

Foundations of a Successful Site Quality Management System

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Abstract: When it comes to consistently giving clients value and quality, the construction industry is essential. But the industry has been having problems with quality, which has resulted in subpar work, dangerous setups, and overspending. Establishing a Quality Management System (QMS) is important for solving these issues. The QMS offers an organized method for controlling the quality of processes and products, providing client satisfaction, adhering to legal requirements, and minimizing loss and rework. Good quality management system (QMS) implementation requires doing things like Company assessment, preliminary planning, awareness-raising, Progressive enhancement, measurement and control, auditing, specialist instruction, control of records, and distribution. Through data analysis from questionnaires and interviews with builders/contractors, consultants, and customers/building occupants, as well as an examination of small-scale building contractors' quality management practices and their effects on cost-effectiveness, organizational effectiveness, and customer satisfaction, the purpose of the research is to highlight the importance of quality management during the minimal building development the undertaker's executing stage.

Keywords: Implementation; QMS; Quality Control; Quality.

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INTRODUCTION

Building firms face competition in the modern market and need to focus on actual value and consistent quality to stand out and impress clients. It is now more important than ever to develop solid bonds with owners and clients, promote teamwork, and produce work of the desired quality. To achieve these goals, the company must implement a continuous improvement (CI) approach to provide efficient quality control. The quality of a building project directly affects its success. Despite large investments in infrastructure and development projects, the Pakistani construction industry has long struggled with quality difficulties. Low-cost bids are frequently used by contractors to secure contracts, even at the expense of their capacity to fulfill requirements and standards. In the same direction, consultants can face pressure to lower early building costs, which

could result in a drop in the necessary quality. Poor workmanship, unsustainable buildings, and a general departure from the necessary standards are examples of this lack of quality.



Fig.1. Quality management system

Fig.1 shows how to implement a quality management system, which is essential for overcoming these obstacles. Clients usually hire consultants for a limited scope of work during construction to

guarantee quality and safety. The process raises project risks, delays, and overall expenses, nevertheless. All phases of the project life cycle and the classification of construction projects must include quality management. A trait or aspect that embodies the contentment and happiness of project participants is called quality. It includes the efficiency with which something is produced while adhering to requirements and client expectations. The goal of quality management systems, or QMS, is to make sure that goods and services continuously meet or surpass the expectations of the client. There are many advantages to implementing a QMS, such as increased customer satisfaction, regulatory compliance, decreased scrap and rework, data-driven decision-making, and the promotion of a continuous improvement culture.

The important phases of design and construction have a big influence on the results of projects. A QMS is a framework for overseeing and recording the structure, practices, roles, and procedures required for efficient quality control. Incorporating an organization can increase productivity and effectiveness with QMS, which strengthens and unifies the structure. Over 90% of construction project failures were attributed to poor design and workmanship, according to a survey done in London by the National Economic Development Office. This emphasizes how crucial quality control is throughout the execution stage. Time and resources must be committed to the development and implementation of a QMS. It is essential to think about getting support from upper management, examining the organizational framework, organizing, raising understanding, offering professional training, putting in place controls over documents, putting the QMS into place, keeping an eye on and managing processes, performing

audits, and embracing continuous improvement. The success of the QMS implementation as a whole is influenced by each of these categories.

The construction sector involves numerous participants, making it difficult to implement QMS principles. Although establishments need to adjust to evolving surroundings, satisfy customer demands, and maintain their competitiveness. The construction industry is incorporating ideas from the manufacturing sector, such as lean production, reengineering, and total quality management (TQM). Developing a culture of collaboration and teamwork among all stakeholders is necessary for the successful execution of the plan, though. Establishing a strong quality management system is a big job, but it pays off in big ways. Quality-One offers tailored solutions to help businesses create and execute QMS. For successful and efficient deployment, they offer QMS consultation, training, and subject matter expert support.

In the final analysis, success in the construction business depends on giving quality management top priority. Organizations may continuously exceed customer expectations, increase productivity, and promote a continuous improvement culture by implementing a thorough QMS.

LITERATURE REVIEW

The significance of QM in building operations and its impact on a company's long-term competitiveness and survival in a demanding and competing development industry are examined by Tan Chin-Keng, Abdul-Rahman, and Hamzah (2011). It is believed that quality management plays a part in every managerial and operational procedure in a building organization. The research employs semi-structured interviews with members of construction-related

companies to get comprehensive data on the perspectives and experiences of practitioners in the industry. The sample is selected by convenience sampling, with an emphasis on construction enterprises that are currently managing projects and are registered with the Construction Industry Development Board of Malaysia. In the study, it is discussed whether the twelve organizations that were questioned had ISO 9001 certification, five of them having it, and the other two in the process of obtaining it. It is known that ISO certification is a trend in the industry right now for marketing purposes. It's interesting to note that none of the businesses presently use Total Quality Management (TQM), and the ones that don't have ISO certification assert that they use other methods of quality control. The theory of Total Quality Management emphasizes customer happiness, while the primary goal of quality management is contract fulfillment. This study aims to clarify the attitudes and practices of quality management in building projects by highlighting the need to strike a balance between contractual obligations and customer pleasure.

The study by Neyestani (2015) investigates how construction projects in Metro Manila, Philippines, are affected by the application of the Quality Management System (QMS). In-depth literature reviews are included in the study to help readers grasp the idea of QMS, pinpoint important variables in building projects, and look at actual research on the benefits of QMS. A questionnaire was given to 25 managers to gather data, and descriptive statistics were employed in the analysis. The results show that the deployment of a QMS has little effect on quality or scope and has a greater influence on customer happiness, cost, and time. The assessment highlights the need for QMS to be incorporated into all project

management procedures due to its methodical approach, documentation, advice, and auditing. A review of the literature suggests that implementing a QMS based on the PDCA approach can improve problem-solving and project performance. The iron triangle of cost, time, and quality as well as project success and customer satisfaction are important factors in the success of building projects.

However, the research indicates that managers have a propensity to concentrate only on ISO 9001 certification, disregarding additional QMS standards that have the potential to augment quality, shorten project duration, and boost client contentment. According to the review, QMS standards can be implemented in projects and are an effective instrument for enhancing organizational performance. It is advised that future studies investigate sustainable development in building projects by implementing QMS.

The importance of implementing a (QMS) for sustainable development in construction organizations is examined by Sergey Lukichev and Marina Romanovich (2016). The study underscores the need for standards to categorize construction enterprises and identify critical factors for choosing QMS instruments, as well as the lack of a clear algorithm for applying QMS in the sector. The study outlines the primary goals of implementing a QMS, which include meeting or surpassing customer expectations, reducing product rejections or returns, boosting product competitiveness, boosting the company's image, and streamlining internal processes. Based on surveys of directors of Russian companies, the report also outlines the justifications for implementing QMS, including quality as a strategic factor, image enhancement, import needs, supplier demands, and stakeholder

expectations. The quality of the QMS is greatly impacted by the selection of the certifying authority, and certification is not always required. The goal of the ISO 9001:2015 standard is to increase competitiveness in the international market. Although there is a wealth of material on QMS content and implementation recommendations, a thorough methodological companion that takes into account the unique needs of construction companies is lacking.

The study intends to investigate the use of quality management in building projects based on the examined literature that focuses on practices, management commitment, and obstacles. To stay competitive in the present business environment, organizations must look for methods to improve efficiency and quality. There appears to be a disconnect in the application of Quality Management Systems (QMS) between large- and small-scale projects, according to the literature. Therefore, more research is required to evaluate building contractors' quality management practices while taking into account employee and customer satisfaction as well as the efficiency of their products in terms of both cost and time. Moreover, a thorough analysis of the major barriers to the use of quality ideas in the construction industry must be carried out.

In their 2017 study, Lou et al. highlight the value of quality control in intricate urban construction projects and investigate how Building Information Modeling (BIM) may help guarantee high standards. It examines the design elements and layout challenges associated with project quality control in complicated urban developments. The merging of BIM and augmented Reality approaches in particular applications to enhance construction quality in pre-, process-, and post-management stages is

covered in this study. Investigations are conducted into the integration of BIM technology with construction quality management systems, with an emphasis on the effects on construction quality control, the development of urban complexes, and the investigation of quality control techniques. The significance of construction quality in urban complexes is emphasized in the study, along with the benefits of BIM approaches for large-scale project development and efficient construction quality control.

In their 2018 article, Malik, et al. address the application of TQM in the building industry. It highlights how TQM increases market share, stakeholder satisfaction, product quality, customer satisfaction, and quality. This study uses real journals and conferences as sources to review research and literature on TQM adoption in the construction industry. Web searches and questionnaire surveys are used in the research to collect important information. The TQM philosophy is examined as a preventive strategy that emphasizes organizing, comprehending, and planning every task. Although TQM has proven effective in manufacturing and other industries, the article recognizes the particular difficulties the construction industry faces and emphasizes the possible advantages of implementing TQM in this field.

The influence of the Quality Management System (QMS) installation on customer satisfaction is examined by Usman et al. (2019). There were eleven small and medium-sized businesses (SMEs) and twenty-four individual guests in the study. Structured questionnaires were used to collect the data, which was then evaluated using Pareto and histogram analysis. The results point to a good relationship between QMS ISO 9001 and customer satisfaction, process improvement, and meeting client

needs. A company's reputation, profitability, and credibility in domestic and international markets can all be improved by implementing ISO 9001. The research highlights the need to prioritize quality initiatives, especially in emerging nations, to augment client contentment.

RESEARCH METHODOLOGY

In this study, the current Quality Management System in building projects is examined and put into practice. Particularly in the execution stage of a project, the elements that affect its quality are determined. Furthermore, the research goals are to explore the shortcomings in Quality Management and devise methods to surmount them by utilizing the gathered information.

The steps in the research methodology are as follows:

- Review several journals and quality standards to conduct an extensive literature survey.
- Determine the variables that affect quality management based on the literature review.
- Create a questionnaire that takes into account these determined parameters.
- Give the completed questionnaires to individuals who share the same background. Additionally, schedule in-person interviews with contractors to talk about the key challenges they face.
- Examine and analyze the information gathered.
- Analyze the factors that have been studied and develop suggestions and fixes to deal with them in a way that will help the contractors.

A five-point rating system is required for several optional points in the questionnaire survey. The following is a description of the scale: 1 = Very Less, 4 = Strong, 3 = Moderate, and 5 = Extremely Strong. A couple of questions are descriptive and several are yes/no.

DATA COLLECTION & ANALYSIS

A survey instrument has been developed to investigate approaches to improve the quality of building projects and assess quality management practices within the construction sector. The questionnaires were created using information from field professionals, including consultants, engineers, contractors, and project managers, as well as assessments of the literature. These experts in the area have a thorough comprehension of the primary elements that impact quality.

Since the superstructure is where building quality is most often compromised, the questionnaires focus mostly on this phase of implementation. Column work, beam work, slab work, brick or block work, and plastering work are the specific tasks that are targeted in the questionnaire. While many variables affect the quality of construction, this project only considers the most important ones, including manpower, material and equipment quality, detailing, pouring and curing concrete, and concrete quality.

There are numerous types of questions in the questionnaire, such as scaling, contingency, and Yes/No questions. It can be defined as the following: the ratio of the total number of responses to the sum of products of the frequency of receiving the same score (low, medium, or high). The Impact Index is useful for assessing the contribution of defect-causing causes. It's employed for factor ranking. The impact index is used to rank the factors in this study. Impact Index is provided by

$$\text{Level of Relevance} = (\sum F r \times r/N)$$

Where, r= severity score;

Low-1, medium-2, high 3, F- frequency of r-scoring variables.

N- total number of participants

DISCUSSIONS AND RESULTS

As part of the research approach,

twenty pairs of questionnaires were given to the construction project attendees, taking into account their previously specified roles and experiences. Responses from 96 responders in all were received, reviewed, and thoroughly assessed. The results of five carefully chosen questionnaire questions are the main topic of this discussion.

The respondents stated that using checklists is the most common quantity management strategy used in building projects. Histograms, control charts, statistical analysis, flow charts, & other tools are also thought to be necessary in handling aspects connected to quantity.

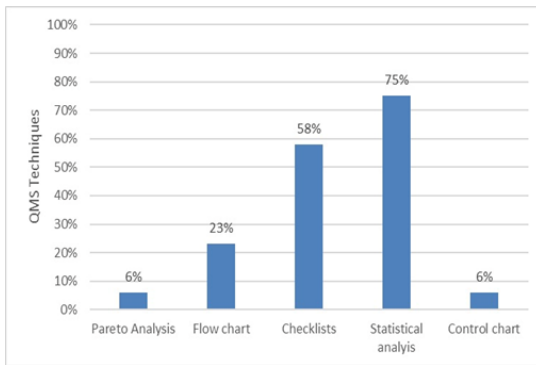


Fig. 2. Quality Management Techniques

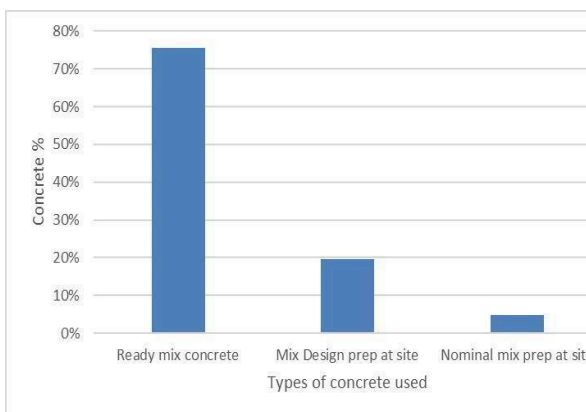


Fig.3. Kind of Concrete Use

In the construction industry, quality control refers to the ongoing inspection and verification of building materials, labor, and procedures to make sure they adhere to

established norms and specifications. This includes procedures including testing, paperwork, and inspections to ensure compliance. To protect employees, guests, and the general public from potential risks found on building sites, safety precautions are essential. These measures include following safety procedures, wearing personal protection equipment (PPE), conducting routine safety inspections, and offering training courses to employees to teach them safe work procedures. Employee education is important for providing employees with the abilities and information needed to carry out their jobs safely and effectively. Programmers for training cover a wide range of topics, including construction methods, machinery operation, safety protocols, and regulatory compliance. Depending on the nation, area, or sector, different standards and laws may apply. To ensure a safe and high-quality work environment, construction businesses and project managers must become familiar with the relevant legislation and requirements.

The first factor that determines the importance of a QC system in building projects is how satisfied customers are, which is followed by factors like competing marketplaces, customer and customer approval, and management loyalty.

Table 1. Critical Elements of QMS Maintenance

Sr./No	Major elements for sustaining QMS	Level of Relevance
A	Client fulfillment	2.49
B	Management motivation	2.32
C	Stakeholders' satisfaction	2.40
D	the customer contentment	2.41
E	competing marketplaces	2.52

The standard of supplies utilized in every construction project is given top priority by the quality control procedures put

in place at construction sites. Additional precautions include following recommended curing and de-shuttering schedules, conducting appropriate testing and sampling, preserving the order of construction, creating quality control procedures, defining roles and responsibilities, guaranteeing high-quality workmanship, conducting routine or weekly inspections, and hosting staff site reviews.

Table 2. Monitoring Techniques for Quality

No.	Monitoring Techniques for Quality	Level of Relevance
A	Material quality in every building activity	2.59
B	Examine obligations & responsibilities.	2.47
C	Establish protocols to manage quality.	2.50
D	The standard of quality across all building operations	2.49
E	Staff meetings for site reviews	2.47
F	Observe the shuttering and curing schedules as recommended.	2.45
G	Make the construction process intact.	2.51
H	Make sure you sample and test properly.	2.52
I	Routine or weekly inspections.	2.45

CONCLUSION

Construction sites have been showing signs of utilizing checklists, which is a very effective quality management tool. The most common kind of concrete used is ready-mix concrete (RMC). The results obtained from the survey participants suggest that large-scale construction projects heavily prioritize quality control, safety protocols,

and personnel training, but small-scale construction sites tend to disregard these aspects. Customer satisfaction has become the most important factor in maintaining a strong Quality Management System (QMS). Furthermore, the most commonly used quality control metric has been determined to be the quality of materials used in all building activities.

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