well it functions. Making sure quality is ensured when deciding who pays for construction projects (Brown, 2009). Quality encompasses elements such as the materials used, the labor done, the degree of completion, the satisfaction of the specifications, and the adherence to the norms and regulations. Consumers like contractors that seem committed to providing excellent workmanship in terms of usefulness, durability, and aesthetics. This guarantees that the finished product either satisfies or surpasses their expectations.



**Figure 4** *Quality Related Sub-criteria*

#### 4.3.1 Quality Control Processes

The many activities that make up these processes—planning, organizing, coordinating, and supervising resources, for example—allow projects to accomplish their goals within the given time, budget, and quality constraints. Customers choose contractors who exhibit these skills because excellent project management guarantees that projects are finished on schedule, within budget, and to expected quality standards.

According to (Johnson 2008), good project management techniques reduce the possibility of negative events and enable smooth communication and collaboration among stakeholders.

Reducing the possibility of interruptions and delays, good project management practices enable contractors to effectively distribute resources, closely monitor progress, and quickly handle problems as they arise. The possibility that their building projects will be successfully finished rises when contractors demonstrate their project management expertise to customers. The choice of contractors is therefore greatly influenced by project management practices.

Methods for effective project management help to reduce risks, foresee difficulties, and promote communication and cooperation among project members. Contractors who have put project management procedures in place to better manage resources, track progress, and handle problems as they come up reduce delays and disruptions. To see their building projects through to a successful conclusion, clients rely on contractors that show they understand project management. Selection of construction contractors is therefore greatly influenced by project management practices.

#### **4.3.2 Certifications and Accreditations**

A contractor's certifications and accreditations serve as evidence of their commitment to maintaining all applicable laws, industry standards, and best practices (Johnson, 2009). Certifications and accreditations show clients that contractors have gone through rigorous compliance, evaluation, and training procedures. A certification from an ISO, LEED, or trade association shows that a contractor is skilled and capable of finishing projects to the highest standards. Clients look to these credentials as indicators of a contractor's skill and dependability when selecting one for a building project.

#### **4.3.3 Meeting Design Requirements**

Ensuring that the completed product satisfies the needs and expectations of the client is dependent on fulfilling design requirements when awarding construction projects (Clark, 2007; Anderson, 2005). The goals, characteristics, and operation of the project are spelled out in thorough plans, specifications, and standards that provide the design requirements.

Just as crucial to contractors meeting design requirements is precisely understanding and interpreting the project specifications as it is to strictly adhering to the provided parameters. This covers, among other things, building with the appropriate techniques, using the correct materials, and exactly following engineering and architectural plans. Following the design guidelines is crucial to ensuring that the project satisfies the functional requirements, aesthetic tastes, and safety requirements of the

client. Choosing a building project should mostly consider meeting design criteria. Given priority are contractors who have demonstrated their ability to adhere to design specifications. Clients are reassured by this that their project will be completed with the highest attention to detail.

#### **4.4 Project Control**

Project control is yet another important consideration when allocating construction projects since it ensures that the work goes without a hitch and stays within the allocated budgets and schedules. Project control is often emphasized by industry experts when construction projects are awarded (Smith, 2007). Resources, schedule, budget, and quality standards of a project are all under the supervision and management of project control. Clients appreciate strong project control skills since they demonstrate that a contractor can get beyond challenges and finish jobs on time. The following three criteria apply.

##### **4.4.1 Project Management Capabilities**

The project management capabilities include the contractor's ability to plan, organize, coordinate, and oversee various aspects of the project. Clients prioritize contractors with strong project management capabilities, as they ensure the smooth execution of the project from start to finish. Industry experts have consistently emphasized the significance of project management capabilities in construction project awards (Johnson, 2009).

Contractors with robust project management capabilities can efficiently allocate resources, manage risks, and resolve issues that may arise during the construction process. This includes coordinating subcontractors, overseeing work progress, and maintaining clear communication with stakeholders. Clients rely on contractors who demonstrate proficiency in project management to deliver successful project outcomes.

##### **4.4.2 Actual Schedule Achieved for Similar Projects**

A contractor's ability to complete projects of a similar nature plays a significant role in securing construction jobs. Demonstration of the contractor's ability to complete projects within budget and on schedule is possible. Subject matter experts in the field frequently emphasize how crucial good performance is to a contractor's ability to complete similar projects on schedule (Smith, 2007). In

the industry, contractors who have completed comparable projects on schedule are regarded as experts because of their project planning, coordinating, and execution skills. Clients can utilize this type of data to gauge a contractor's ability to effectively manage resources, lower risk, and solve issues that arise throughout a project. By prioritizing contractors who have successfully finished similar projects on schedule in the past, clients can reduce project delays and ensure that projects are delivered on time.

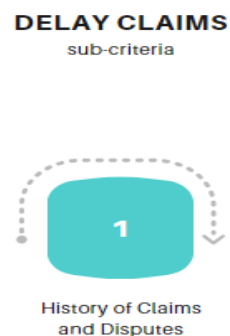
#### 4.4.3 Resource Availability

Resources include, among others, money, labor, materials, and equipment. Any of these resources not being easily accessible increases the possibility of overbudgeting, under-completing, or delaying building projects. Materials shortages, for example, can stop building, and a lack of qualified workers can cause things to move very slowly. Enough resources also guarantee effective project management, which enables jobs to be finished on schedule and within budget.

As per construction management research, a project's success is mostly dependent on its resource availability (Feng, 2018). It takes meticulous planning and distribution of those resources to prevent running out of them or missing a deadline. With an ongoing supply of resources, construction teams may increase output, reduce downtime, and get satisfactory results.

#### 4.5 Delay Claims

By examining past disputes, project owners can assess a contractor's performance, identify potential risks, and negotiate contractual terms that protect their interests. Proactive management



**Figure 5** *Delay Claims Related Sub-criteria*

of disputes contributes to smoother project execution, better stakeholder relationships, and ultimately, successful project outcomes.

#### **4.5.1 History of Claims and Disputes**

This is a great way to assess the contractor's efficiency and dependability. In order to assess a contractor's ability to handle problems and disputes, project owners often review the contractor's dispute history. Concerns regarding a contractor's ability to oversee a project and fulfill contractual duties may arise from their history of repeated claims (Abbas et al., 2019). By carefully considering this aspect of the selection process, project owners can lessen the chance that unresolved conflicts will result in delays.

To manage project risks, one must be aware of the contractor's history of disputes and claims. Historical disputes may reveal behavioral patterns that pose a threat to the current project. For example, if a contractor persistently challenges safety concerns, it could endanger both the project's progress and the safety of the workers. Project managers can ensure a smoother execution process and proactively reduce risks by being aware of these trends (Mok et al., 2018). Stakeholders in the project can anticipate future problems and negotiate contract terms that address them beforehand by analyzing past conflicts.

Stakeholder satisfaction and project outcomes may also be impacted by the contractor's past disputes and claims. Argumentative projects often experience increased costs, strained relationships, and setbacks. If a contractor fails to finish a project on time and within budget, stakeholders may lose faith in them, which could harm their reputation and their ability to get new business. To mitigate these negative consequences and promote project success, project owners should carefully consider a contractor's dispute resolution record (Abbas et al., 2019).

#### **4.6 Current Workload**

The projects at hand of a contractor are also crucial to predict their ability to deliver quality work within specified timelines.



## CURRENT WORKLOAD

sub-criteria



Number and Sizes  
of Projects at hand

**Figure 6** *Current Overload Related Sub-criteria*

### 4.6.1 Number and Sizes of Projects at hand

Contractors that specialize in heavy lifting may struggle to give each job the time and attention it needs, leading to delays and subpar results. Contractors can only handle so many jobs at once, and that number is directly proportional to the complexity and size of each one. Contractors may experience a decline in productivity, according to research, as a result of the time and energy required to oversee multiple large-scale projects (Hanna & Newman, 1990).

Additionally, the available resources and the project timeline can be impacted by a contractor's workload. Overworked contractors may struggle to respond fast to client requests and project deadlines. Therefore, there is a chance of project delays, cost overruns, and unhappy clients. When choosing candidates, these project owners often consider the contractor's workload. Contractors are less likely to fail or experience schedule delays if they are able to devote sufficient time and energy to each project, as suggested by Love et al. (1998).

If contractors have a track record of taking on overly ambitious projects, owners and clients may see them as risky and not hire them again (Elsass & McNeil, 2000). Finding a happy medium between workload and capacity is essential for contractors who wish to ensure projects are completed successfully. By reviewing a contractor's workload and portfolio of finished projects, project owners can make informed decisions, encourage successful project outcomes, and reduce risks.

## 4.7 Risk Management and Safety

Part of this complex characteristic is a thorough approach to recognizing, evaluating, reducing, and tracking risks particular to construction-related activities. In the building business, there are many hazards that could endanger the health of the workers, project schedules, financial resources, and public opinion. Among the several types of risks are those related to the job and financial uncertainty. As such, preventative risk management plans and safety precautions are necessary to ensure project results, reduce interruptions, and ensure worker safety. Every phase of project planning, execution, and completion can be used by construction industry stakeholders to proactively reduce risks and advance a resilient and safe culture.



**Figure 7** Risk Management and Safety Related Sub-criteria

### 4.7.1 Safety Record

A contractor's safety record matters a great deal for both worker safety and overall project success. Prominent safety records show that contractors are dedicated to creating a safe workplace, which lowers the possibility of mishaps, injuries, and fatalities at work. Research results show that construction companies who put safety first are more likely to get good safety outcomes and on-schedule project completion (Fernández-Muñiz et al., 2007). Contractors who put safety first not only protect their staff but also experience less downtime, stay out of expensive legal hot water, and advance in the business. As such, project owners frequently choose contractors who have a track record of putting reasonable safety protocols into place and encouraging a safety culture on the job site.

### **4.7.2 Insurance Coverage**

If there is an accident or injury on the job, workers' compensation insurance shields companies and their staff from financial loss. Knowing that contractors carrying full insurance can manage any unforeseen liabilities or risks that may come up during construction gives everyone working on the project peace of mind. Having enough insurance shields project owners from lawsuits and other types of financial loss in addition to shielding workers from financial hardship in the case of an accident (Stone, 1991). Though accidents and injuries are common hazards in the construction sector, insurance offers a safety net. It reduces the effect of unforeseen events and facilitates the progress of projects.

### **4.7.3 Contingency Planning**

Regarding building projects, managing unanticipated obstacles and reducing risks require having a backup plan in place. Effective backup plans help contractors foresee possible setbacks including bad weather, material shortages, or labor strikes, and to take preventative steps to reduce the impact on project schedules and costs. Effective contingency planning, claim Hwang and Ng (2003), enhances both project performance and resilience. Contractors can improve project outcomes, win over clients, and keep the project moving forward even in the face of adversity by anticipating possible issues. Contractors that show readiness and vision by creating thorough backup plans are therefore highly valued.

## **4.8 Sustainability and Environmental Considerations**

A paradigm shift has occurred in the construction industry in recent years toward incorporating sustainability and environmental considerations into all stages of a project's lifecycle. With growing awareness of climate change, resource depletion, and environmental degradation, stakeholders in the building industry are realizing the importance of sustainable practices to reduce environmental impact and ensure long-term viability. Sustainability and environmental concerns in building encompass a wide range of issues, including but not limited to: lowering carbon emissions, protecting natural resources, increasing energy efficiency, encouraging the use of environmentally friendly materials, and reducing environmental hazards. Consequently, sustainability principles are now integral to contemporary building practices, demonstrating concern for the environment and

the hope of creating a built environment that can withstand the test of time. The figure below shows the sub-criteria for this category.

#### 4.8.1 Green Building Credentials



**Figure 8** *Sustainability and Environment Related Sub-criteria*

Credentials for green building show how committed a contractor is to environmental friendliness and sustainability. Certificates in green building, such as LEED (Leadership in Energy and Environmental Design), show that a contractor is skilled at using environmentally friendly materials and technologies and building sustainably (Kibert et al., 2005). Importantly for project owners and stakeholders, these credentials demonstrate the contractor's ability to work on green, resource-efficient, and health-conscious projects. Green building certified contractors are highly sought for sustainability-focused building projects that want to meet government regulations and earn green building certifications.

#### 4.8.2 Environmental Compliance

Another critical component of environmental compliance in building projects is making sure contractors follow all applicable environmental laws and regulations throughout the project. Following environmental laws and regulations is necessary to keep the negative effects of pollution, habitat loss, and resource loss to a minimum (Stevens & Hite, 1997). To protect the environment from harm, contractors need to take steps to halt erosion, properly dispose of waste, and maintain

natural areas. If a contractor violates environmental regulations, they risk penalties, legal trouble, project delays, and reputational damage. The majority of project managers want to make sure that their works are safe for the environment.

#### **4.8.3 Energy Efficiency**

If contractors want to reduce operating costs, energy consumption, and the environmental impact of building projects, they must prioritize energy efficiency. According to (Hao et al. 2008), contractors can improve building performance while consuming less energy by utilizing energy-efficient design concepts, materials, and technologies. Studies reveal that energy-efficient buildings not only help the environment but also yield financial benefits for owners and managers due to reduced energy bills, increased occupant comfort and productivity, and reduced energy consumption (Lippiatt, 2006). By prioritizing energy efficiency, contractors can satisfy regulatory requirements, demonstrate their dedication to sustainability, and satisfy client requests for green building practices.

### **4.9 Compliance with Regulations and Standards**

In construction, adherence to all applicable rules and regulations is highly prized. All of these are taken care of by adhering to the regulations set out by various government bodies, regulatory organizations, and trade groups. The construction industry relies on these regulations and standards, which outline quality assurance processes, environmental protection measures, safety protocols, and building codes. The public's well-being, the environment's integrity, and the built environment's structural integrity depend on compliance with these regulations, which is both legally and ethically imperative. Three sub-criteria follow:

## COMPLIANCE WITH REGULATIONS AND STANDARDS

sub-criteria



**Figure 9** Regulatory Compliance Related Sub-criteria

### 4.9.1 Regulatory Compliance

The contractor makes sure that all part of their work conforms with the standards set by regulatory bodies by following all applicable laws, codes, and regulations. To stay out of trouble legally, keep projects on schedule, and protect their reputations, contractors have to follow a plethora of rules related to safety, environmental preservation, zoning, and building codes. The success of the project can be seriously harmed by breaking the rules, which can include heavy fines, missed work, and bad publicity, according to Arditi et al. (1999). As much as feasible, contractors should focus on following the rules. This proves their dedication to maintaining morality, guaranteeing public safety, following the law, and living up to community expectations.

Following the rules also helps to guarantee that building projects last and stay steady. For example, provided building projects follow environmental laws, they cannot damage ecosystems, water supplies, or air quality. Following zoning laws is one way contractors show their support for sensible land use and city development planning. Infractions of rules could result in financial losses, postponed projects, and legal issues. Every one of these elements might hurt the project's success. Contractors must thus be aware that rules are always changing and should proactively include compliance measures into their work processes and project schedules. Following the rules not only keeps the contractor out of legal hot water but also improves their standing and competitiveness in the building industry by proving their corporate accountability and attention for doing things correctly.

### **4.9.2 Quality Standards**

It is determined by adherence to quality standards how long, how well, and how safe the products are. Contractors must adhere to industry best practices as well as quality standards established by organizations such as ASTM, ACI, ANSI, and others if they are to satisfy their clients and complete projects on schedule. Maintaining quality standards will increase project performance, please clients, and save money on warranty and rework (Fulford and Standing, 1996). Contractors who closely monitor the building process and implement robust quality management systems can reduce the likelihood of errors, malfunctions, and client complaints. These systems facilitate the early identification and resolution of issues. Reputation of the contractor and the long-term profitability of the company depend on upholding quality standards.

Long-lasting building projects benefit the client and the contractor equally because of the commitment to quality standards. Well-built structures are ones that are robust, safe, and require little maintenance over their lives. Contractors gain market advantage and increased credibility when they routinely complete projects that either meet or exceed quality standards. Regarding building projects, adhering to quality standards reduces the likelihood of errors, delays, and conflicts (Harris et al., 2006).

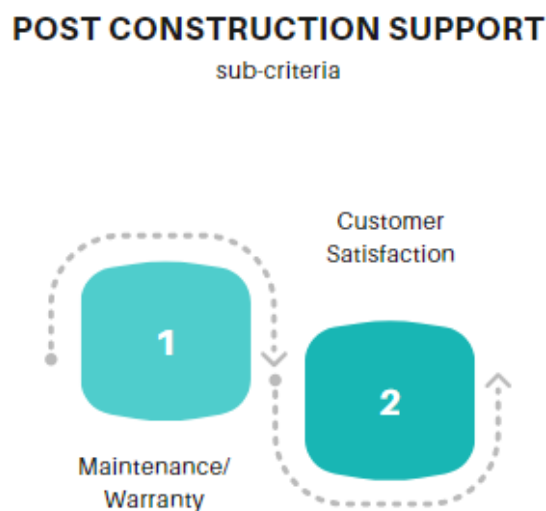
### **4.9.3 Ethical Standards**

Contractors must adhere to moral principles in order to maintain transparency, honesty, and trustworthiness throughout a construction project. It is imperative that contractors maintain high ethical standards when interacting with clients, suppliers, subcontractors, and other stakeholders. If they uphold moral standards, contractors can run their businesses with honesty, fairness, and integrity. They strengthen their network and raise their profile in the industry in this way. An ethical builder will honor all agreements, be fair to workers, and be transparent about any conflicts of interest. Contractors who uphold moral standards earn their clients' respect and confidence, which in turn leads to increased business and word-of-mouth recommendations. According to Harris et al. (2006), being ethical promotes responsibility, ethics, and professionalism throughout the whole project. The long-term viability and success of construction projects depend on this. Reputations and safety are two additional benefits that morally upright contractors enjoy. You can lose clients, get in trouble with the law, and delay projects if you engage in unethical behavior like

bribery or fraud. By encouraging candor and personal accountability among workers, ethical contractors improve working conditions. Independent contractors can uphold moral standards by, among other things, being transparent about their financial situation, employing individuals from diverse backgrounds, and establishing clear policies regarding conflicts of interest. Contractors that prioritize honesty and integrity in their work are more likely to succeed in attracting top talent, strengthening relationships with clients, and completing projects successfully. Contractors who care about their long-term success would do well to uphold moral standards since it is good business and the moral thing to do.

#### 4.10 Post Construction Support

This means providing support, maintenance, and follow-up services once the building is finished and the client has taken possession of it. Helping clients after a project ends includes warranty services, maintenance plans, end-user training, and problem-solving and answer-the-question help. To satisfy clients, guarantee the built environment is long-lasting and functional, and preserve the industry's respect and standing in the community, professionals in the construction industry put in endless hours. There are two sub-criteria:



**Figure 10** *Post-Construction Support Related Sub-criteria*

##### 4.10.1 Maintenance/ Warranty

Maintenance and warranty provided by the contractor are essential components of construction projects, ensuring the long-term performance, functionality, and durability of built structures.



Contractors who offer maintenance and warranty services demonstrate their commitment to customer satisfaction and stand behind the quality of their workmanship. For example, a contractor may provide a warranty covering defects in materials or workmanship for a specified period after project completion, giving clients peace of mind and protection against unexpected expenses. Research by Culpin and Davey (1991) suggests that offering comprehensive warranties enhances the contractor's reputation and competitiveness in the market, as it reassures clients of the contractor's reliability and accountability. By fulfilling warranty obligations and promptly addressing maintenance issues, contractors uphold their contractual commitments and contribute to the overall success and longevity of construction projects.

In addition, maintenance and warranty services provided by contractors contribute to cost savings and asset preservation for project owners over the project lifecycle. For instance, routine maintenance tasks such as inspections, repairs, and servicing help identify and address potential issues before they escalate into costly problems. By proactively maintaining built assets, contractors extend their service life, reduce the need for major repairs or replacements, and minimize downtime and disruptions. Additionally, honoring warranty obligations enables project owners to seek recourse for any defects or deficiencies that may arise post-construction without incurring additional expenses. This ensures that the project owner's investment is protected and that the built environment continues to meet its intended purpose effectively. Therefore, maintenance and warranty services provided by contractors play a critical role in ensuring the sustainability, functionality, and value of construction projects over time, benefiting both the project owner and end-users.

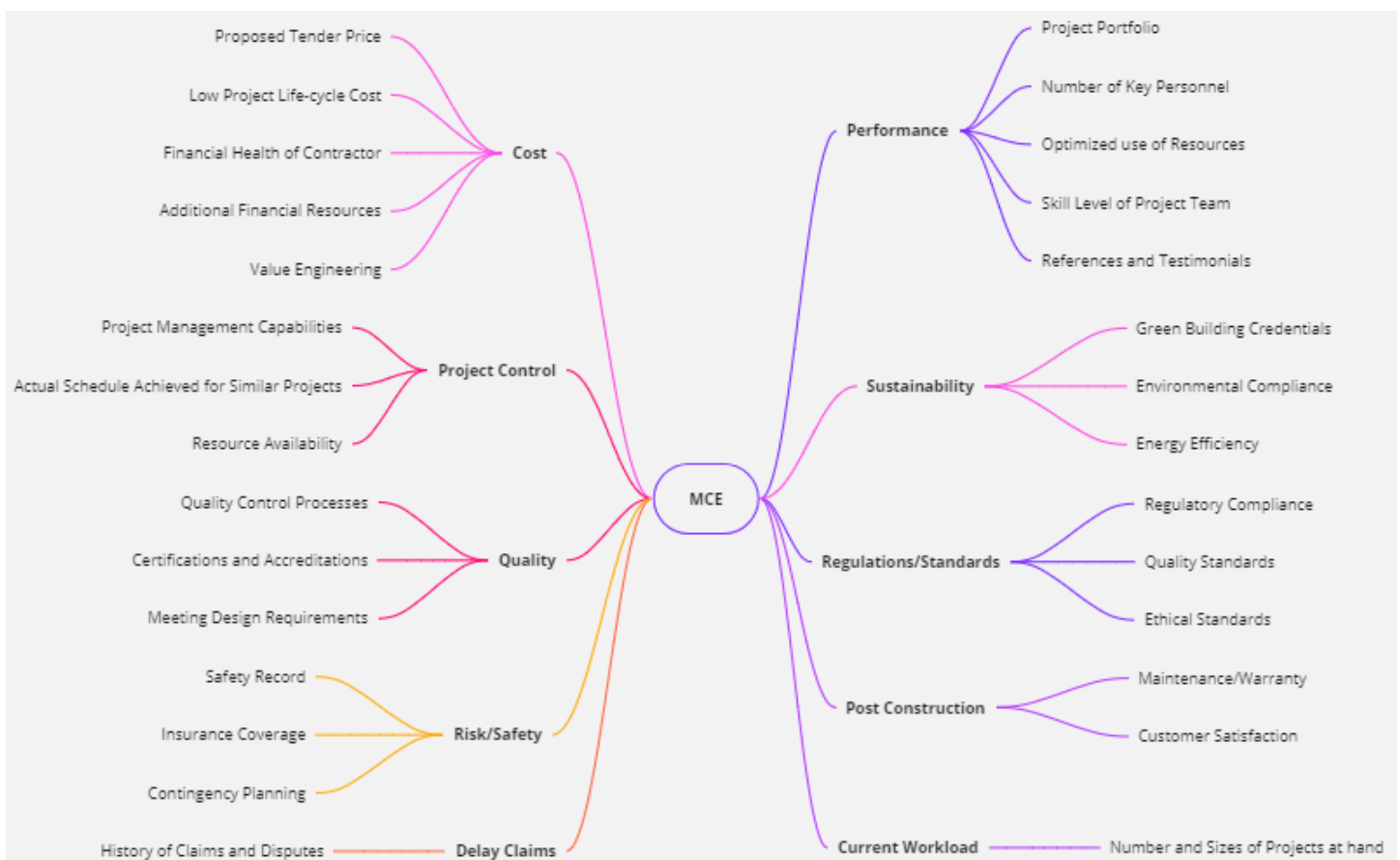
#### **4.10.2 Customer Satisfaction**

Customer satisfaction influences the success, reputation, and long-term viability of contractors and projects. Satisfied customers are more likely to provide positive feedback, refer the contractor to others, and engage in repeat business, thereby enhancing the contractor's market competitiveness and profitability. Research by Love et al. (1998) emphasizes that customer satisfaction is a key determinant of project success, as it reflects the extent to which the contractor meets or exceeds the client's expectations in terms of quality, timeliness, and budget adherence. A satisfied customer who is pleased with the craftsmanship and professionalism of a contractor may recommend their

services to friends and family, leading to new business opportunities through word-of-mouth referrals.

Also, customer satisfaction in construction projects is essential for building positive relationships and fostering collaboration between contractors and clients. Satisfied clients are more likely to engage in open communication, provide constructive feedback, and resolve issues amicably, leading to smoother project delivery and fewer disputes. A commercial client who is satisfied with the level of communication and responsiveness of a contractor may be more willing to engage in future projects and negotiate favorable contract terms. Additionally, satisfied clients are more likely to provide valuable testimonials and endorsements, enhancing the contractor's credibility and attracting new business opportunities. Therefore, contractors must prioritize customer satisfaction throughout the project lifecycle by delivering high-quality work, maintaining transparency, and proactively addressing client concerns and preferences.

All the criteria and sub-criteria discussed above have been illustrated in figure below:



**Figure 11** An Overview of all Evaluation Criteria and Sub-criteria

## 5 Implementation of Study

This chapter covers the sampling technique, data collection approach, format of the questionnaire and its execution.

### 5.1 Sampling

The term "population" refers to the complete group of people or objects that researchers want to analyze. It may be all of the residents in a city, all of the students at a school, or all the products of a certain type. Sampling, on the other hand, is the process of picking a smaller group of people or objects from a population to represent it in a research study. This smaller group is known as the sample.

There are several types of sampling. Random Sampling where everyone in the population has an equal chance of being picked. Stratified Sampling where the group is divided into smaller groups, and then some objects from each group are picked. Systematic Sampling where individuals or objects are picked after certain intervals from a list. Convenience Sampling where researchers choose individuals who are conveniently available or easily accessible and this sampling technique was selected for this study. Advantages of Convenience Sampling include:

- ❖ Quick and easy to implement.
- ❖ Does not need a lot of time or resources.
- ❖ Handy when it is hard to reach everyone in the group.
- ❖ Can give some useful information even if it is not perfect.
- ❖ Lets the researcher be flexible in where and how he gathers data.
- ❖ Can be a good start for further research.

### 5.2 Data Collection

There are two main methods for data collection in a research process. Qualitative approach and Quantitative approach.

Qualitative research focuses on acquiring information that is difficult to quantify, such as people's thoughts or feelings. This might include things like interviews or observations. One disadvantage of qualitative approaches is that the data is more difficult to examine because it is not as clear as numbers. Furthermore, because the sample size is often small, generalizations may be more difficult to establish.

On the other hand, quantitative approach focuses on gathering data that can be measured and evaluated numerically. This might involve surveys or experiments in which we count or measure items. One advantage of quantitative approaches is that they provide accurate and reliable data that is easier to compare and interpret. Furthermore, data can be collected from a bigger number of people, which help to generalize the findings more easily.

Each method has its strengths and weaknesses, and sometimes researchers might use both to get a more complete picture. For this particular research, quantitative approach was selected for data collection and a questionnaire was deployed to industry experts.

### **5.2.1 Questionnaire Planning and Execution**

The questionnaire consists of three major sections. First section covers the introduction and purpose of the research along with instructions for the respondents to fill the questionnaire. It also ensures that data will be used only for research purposes and the personal information of the respondents will be kept confidential and in case of sharing, a prior approval will be sought from the respondents. Likert scale numerical values along with corresponding description i.e. very low to very high (1-5) is also given in this section.

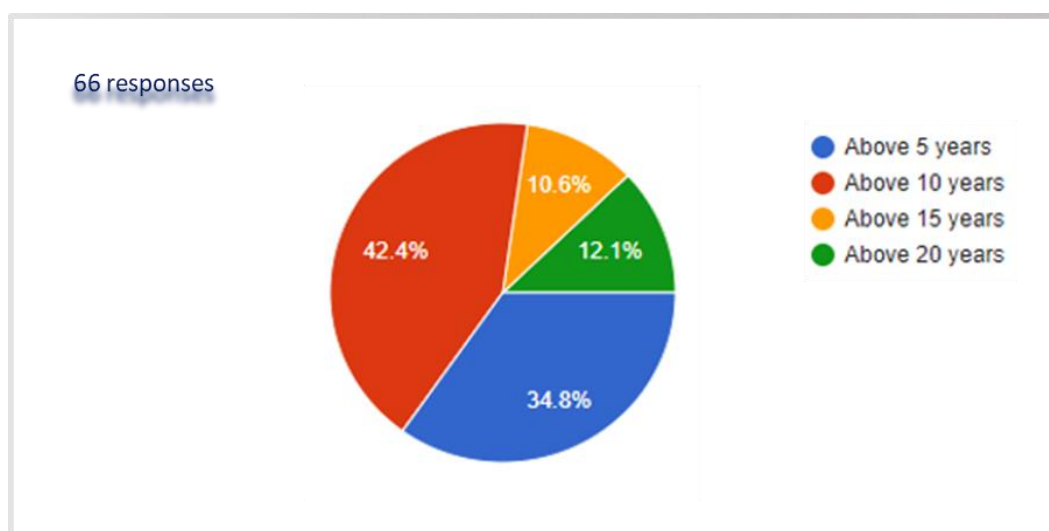
Second section, which is primarily consist of background information of the respondents to get a fair idea about academic qualifications as well as professional competence of the targeted audience of the questionnaire. Therefore, this section focuses to seek information on academic qualifications of the respondents, their professional experience in the industry. Another question was also introduced in this section which was meant to understand the varying perspectives of the respondents i.e. which type of organization they belong to. This was seemed essential because various stakeholders get affected disproportionally from the same factor or parameter, so this question was introduced to obtain a wholesome picture of all stakeholders in the construction

industry. Emails of the respondents were also requested for sharing the final outcome of the study as well as for any future correspondence.

Third section consist of questions. It consists of 29 questions which are spread across ten categories. At the end, an open-ended question was also included where respondents were asked for any valuable feedback, input, or value addition regarding the topic.

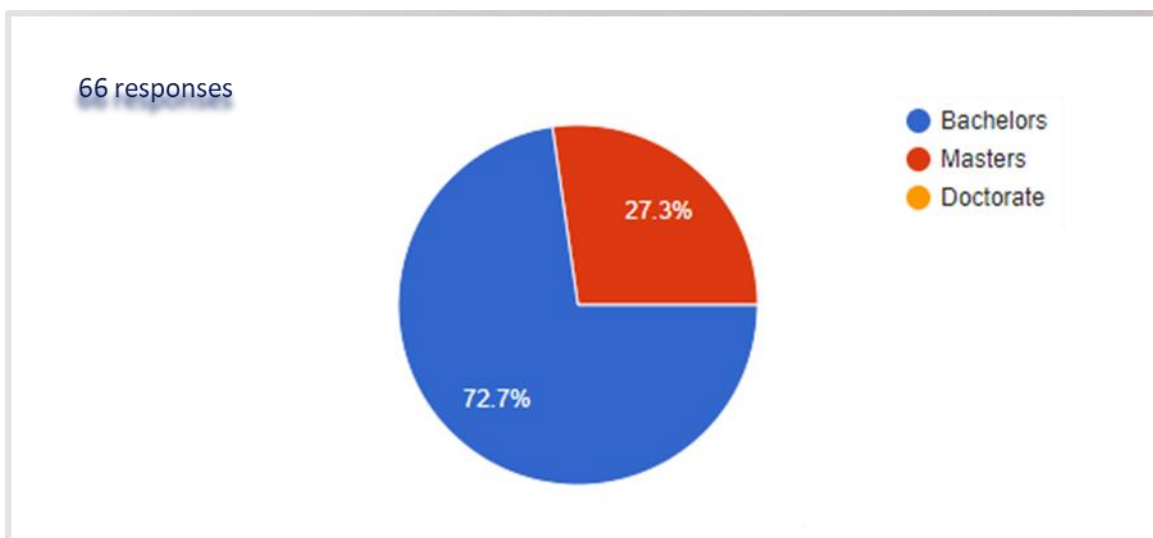
### 5.2.2 Background of Questionnaire Respondents

While distributing the questionnaire, one of the major concerns was to target the construction industry professionals with as much experience as possible and the reason for this was that experienced persons have had various experiences throughout their careers and this aspect makes their opinions and viewpoint more valuable. In addition, it will also render more reliability to the findings of this research. Considering these facts, no respondents with less than 5 years of experience was approached. In this study, even the individuals with least experience have more than 5 years of experience. The largest number of respondents in the sample i.e. 28 individuals (42.4%) have more than 10 years of experience in the industry. Second largest group is respondents with experience above years (34.8%). Individuals with experience above 15 years and above 20 years accounts for 10.6% and 12.1% i.e. 15 respondents of the sample possess more than 15 years of experience, and this is crucial from reliability viewpoint. Breakdown has been given in Figure 12 below:



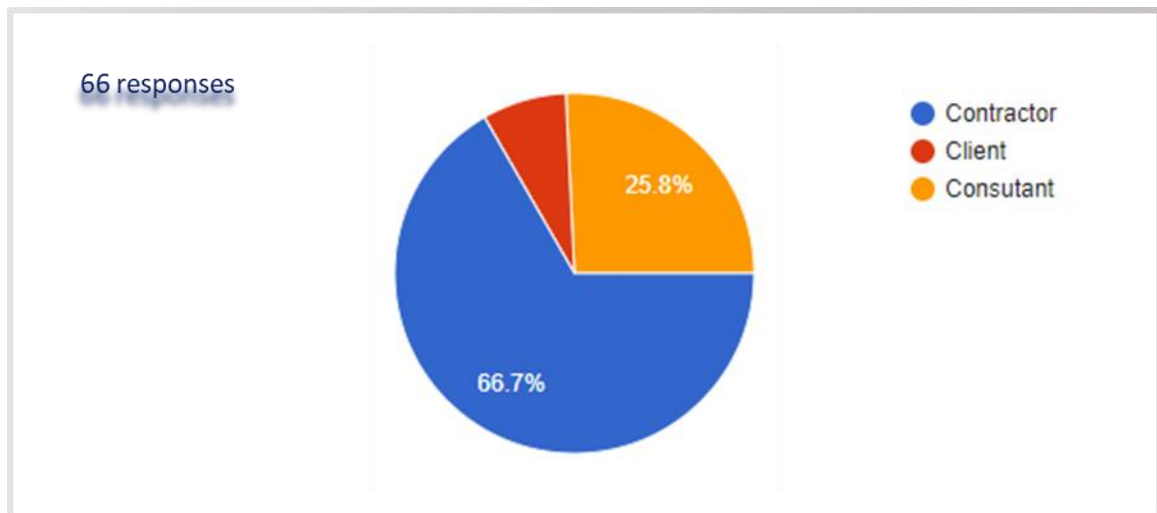
**Figure 12** Experience of Respondents

Second parameter which was considered seriously to target the respondents was their academic qualification. Only those individuals who possess at least a bachelor's degree were included in the sample and this was crucial as in Bangladesh construction industry, a lot of people do not possess higher education. Instead, they have made their way up through years of practical experience in the field and they are good at their work, but they lack when it comes to theoretical knowledge. So, by setting a threshold for academic qualifications, author was able to focus on the respondents which are experienced as well as highly qualified and again this factor would add to the reliability of the findings of this research. As the Figure 13 below shows, 72.7% of sample size possesses the bachelor's degree whereas another 27.3% have master's degree that means all the audience of the questionnaire was highly qualified. Questionnaire was also sent to a few PhDs but regretfully, no response was received.



**Figure 13** *Qualification of Respondents*

Another fact of the construction industry is that various stakeholders in a project get affected by varying degree of severity from a certain factor depending upon their role and responsibilities in a particular project. Individuals as well as organizations involved in a construction venture belong to either of contractor, client, or consultant. Therefore, in order to obtain a holistic view of all the stakeholders, efforts were made to include representatives of all three categories and resulting contributions can be seen in Figure 14:



**Figure 14** Stakeholder of Respondents

## 6 Results and Analysis

The data retrieved from the questionnaire was analyzed using Weighted Average Method (WAM) which is considered an appropriate approach for this type of small study by several researchers. In this method, firstly, each Likert scale value is multiplied by the respective number of respondents. Secondly, all resultant values are added and in the third step, the result is divided by the total number of respondents in the sample i.e. 66 in this case. Mathematical relation is given below:

$$\frac{\sum LS \times R}{N}$$

Where:

LS = Likert Scale Value

R = Number of respective Respondents

N = Total Number of Respondents

Using this relationship, we can arrive at a common yardstick to measure the relative significance of each sub-criteria, and henceforth, this value will be referred to as the Comparative Importance Index (CMI).

## 6.1 Project Cost

Cost	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Proposed Tender Price	3	1	19	20	23	3.894
Low Project Life-cycle Cost	2	9	29	18	8	3.318
Financial Health of Contractor	0	5	22	22	17	3.773
Additional Financial Resources for Priority Projects	1	1	23	30	11	3.742
Value Engineering	1	8	19	24	14	3.636

**Table 1** Project Cost

As mentioned in chapter 2 that *Proposed Tender Price* is the sole criterion in lowest-bid procurement, and it is still one of the most critical factors in multi-criteria procurement system. And this statement comes out to be true as Table 1 below shows that in Cost category, this factor comes out to be most important with a CII of 3.894 followed by aspects related to financial strength of the contractor such as *Financial Health of the Contractor* (CII = 3.773) and *Additional Financial Resources for Priority Projects* (CII = 3.742) ranked second and at third respectively. *Low Project Life-cycle Cost* found to be the least important in this category and this could be due to the fact that it is often challenging to calculate this over a long period of time and that is why due to its vague nature, it could not capture the attention it deserved in eyes of the industry professionals and therefore ranked last.

## 6.2 Performance

As illustrated by Table 2, most of the respondents considered *Skill Level of Project Team* highly critical sub-criteria. 22 Respondents deemed its significance as *very high* and, another 23 considered it *high* resulting in a CII of 3.97 and elevating it to the top of *Performance* category. Similarly, *Number of Key Personnel* is ranked second (CII = 3.833). *Project Portfolio* (CII = 3.697) and *Optimized Use of Resources* (CII = 3.667) are found to have almost similar impact. The least significant factor in this class was *Reference and Testimonials* with CII of 2.621. The probable reason for this very low deemed impact could be the absence of any central digitized system to obtain and share



testimonials of the contractors with other client organizations otherwise it could be a very useful tool to gauge the efficiency and capability of contractors to deliver certain types of projects.

Performance	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Project Portfolio	1	9	13	29	14	3.697
Number of Key Personnel	2	1	19	28	16	3.833
Optimized use of Resources	0	9	16	29	12	3.667
Skill Level of Project Team	0	3	18	23	22	3.970
References and Testimonials	0	7	27	25	7	2.621

**Table 2 Performance**

### 6.3 Quality

Quality	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Quality Control Processes	1	7	15	24	19	3.803
Certifications and Accreditations	3	7	17	27	12	3.576
Meeting Design Requirements	0	4	20	21	21	3.894

**Table 3 Quality**

From client's perspective, one of the most important aspects is to transform the idea to reality as perfectly as possible. It also encompasses requirements set by the clients regarding quality and durability. No doubt that *Meeting Design Requirements* (CII = 3.894) was deemed most important factor when it comes to quality as shown in Table 3. *Quality Control Processes* by the contractor found to be on second spot with CII of 3.803. *Certifications and Accreditations* stand at third with a CII of 3.576 which is still way higher than CII of *Reference and Testimonials* (2.621). This is because of the fact that certain institutions and councils are already in place and functioning effectively and playing a positive role for the betterment of construction industry of Bangladesh. A few of them are

Public Works Department (PWD), Roads and Highway Department (RHD), Local Government Department (LGD).

## 6.4 Project Control

Project Control	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Project Management Capabilities	1	4	14	24	23	3.970
Actual Schedule Achieved for Similar Projects	2	7	16	30	11	3.621
Resource Availability	1	6	18	28	13	3.697

**Table 4** *Project Control*

In this criteria, *Project Management Capabilities* (CII = 3.97) of the contractor have been marked most important by the experienced professionals. This can be explained that if a contractor has well-qualified and experienced workforce, but one important aspect of project management capabilities is missing, the project is instantly vulnerable to several unwanted outcomes such as cost overrun, poor quality of work performed and more than one extension of time (EOT) claims.

A contractor with good project management skills can carefully plan, organize, and supervise all parts of the construction work effectively. This involves making sure resources are used wisely, risks are identified and managed, and communication with everyone involved is clear. A skilled project manager can handle any problems that come up and find solutions quickly. Plus, good project management helps to keep everyone involved informed and accountable, which makes the whole process run more smoothly. Ultimately, it ensures that the project is completed properly, on time, and within the budget. Therefore, this also calls for investment on the behalf of contractors to their workforce for training and incentivizing project management certifications/training and procurement of modern-day tools and software for the project management office.

## 6.5 Delay Claims

Delay Claims	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
History of Claims and Disputes	7	9	18	27	5	3.212

**Table 5** Delay Claims

Table 5 shows that the *History of Claims and Disputes* has a CII of 3.212. This is crucial to know this history as it helps project owners understand how the contractor deals with issues and conflicts that might come up during construction. If a contractor has a lot of past claims and disputes, it could mean they struggle to handle problems effectively, which might cause delays or extra costs. On the other hand, if a contractor has a good track record of resolving issues smoothly, it shows they can manage challenges well, which is important for a successful project.

On the flip side, if a contractor has a history of resolving disputes fairly and constructively, it shows they prioritize good relationships and teamwork, which is key for a harmonious project environment. Considering a contractor's history of claims and disputes helps project owners manage risks. By knowing how a contractor has handled conflicts in the past, they can better assess the likelihood of similar issues arising in the future. This allows project owners to make informed decisions and choose a contractor who has demonstrated the ability to minimize disputes and keep the project running smoothly.

## 6.6 Current Workload

Current Workload	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Number and Sizes of Projects at hand	1	7	23	22	13	3.591

**Table 6** Current Workload

The number and sizes of Projects at hand is another important parameter to measure a contractor's ability to deliver a project as per the desired timeline and budget. This parameter has a CII of 3.591 which is deemed on the higher side as compared to most of the other parameters. Therefore, it is

essential to consider the current workload of the contractor along with his resources such as manpower, equipment, machinery, and financial health because only a strong project portfolio and proven record of project delivery can make a contractor suitable to undertake a certain project. At times, it has been observed that a reasonable contractor failed to deliver on a certain project because he was engaged in too many projects and could not concentrate on one particular project resulting in EOT and cost overrun.

## 6.7 Risk Management and Safety

Risk Management and Safety	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Safety Record	2	9	13	29	13	3.636
Insurance Coverage	9	4	26	19	8	3.197
Contingency Planning	3	7	25	24	7	3.379

**Table 7** Risk Management and Safety

Risk management is one of the 10 knowledge areas of project management and should be paid attention to so that the safety and well-being of the workforce can be ensured. In this category, *Safety Record* (CII = 3.636) of the contractor was considered the most important factor in gauging the contractor's ability to deliver safely and without bringing a bad name to the client or the project as in case of an accident or fatality, the news spread all over the local media which is harmful to client as well as the project in future especially if the project was of commercial nature. *Contingency Planning* (CII = 3.379) ranked second by the respondents underscores the significance of handling unforeseen and unexpected scenarios during various phases of a project. *Insurance Coverage* (CII = 3.19) is ranked last and an acceptable reason could be that in Bangladesh's construction industry, this aspect is not paid the heed it requires and it calls for industrywide awareness regarding safety and ensuring the well-being of the workers and supporting them in case of unfortunate accidents and fatalities.

## 6.8 Sustainability and Environmental Considerations

Sustainability and Environmental Considerations	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Green Building Credentials	6	8	28	18	6	3.152
Environmental Compliance	4	13	17	22	10	3.318
Energy Efficiency	2	11	22	19	12	3.424

**Table 8** *Sustainability and Environmental Considerations*

As shown in Table 8, *Energy Efficiency* (CII = 3.424) has been considered the foremost factor when it comes to sustainability and environmental considerations. This is partly because of the recent sharp increase in energy prices due to increased demand and insufficient production which has forced the government to produce energy through fossil fuels which is again hazardous to the environment and results in a lower air quality index in the metropolitan cities of Bangladesh. *Environmental Compliance* (CII = 3.318) comes out to be second in this category and this can be attributed to commendable efforts of environmental NGOs as well as UNO guidelines to preserve the environment resulting in increased awareness on the subject on a global scale. *Green Building Credentials* (CII = 3.152) has been ranked last, and this is due to the fact that in Bangladesh, only a little research has been done on the subject and there is not so much focus on this important aspect, and it again, calls for awareness and significance of the green buildings to the industry stakeholders.

## 6.9 Compliance with Regulations and Standards

Compliance with Regulations and Standards	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Regulatory Compliance	1	5	21	24	15	3.712
Quality Standards	0	6	15	28	17	3.848
Ethical Standards	0	11	19	21	15	3.606

**Table 9** *Compliance with Regulation and Standards*

Table 9 illustrates that *Regulatory Compliance* (CII = 3.848) and *Quality Standards* (CII = 3.712) are found to possess relatively higher CII as compared to most of the parameters because clients are not willing to accept anything less than what has been set in project specifications, bill of quantities

(BOQ) and drawings. Clients are paying for a quality work and should be paid back with the same. For regulatory compliance, the governmental departments are very strict and show very little tolerance only in certain special situations otherwise client may be subjected to hefty fines and in worst case scenarios, even the project may be sealed off by the authorities until their observations have been addressed in an effective and acceptable manner. This situation also leads to a prolonged legal battle for the clients resulting in a waste of resources, time and opportunity.

## 6.10 Post Construction Support

Post Construction Support	Likert Scale values retrieved from respondents					Comparative Importance Index
	1	2	3	4	5	
Maintenance/Warranty	2	8	17	23	16	3.652
Customer Satisfaction	0	5	23	19	19	3.788

**Table 10** *Post Construction Support*

*Customer Satisfaction* (CII = 3.788) as shown in Table 10, is deemed critical among postconstruction parameters. When customers are pleased with the work done by the contractor, they are more likely to tell others about it, which helps the contractor get more jobs in the future. Also, satisfied customers can vouch for the contractor's reliability and trustworthiness, which is a big deal in the construction world. When customers are happy, they're also more likely to hire the same contractor again for future projects, which keeps the business going strong. So, making sure customers are satisfied is not just about finishing the project well, but also about building a good reputation and ensuring future success.

## 7 Conclusion

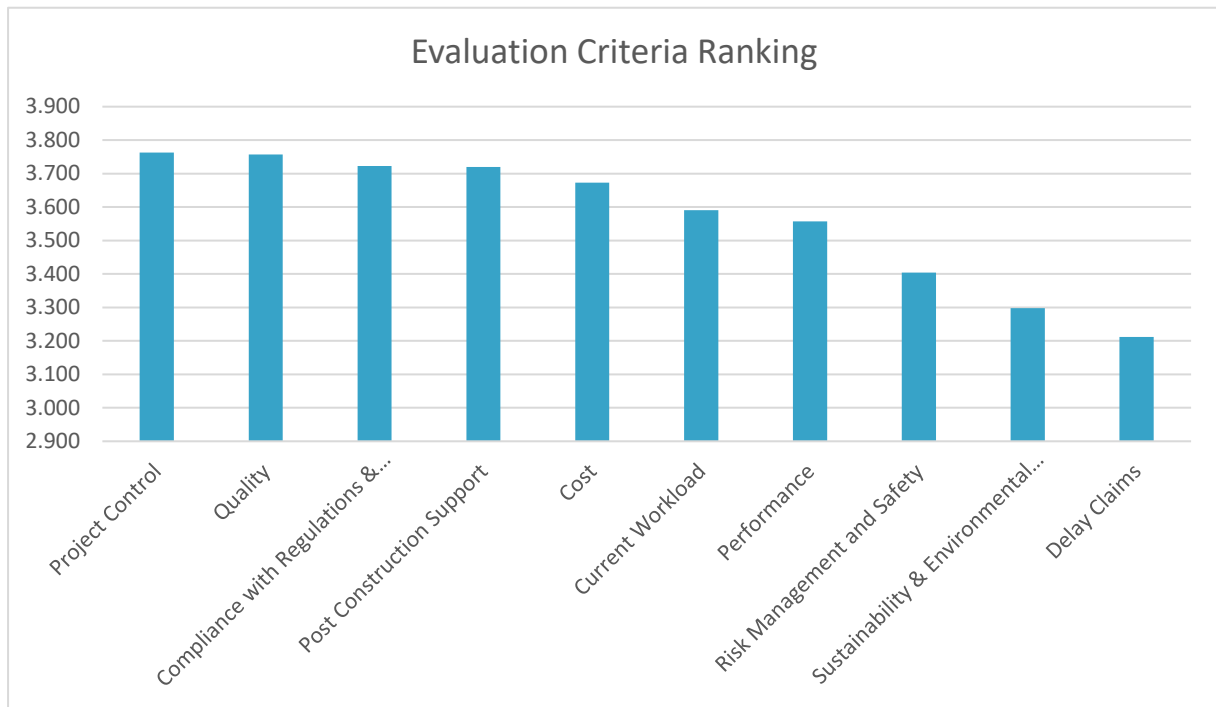
Using the mathematical relation given above in Chapter 6, the Comparative Importance Index (CII) was calculated for all sub-criteria. In addition, the average CII of all the sub-criteria present under an evaluation criterion was also calculated, so that the findings of the research could be presented from two different perspectives. All 10 evaluation criteria were rearranged in descending order of severity based on mean criticality index and the results are shown in Table 11 below.

## 7.1 Conclusion and Discussion

Results show that “Project Control” (MCI = 3.763) is the most critical criteria as reported by experienced professionals in the construction industry. This fact is interesting as in traditional procurement, the cost is considered the most critical factor, but our findings suggest that in order to deliver a successful project, cost is not the most important factor. Instead, it is the abilities, experiences, and past performances of the project team. The second most crucial criterion is “Quality” (MCI = 3.758) which shows that the stakeholders are not willing to accept anything below the requirements set in project documents and they are willing to pay more in order to get the envisaged project deliverables. “Compliance with Regulations & Standards” (MCI = 3.722) and “Post Construction Support” (MCI = 3.720) have been ranked third and fourth with almost the same value as MCI. Cost, which in general, is considered the most critical factor found to be in 5<sup>th</sup> position that means with growing awareness in the construction industry, the stakeholders are keen to pay attention to several other factors besides cost before awarding a project. “Current Workload” (MCI = 3.591) and “Performance” (MCI = 3.558) are ranked in 6<sup>th</sup> and 7<sup>th</sup> place. Likewise, “Risk Management and Safety”, “Sustainability & Environmental Considerations” and “Delay Claims” have been deemed the least important criteria before awarding a construction project.

S/N	Evaluation Criteria	Mean Comparative Index [MCI]	Rank
1	Project Control	3.763	1
2	Quality	3.758	2
3	Compliance with Regulations & Standards	3.722	3
4	Post Construction Support	3.720	4
5	Cost	3.673	5
6	Current Workload	3.591	6
7	Performance	3.558	7
8	Risk Management and Safety	3.404	8
9	Sustainability & Environmental Considerations	3.298	9
10	Delay Claims	3.212	10

**Table 11** Ranking of Evaluation Main Criteria



**Figure 15** Ranking of Evaluation Criteria

A look back at the theoretical basis of this study suggests that these findings are closely related to work done by other researchers. A summary of previous researcher findings has been presented below table which shows partial agreement with the findings of this research.

Sr. No	Criteria	Percentages
1	Performance	21.50%
2	Cost	20.40%
3	Quality Control	17.10%
4	Project Control	10.60%
5	Risk	10.0%
6	Health and Safety	9.95%
7	Delay Claims	5.70%
8	Current Workload	4.80%

A few prominent common findings are as follows:

- ❖ Quality remains among the top evaluation criteria as emphasized by the industry experts.
- ❖ Cost is in the middle of the spectrum i.e. it is important, but a few aspects are more critical even than cost.
- ❖ Delay Claims were found to be among the least important factors to be considered for evaluation.



In addition, as considered total of 29 sub-criteria have been ranked individually based on the Comparative Importance Index (CII) and these have been classified into three categories as mentioned below:

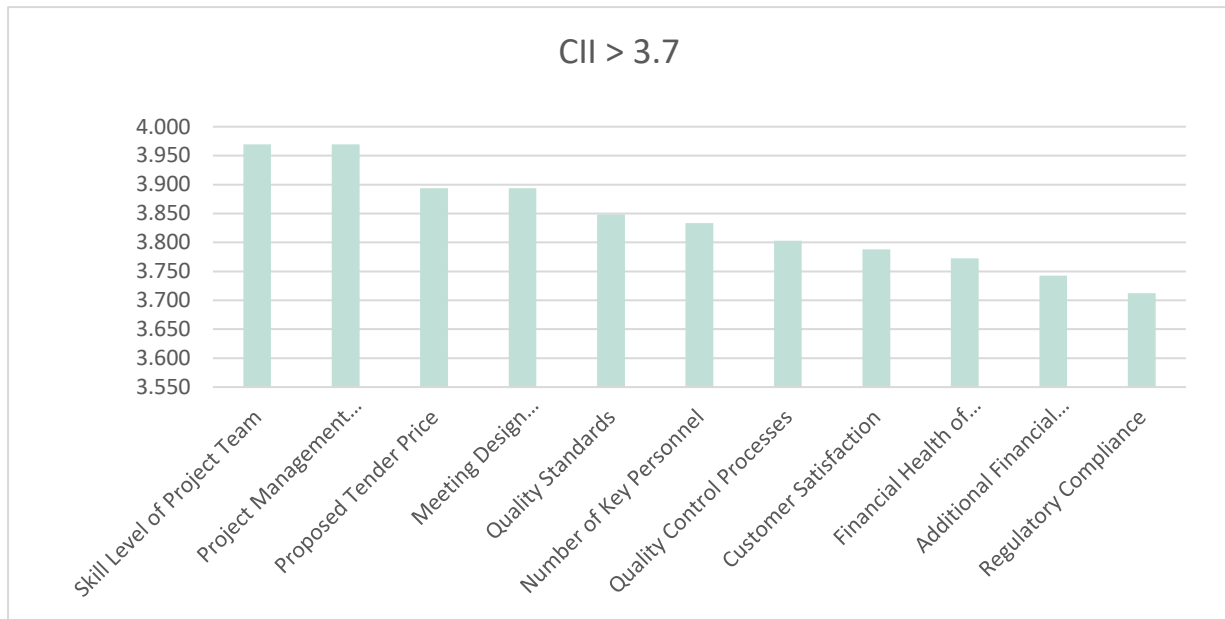
Category	CII Value
Most Critical	$CII > 3.7$
Moderately Important	$3.7 > CII > 3.5$
Least Important	$CII < 3.5$

### 7.1.1 Most Critical Sub-criteria

Table 12 below shows the 11 Most Critical sub-criteria for contractor evaluation. The most critical evaluation criteria found to be “Skill Level of Project Team” and “Project Management Capabilities” with the same value of CII which is 3.970. The second most significant criterion is “Proposed Tender Price” (CII = 3.894). It is interesting to note that the Proposed Tender Price which is considered the sole criterion in Traditional Low Bid (TLB) is ranked third that means skill level and project management abilities of the contractor carry even more importance as per the opinions of industry stakeholders. Other vital factors include Design Requirements, Quality Standards, the Financial Health of the Contractor, and Customer Satisfaction.

S/N	Evaluation Sub-criteria	Comparative Importance Index [CII > 3.7]	Rank
1	Skill Level of Project Team	3.970	1
2	Project Management Capabilities	3.970	
3	Proposed Tender Price	3.894	2
4	Meeting Design Requirements	3.894	
5	Quality Standards	3.848	3
6	Number of Key Personnel	3.833	4
7	Quality Control Processes	3.803	5
8	Customer Satisfaction	3.788	6
9	Financial Health of Contractor	3.773	7
10	Additional Financial Resources	3.742	8
11	Regulatory Compliance	3.712	9

**Table 12** Most Critical of Sub-criteria



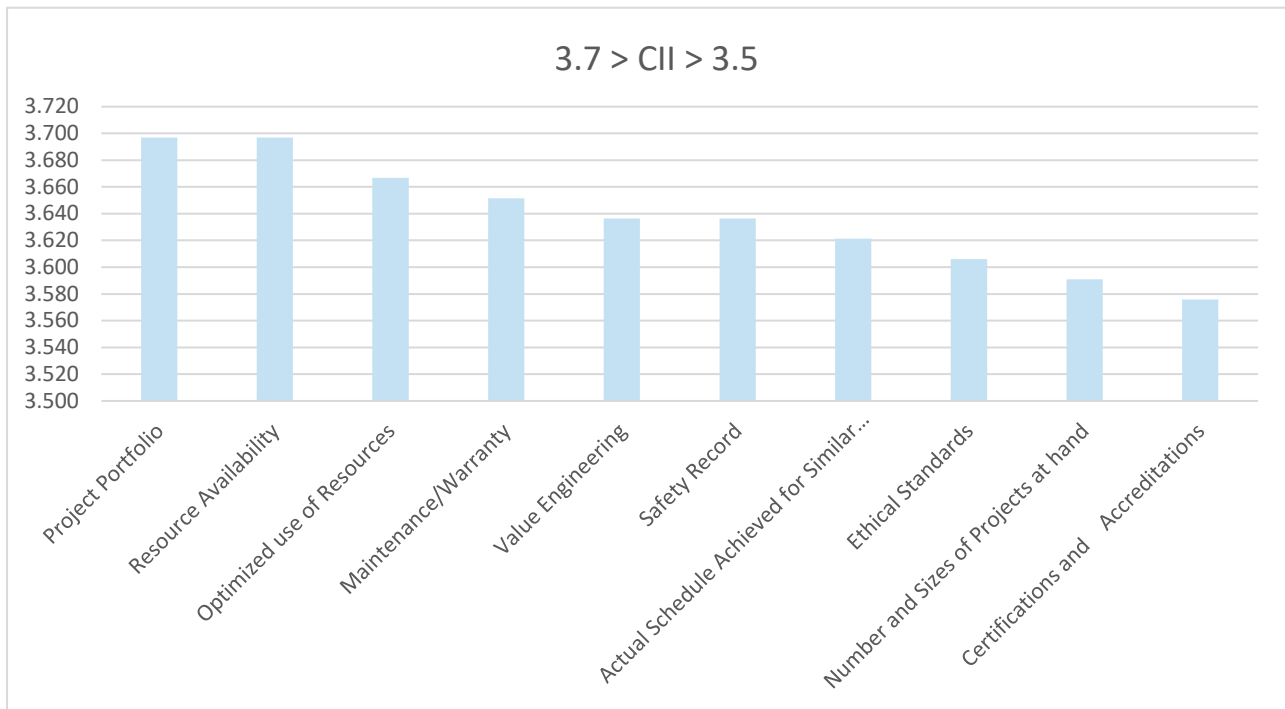
**Figure 16** Most Critical of Sub-criteria

### 7.1.2 Moderately Important Sub-criteria

There are a total of 29 factors, and it is hard to focus on all of them simultaneously while evaluating various contractors, especially in case there are several bidders. As this study aims to facilitate the clients to choose the best bidder for the project, so it was advisable to classify all the factors based on their CII. This category consists of the sub-criteria that are found to be in the middle of the spectrum, and they should be paid moderate consideration at least during evaluation. Table 13 shows 10 moderately important factors for evaluation which include on top “Project Portfolio” and Resource Availability with a similar CII value that is 3.697. Followed by “Optimized use of Resources” (CII = 3.667) and “Maintenance/Warranty” (CII = 3.652). This category also encompasses factors such as “Number and Sizes of Projects at hand” and “Certifications and Accreditations”.

S/N	Evaluation Sub-criteria	Comparative Importance Index [3.7 > CII > 3.5]	Rank
1	Project Portfolio	3.697	1
2	Resource Availability	3.697	
3	Optimized use of Resources	3.667	2
4	Maintenance/Warranty	3.652	3
5	Value Engineering	3.636	4
6	Safety Record	3.636	
7	Actual Schedule Achieved for Similar Projects	3.621	5
8	Ethical Standards	3.606	6
9	Number and Sizes of Projects at hand	3.591	7
10	Certifications and Accreditations	3.576	8

**Table 13** Shows 10 moderately important factors for the evaluation



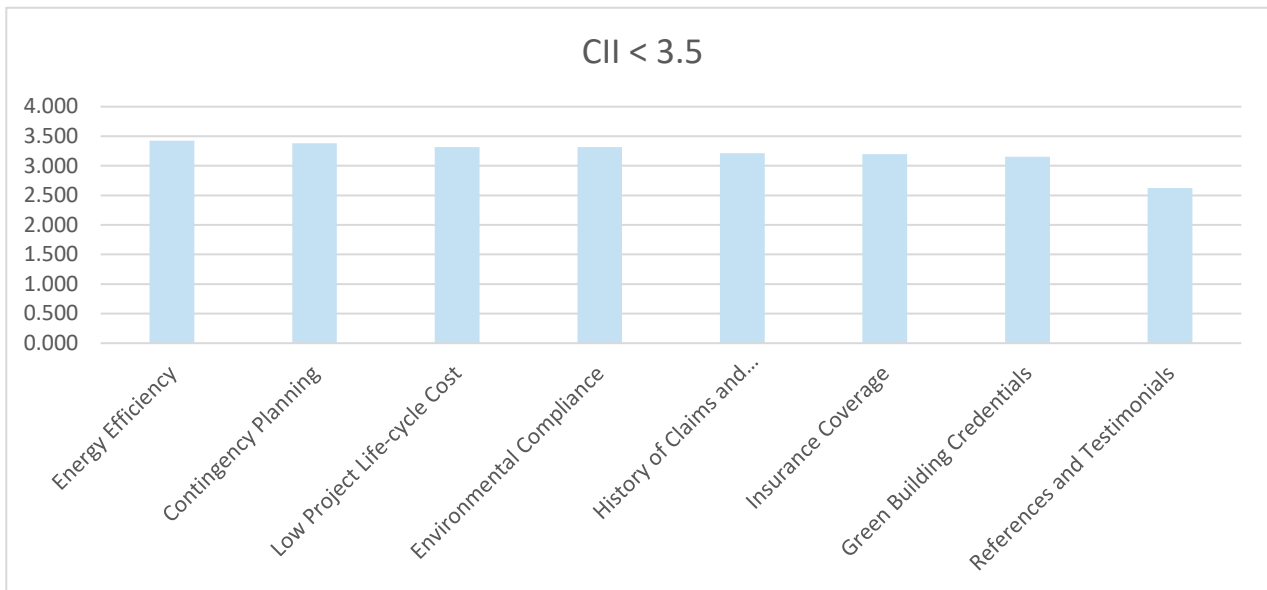
**Figure 17** Shows 10 moderately important factors for the evaluation

### 7.1.3 Least Important Sub-criteria

One-third of sub-criteria were found to be almost irrelevant and therefore, these can be ignored in order to save the resources. Most of these factors are related to sustainability and environmental considerations and one reason for them to be least important could be unawareness of the increasing necessity of green building and sustainability of the environment to protect the planet for the generations to come as a collective responsibility of mankind. Table 14 shows the 8 least important factors for evaluation and the same has been illustrated in figure 18.

S/N	Evaluation Sub-criteria	Comparative Importance Index [CII < 3.5]	Rank
1	Energy Efficiency	3.424	1
2	Contingency Planning	3.379	2
3	Low Project Life-cycle Cost	3.318	3
4	Environmental Compliance	3.318	
5	History of Claims and Disputes	3.212	4
6	Insurance Coverage	3.197	5
7	Green Building Credentials	3.152	6
8	References and Testimonials	2.621	7

**Table 14** Least Important Sub-criteria



**Figure 18** *Least Important Sub-criteria*

## 7.2 Research Objectives and Outcomes

In the beginning of this study, it had two clear questions:

1. For a successful project delivery in the construction sector of Bangladesh, what are the relevant elements to consider at the project award phase?
2. How much important is each one of the elements identified above, in comparison to other elements and which factors should be prioritized in decision-making?

The research successfully found the answer to the first question and came up with 10 distinct evaluation criteria along with 29 sub-criteria to be considered before awarding a project. In response to second research question, the study was able to establish the comparative importance of each sub-criteria and it further distributed all the sub-criteria across three categories namely Most Critical, Moderately Significant, and Least Important sub-criteria which should be viewed in accordance with their deemed severity on project objectives by the decision makers before awarding a construction project.

The work is in partial agreement with the findings of Hasnain & Thaheem (2016) for highway construction.

### **7.3 Research Reliability**

Research reliability refers to the consistency and repeatability of research findings. That means the same results will be found if the research has to reoccur under the same circumstances. The reliability considerations were taken into account throughout the research process. A major milestone from a validity point of view was the inclusion of all the stakeholders involved in the construction industry i.e. project owners (clients), contractors, and consultants in the research sample so that a comprehensive understanding of the subject matter could be achieved. Moreover, before distribution, the questionnaire language and structure of the questionnaire were reviewed by two experts to ensure the clarity of the language used and to test the technical functionality of google forms used for survey purpose.

In order to enhance validity of the research, another step was exclusion of any respondent with less than 5 years of experience. In this study, even the individuals with least experience have more than 5 years of professional experience, and 42.4% of sample size have more than 10 years of experience in the industry.

Furthermore, the results are in partial agreement with the findings of Hasnain & Thaheem (2016) for highway construction.

Keeping in view all of the above, the results of this study can be regarded as valid at least from the researcher point of view.

### **7.4 Research Ethics**

According to JAMK research ethics guidelines were strictly followed throughout the research process. Attributes to the authors were made and credits were given wherever they were due. Paraphrasing and rephrasing were used throughout the report to abstain from plagiarism. As mentioned earlier, this study used a questionnaire for data collection from experts, it was ensured that all the respondents understood the purpose and motivation behind this study, and this was achieved by introducing a section at the beginning of the questionnaire that briefly explained the intent, scope and usage of data received through the questionnaire. Respondents were assured that their personal information would be kept entirely confidential, and their responses would be used

only for research purposes after the completion of research, all the relevant information received from the respondents would be erased for data protection purposes. A few major ethical considerations which were paid heed to are given below:

**Informed Consent:** All the participants voluntarily participated in the research, and they were informed about the purpose, process, and benefits of the research.

**Fair Treatment:** In order to avoid personal bias and prejudices which may affect the outcomes of the research, this study opted for a quantitative research approach.

**Responsible Conduct:** Throughout the research process, the conduct of the researcher has been responsible and in line with ethical guidelines.

**Respect for Participants:** The research participants were respected not only by assuring the confidentiality of their personal data but also by offering freedom of voluntary participation.

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