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## **CRITICAL FACTORS THAT AFFECT THE QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS**

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### **ABSTRACT**

India, like many other nations, is highly dependent on the building industry. It employs a large number of people, resources, and machinery and operates under severe deadlines. The survey's questionnaire was developed with the help of the aforementioned contextual information, expansive quality viewpoint, and normative quality perspective. We have already sent out over 500 surveys by email, hard copy, soft copy, postal service, and courier service. Multi-story buildings, whether for residential or commercial usage, are included in this analysis. Depending on the details, the price tag for the project might be anything from INR 1 crore to INR 100 crores. The private sector is also represented in this study. In all, 14 months were spent collecting data. We have gained an understanding of the essential factors that contribute to the successful implementation of quality management in construction projects.

**KEYWORDS:** Quality, Construction Projects, Performance, Construction Site and Practice

### **INTRODUCTION**

India, like many other countries, relies heavily on the construction sector. It has a strict deadline and uses a lot of people, stuff, and machines. Since then, the construction sector has been profoundly impacted by this breakthrough. The building industry is experiencing extreme cyclical changes. Industries such as cement, pipes, sanitary products, tiles, ready mix concrete, etc. all benefit from building in some way. In addition to being a lucrative national asset, the building industry also fosters the growth of domestic human resources and creates more jobs than any other sector of the economy.

Given the magnitude of the construction industry, it is critical that the primary obstacles to productivity be identified and addressed. In many nations, the construction sector has embraced outdated technologies, and there is no consistent relationship between the cost of building and how long it takes to complete. There is a growing awareness among customers about both the cost and length of time needed to complete a project to a satisfactory standard. These days, construction company management cares more about quality as a competitive advantage than it does about anything else. As a result, the construction industry has to establish standards at each

level of the process in order to consistently provide outputs that meet or exceed customer expectations, which is essential if it wants to keep clients happy and continue doing business with them.

position as the oldest known occupation in the world. A variety of terms are used by quality assurance experts to describe the characteristics that constitute a high-quality project. As a starting point, you may think of quality as "filling the customer's expectations" or "compliance with customer's specification." No matter whose definition of quality we use, putting it into reality proves to be a formidable challenge. Quality, from the perspective of the end user, is defined as the degree to which the product meets their expectations in terms of its look, performance, and dependability within a certain budget.

Timeliness, affordability, and quality are sometimes referred to as the "iron triangle" of project management. The project management team's focus is almost exclusively on the schedule and budget compliances. In turn, this leads to mediocrity in the quality of work being done at construction sites. Sometimes, the quality of a project is sacrificed in favour of meeting its deadline and budget constraints. Despite the fact that numerous studies have demonstrated the significance of maintaining and doing quality projects, these factors are often compromised in order to accomplish more immediate goals, such as the handing over of some critical structures or only a portion of the structures that fall in the critical path, etc. Controlling the performance of an installation, construction, or engineering structure should be handled in the same manner as the management of time and cost, as Barnes (1987) stresses. In addition, a recent poll of Indian construction professionals indicated that among the five most prevalent project performance criteria (compliances to schedule, cost, quality, no-dispute, and safety), quality compliance ranked second only to schedule compliance.

Maintaining a high standard of quality in construction is what quality management is all about. Happy customers mean repeat business, which means a thriving firm in the long run. From their point of view, quality management as it is used in construction encompasses concepts such as quality control, quality confirmation, quality advancement, quality measurements, and so on. The researchers also found that the first examples of formal quality management practices in building date back to classical Greece and Rome. The efforts made by managers to ensure the implementation of their quality arrangements, including quality control, quality affirmation, and quality improvement, are all a part of quality management practice. In addition, we found that construction companies are increasingly accepting quality management in their efforts to address quality concerns and meet customer expectations.

## LITERATURE REVIEW

**Neyestani, Behnam. (2017).** Since the early 1990s, businesses have relied on quality management systems (QMS) to help them save costs, boost output, satisfy customers, and expand their market share. In the building sector, it may help businesses accomplish their goals and guarantee that their needs are met throughout the whole of a project (need). The primary objective of this paper was to analyse how the introduction of a quality management system affected major aspects of building projects in the Manila metropolitan area of the Philippines. To achieve these goals, the study performed a comprehensive literature analysis of relevant books, journals, and online resources to learn more about QMS, building project parameters, and the

results of empirical research into QMS's impact on these areas. Based on these reviews, a questionnaire was developed and sent out to each of the 37 managers at random to gather the necessary information. Descriptive statistics were then used to analyse the data and draw conclusions. QMS adoption in Metro Manila building projects was shown to have the greatest influence on customer satisfaction, followed by cost and time, with the least effective result being on scope (quality).

**C. Vijayabanu\*, S. Karthikeyan, P. Vijay Surya (2022)** Since the construction industry is currently highly competitive, businesses in the field have had to up their game by adopting a process of continuous improvement that guarantees sufficient project quality while also reducing the time and money spent on its execution. The primary goal of this research is to develop a model using a second-generation partial least-squares (PLS) structural equation model (SEM) approach to examine the effects of TQM practices on construction project productivity, cost reduction, service quality, customer satisfaction, and timeliness of service in Tamil Nadu. Design/Methodology: Primary data have been taken via a questionnaire filled out by 94 residents of the Tamil Nadu districts of Chennai, Kanchipuram, Coimbatore, Trichy, Karur, and Tirunelveli. Project managers, builders, engineers, consultants, and managers all contributed to the data set. This research also demonstrated a favorable and statistically significant link between TQM procedures and the success of building projects. A total of 79.5% of the project's success would depend on TQM aspects including Benchmarking (BM), Employee Involvement and Empowerment (EMPINV), Innovation (INNOV), Supplier Quality Management (SPQM), and Technical (TECHN).

**Kashif Alia, et.al (2022)** Road construction projects that fall short of expected quality and performance may be evaluated in a number of ways. The purpose of this research is to assess the variables influencing the quality management of road building projects in Indonesia by determining the most significant obstacles to adopting quality management systems and investigating potential solutions to these issues. This study employs a quantitative and qualitative methodology to assess the efficacy of quality management on Indonesian road building projects. The goals of this research are accomplished via the use of quantitative data collected through two rounds of Delphi questionnaire surveys as the major data source and qualitative data collected via focus group interviews. Quality standards and paperwork are not always readily available, even in the preconstruction phase of a project, which creates difficulties for adopting quality management practices. When constructing a road, the project team is the most important aspect in quality control activities and the quality management roles and duties of the many stakeholders. This limitation is concerned with how the primary stakeholders may interact in terms of their competence, dedication, and collaboration to guarantee that quality management systems are put into effect. Controlling the road paving materials, managing the project operations to a predetermined standard, and reporting project performance are all aspects of its implementation. This research provides new information for quality management and quality assurance in the context of a road building project. For the first time, this research analyses the quality management procedures used on Indonesian road building projects. The reasons for the poor road condition are determined and assessed throughout the study. All of the obstacles that have come to light are major roadblocks in the way of implementing quality management methods and producing high-quality road goods.

**Kashif Alia, Sajjad Mubina, and Ekatrina Gavrishykb (2022)** The construction sector plays a crucial role in a country's progress, yet it has traditionally been difficult to finish projects successfully due to the many moving parts involved. The golden triangle, also known as the three constraints of project management, comprises of time, money, and quality, and each of these factors is crucial to the successful completion of a construction project. Three aspects of a construction project's quality management system are the subject of this research. Assuring quality in three stages: 1) preparation, 2) monitoring, and 3) evaluation. In order to evaluate the quality management system of ongoing construction projects, a questionnaire is prepared using a variety of indicators. According to the results, most projects are using a subpar quality management system that has major flaws in terms of quality assurance and control. Several substantial suggestions have been made to enhance the current quality management system.

**Mazlina Zaira Mohammad, Marina Viana and Ahmed Talal Raghieb (2019)** Quality assurance, quality control, and quality planning are the pillars upon which the QMS rests. The construction industry must ensure that all projects will be completed on time, within budget, and to the highest standard of quality and safety. Examining five previously published publications on Quality Management Systems (QMS) in the construction industry from a Malaysian perspective, this essay aims to provide a critical and constructive study of the topic. The literature of the Quality Management System in Malaysia has been analyzed. Results from these studies often pointed to three outcomes: increased owner/client satisfaction, enhanced firm management and work capacity, and the ability of the project management team to swiftly oversee the development activities throughout the project's life cycle. In order to improve the results, further research should employ consistent performance indicators at the project to evaluate the effectiveness of QMS over large samples.

## **RESEARCH METHODOLOGY**

The questionnaire for this survey was designed using the previously mentioned background data, broad quality perspective, and standard quality perspective. Over 500 surveys have been sent by email, hard copy, soft copy, postal service, and courier service. Buildings of all sorts, including those with many stories for residential or industrial use, are included in this study. Depending on specifics, project costs might be anything from 1 crore to 100 crores. This analysis includes data from the private sector. Data collection lasted for a total of 14 months.

## **DATA ANALYSIS**

Central tendency measurements, including mean and standard deviation, are calculated as part of descriptive analysis. These two help researchers find the means and variances of their study's variables. Descriptive statistics, such as means and standard deviations, are used to summarize large amounts of data and provide light on the characteristics of subsets of that data.

## **PROJECT BACKGROUND ASPECT**

The elements of the project's context need to be investigated thoroughly to ensure that nothing important is overlooked. Included in this category are the ten criteria listed in Table 1.

**Table 1 Factors included under Project Background Aspect**

Sl.No.	FACTOR NUMBER	ASPECTS / FACTORS
<b>PROJECT BACKGROUND</b>		
1.	PBF1.	Knowledge about material resources near the site
2.	PBF2.	Time management on tender submission
3.	PBF3.	Knowledge about the climatic condition
4.	PBF4.	Knowledge about client reputation
5.	PBF5.	Knowledge about the methodology of construction
6.	PBF6.	Knowledge about labour and material cost
7.	PBF7.	Awareness about quality management
8.	PBF8.	Knowledge about codes and specifications
9.	PBF9.	Clarity about contract terms
10.	PBF10.	Usage of latest technology

Table 2 displays the average responses and standard deviations for the 10 variables.

**Table 2 Mean and Standard Deviation values of Factors under Project Background Aspect**

Sl.No.	FACTOR NUMBER	ASPECTS/FACTORS	MEAN	STANDARD DEVIATION
<b>PROJECT BACKGROUND</b>				
1.	PBF1.	Knowledge about material resources near the site	4.076	0.266
2.	PBF2.	Time management on tender submission	4.801	0.400
3.	PBF3.	Knowledge about the climatic condition	4.788	0.409
4.	PBF4.	Knowledge about client reputation	2.915	1.108
5.	PBF5.	Knowledge about the methodology of construction	4.085	0.279
6.	PBF6.	Knowledge about labour and material cost	4.788	0.409
7.	PBF7.	Awareness about quality management	3.731	0.443
8.	PBF8.	Knowledge about codes and specifications	3.865	0.811
9.	PBF9.	Clarity about contract terms	4.000	0.270
10.	PBF10.	Usage of latest technology	4.511	0.501

Table 3 lists the nine discovered variables with mean values more than 3, which may be safely assumed to be the most significant.

**Table 3 Factors under Project Background Aspect with Mean value more than 3**

Sl.No.	FACTOR NUMBER	ASPECTS/FACTORS	MEAN	STANDARD DEVIATION
<b>PROJECT BACKGROUND</b>				
1	PBF1.	Knowledge about material resources near the site	4.076	0.266
2	PBF2.	Knowledge about time management	4.801	0.400
3	PBF3.	Knowledge about the climatic condition	4.788	0.409
4	PBF5.	Knowledge about client reputation	4.085	0.279
5	PBF6.	Knowledge about the methodology of construction	4.788	0.409
6	PBF7.	Knowledge about labour and material cost	3.731	0.443
7	PBF8.	Awareness about quality management	3.865	0.811
8	PBF9.	Knowledge about codes and specifications	4.000	0.270
9	PBF10.	Clarity about contract terms	4.511	0.501

The means of the respondents' answers to each management component were compared using a one-way analysis of variance (ANOVA). In the case of considerations less important than

a factor in terms of how much they value it, in their opinion. Table 4 displays the analysis of 5%, Tukey's B Post Hoc Tests were conducted to identify the group which differs in variance findings for the elements that make up the project's backdrop aspect.

**Table 4 ANOVA Results for Factors under Project Background Aspect**

Sl.No.	FACTOR NUMBER	ASPECTS/FACTORS	SIGNIFICANCE VALUE
<b>PROJECT BACKGROUND</b>			
1	PBF1.	Knowledge about material resources near the site	0.3510
2	PBF2.	Time management on tenders submission	0.0137
3	PBF3.	Knowledge about the climatic condition	0.0690
4	PBF4.	Knowledge about client reputation	0.0217
5	PBF5.	Knowledge about the methodology of construction	0.0720
6	PBF6.	Knowledge about labour and material cost	0.0383
7	PBF7.	Awareness about quality management	0.0380
8	PBF8.	Knowledge about codes and specifications	0.0238
9	PBF9.	Clarity about contract terms	0.0733
10	PBF10.	Usage of latest technology	0.1835

In Table 5, we can see the five components that had a significance level of less than 5%.

**Table 5 Factors under Project Background Aspect with Significance Value Less than 5%**

Sl.No	FACTOR NUMBER	ASPECTS / FACTORS	SIGNIFICANCE VALUE
<b>PROJECT BACKGROUND</b>			
1	PBF2	Time management on tender submission	0.0137
2	PBF4	Knowledge about client reputation	0.0217
3	PBF6	Knowledge about labour and material cost	0.0383
4	PBF7	Awareness about quality management	0.0380
5	PBF8	Knowledge about codes and specifications	0.0238

There are five elements with significance levels lower than 5% that need new ways of

thinking about them.

The most crucial characteristics to think about under project6's background features are those that show up in both descriptive and ANOVA analysis. In Table 6, we detail the four most salient considerations.

**Table6IdentifiedMostImportantFactorsunderProjectBackgroundAspects**

Sl.No.	FACTOR NUMBER	ASPECTS / FACTORS	SIGNIFICANCE VALUE
PROJECT BACKGROUND			
1	PBF2	Time management on tender submission	0.0137
2	PBF6	Knowledge about labour and material cost	0.0383
3	PBF7	Awareness about quality management	0.0380
4	PBF8	Knowledge about codes and specifications	0.0238

In an effort to meet the tender submission deadline, certain details may be left out of the proposal. This will cause future delays and disagreements that are not essential.

A subsequent estimate of the overall cost of a building project may be significantly impacted by early knowledge of labour and material costs. Since this is the case, it is essential to pay prior weight to the element of knowing the labour and material costs at an early stage. The following advantages will result from an increased understanding of quality management.

- Having a reputable standing
- The number of satisfied clients grows
- raise businesses' earnings
- Nocomplains
- Nopenalties
- Workplace satisfaction rating

In terms of the context of your project, understanding quality management is the single most important consideration.

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To prevent mistakes, it's important for all project engineers on a construction team to be familiar with relevant building rules and requirements. The ability to understand codes and requirements may help fix flaws and problems.

## CONCLUSION

Total quality management for building projects has been planned out after identifying the most important issues that might hinder its success. Based on how crucial they are, we have divided them into three categories: very important, substantial, and less significant. It has been determined what crucial aspects are at the heart of successful quality management in building projects. Priority should be given in real time monitoring to the identified essential elements. The components with a lower significance value shouldn't be disregarded, but rather given more weight. Based on the identified crucial elements, it was shown that high-quality training had a greater impact on employee performance.

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