

TQM in Construction Management: A Review

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ABSTRACT

With the advent of present policies of liberalization, Privatization and globalization the economic scenario has completely transformed in last one and half decade. By way of the continuous inflow of Multinationals and trend towards Global bidding, our construction companies have to face tough competition within the country as well as outside the country to win the contracts. They have to be competitive in terms of cost, time (Schedule) and Quality of a construction project to be ahead in the bidding run. If we study the total construction process for a particular project right from inception of the idea to start up and finally execution and making it open for use, at each and every phase quality management is required to get an end product which is possessing total quality thus having zero defect from the point of view of customer. To stand today in the competition what construction firms must strive today is not only for customer satisfaction but also for customer delight one step ahead of customer satisfaction. Total Quality Management is a beliefs which can bring about revolutionary change in construction Industry by completion of construction projects with trouble free structures and longer life and thus help in becoming global. In this seminar report an attempt is made to understand TQM in a detailed way and implement it in an appropriate way in future.

KEYWORDS: TQM, Construction, Six Sigma, etc

INTRODUCTION

Small A key to achieving success is assembling a stable and strong management team. Quality is never by chance; it is the outcome of intelligent efforts that have to manage. The essence of quality management is to apply the knowledge and make it productive to achieve the desired quality. A theory of Total Quality Management (TQM) is necessary for the modern construction era as quality has become a parameter we evaluate or evaluate by others. Numerous questions like what is it, how it is measured, how it is controlled, how to improve it, etc. must be answered to get the required quality. Quality management is often the complete process that answers all such questions.

Construction projects involve various functions across different segments and activities. Yet, the one thing they all offer is their longing to deliver quality work on schedule and within the financial plan. Quality management is the foundation for construction projects and plays a significant role in

defining whether the project is a success or a failure. Every construction company desires to deliver quality work, as it has become the company's judging criteria and plays a vital role in building its reputation. Quality management in Construction involves putting the policies, processes, and procedures to improve the approach and methods to deliver the aimed quality and match the required standards, for any company, establishing the internal and external principles and the guidelines results in quality.

A. Total Quality Management in Construction

The concept of Total Quality Management (TQM) aims to improve the organization's ability to achieve quality and deliver the desired output to the client on a continuously improving basis. There are a few differences between the traditional and total quality management systems.

- a. TQM is process-oriented rather than the result-oriented traditional approach.

How to cite this paper: Prof. Aditi Sonawane | Pooja Pramod Ghule | Disha Atul Paresh "TQM in Construction Management: A Review" Published in International

Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-7, December 2022, pp.822-827,

URL: www.ijtsrd.com/papers/ijtsrd52445.pdf



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- b. TQM prioritizes quality, flexibility, and services rather than the cost.
- c. TQM involves a more horizontal organizational structure than the traditional vertical management system.
- d. TQM presumes that profits follow the quality and not vice-versa.
- e. A portion of the advantages derived from TQM include; a decrease in quality costs, more significant levels of representative and customer fulfilment, less remedial work, fewer deferrals, and closer associations with subcontractors and vendors.



Fig. 1: Time, Quality and Cost

Time, Cost and Quality

Time cost and quality are three important factors in planning and controlling construction projects. Getting these factors in balance, which minimizes the project duration, the total project cost, and maximizes the total quality, could define the success of a construction project. Aside from planning and estimating the project properly, a consideration of uncertainty while implementing the project is needed to represent a more realistic outcome for time, cost, and quality trade-off (TCQT) problem in construction projects. A quality performance is being considered in recent contracts in addition to time and cost factors. Usually, the use of low-technology methods and inexpensive resources lengthens project duration.

Applying new technologies and productive resources may reduce project time, but at increased project cost. Construction project quality may decrease as project time or cost is reduced. As a result, the deterioration and aging of relevant construction projects that involve bridges, tunnels, and highways, for example, may occur faster than expected and the cost of maintaining, rehabilitating, or rebuilding the system may be higher than expected. Therefore, construction planners often balance three contradictory objectives including project time, cost, and quality in practical project.

Getting the time, cost, and quality of the construction project in balance then becomes a significant criterion to judge whether the project is successful or not. Repetitive construction project is dominant in the construction industry. A repetitive construction project is a project whose activities are repeated in similar or identical units.

LITERATURE REVIEW

P. Mohan Anjani Kumar et. al. (2021) studied an empirical case study and approach on TQM in a stipulated construction firm. In comparison to other sectors such as manufacturing and service, the construction sector is perceived to impose a low value on performance. TQM is implemented by very few construction companies in this world, and the top-down technique is widely used. To incorporate TQM in a company, top management must contribute to a "bottom-up" strategy by creating a "Quality Circle." According to this study, the first and most important criteria for introducing TQM in construction firms is top management involvement, other obstacles that companies must overcome include a lack of education, lack of confidence, lack of common trust, a lack of skilled staff, market competition, weak strategies and requirements, bad behavior, the availability of experienced field managers, and so on. In this approach, one case study is analyzed to show how Total Quality Management (TQM) is efficiently applied by using a "bottom-up" approach and creating a PMO in an Indian construction company. After some study of the Pareto graph, and identifying root causes using Root Cause analysis, experience is applied in the provided studied construction firm to apply TQM. Following that, a method for applying TQM in a building company is suggested. [1]

Manjunathgouda. M. Patil et. al. (2017) studied assessment of maturity level of total quality management in construction industry. The purpose of this paper is to study the implementation of Total Quality Management (TQM), its and degree of awareness of TQM in Indian construction industry. This paper fills the gap in the literature by studying the implementation of TQM in construction industry. The implementation of TQM in construction industry is complex as it is different from other sectors. The implementation is at development level and mostly restricted to corporate firms. TQM is generally believed of some significance rather than great importance to the construction organizations. Hence

to establish that there is need to change this understanding of Proprietors (clients), Project Managers, Engineers, Government bodies, this topic is chosen. An attempt is made to study the adoption of quality management practices in Indian construction industries and the maturity level of TQM in construction projects. To know the desired information a standard questionnaire is prepared after consulting experts and reviewing literatures. A survey has been conducted amongst all class of contractors and government bodies in different capacities and about 75 samples are collected. The analysis made gave clear picture of status of implementation of TQM in construction industry and the level of TQM literacy. More than 48% responses indicated that their companies have implemented a formal quality management system, and about 51% of engineer's indication of not knowing TQM principles needs to be addressed through structured awareness programs covering state agencies. It is observed that, the training covered for laborers is below average and needs to be increased as this component is most crucial in producing quality product. About 50% of the engineers suggested that construction industry is a rather unorganized sector in India and by implementing TQM the industry will become better organized. [2]

N. Y. Zainun et. al. (2017) studied An Overview of Total Quality Management (TQM) practice in Construction Sector. In construction sector TQM can be termed as a philosophy which guides construction professionals on the proper execution of construction projects in terms of quality. The aim of this paper is to discuss on quality management practice in construction sector. This paper evaluated five previous researches and the findings were discussed to find a conclusion of TQM practice in construction sector. The study found that TQM had been successfully practice in construction sector at Saudi Arabia, India, US and South Africa. Application of Artificial Neural Network (ANN) helps to improve the implementation of TQM in construction sector. In conclusion, quality management practices will give better control of processes in construction sector. [3]

Fatemeh Nouban et. al. (2017) overviewed on the total quality management in construction management. Total quality management (TQM) is a management idea, broadly applied to the construction and the service sectors. It can enhance the quality in the areas in question. Some studies attempted to shine the light of this idea to construction management. Nevertheless, construction management is yet to accept the concept of TQM. Construction corporates have constantly been pushed back and forth between

the implementation of the concept and following the traditional management methods. Since its early beginning, the construction industry has revoked change. Unfortunately, TQM principles are yet to be applied to the entity of construction sectors. There are many contractors that have succeeded in implementing TQM in their corporate. Their number decreases at the practical approach of their suppliers and subcontractors. The aim of this paper is to pinpoint the latest studies made on the elements that affect the implementation of the principles of TQM in the ground field of construction management. [4]

Shreyas Gowda C. H. et. al. (2015) studied total quality management in construction. The primary purpose of TQM is to provide excellence in customer satisfaction through continuous improvements of products and processes by the total involvement and dedication of each individual who is in any way a part of that product/process. It is a structured approach to improvement. If correctly applied, it will assist a construction company in improving its performance. Unfortunately the Construction industry has lagged behind other industries in implementing TQM. The main reason for that has been the perception that TQM is for manufacturing only. One aspect of TQM that has frustrated the construction industry the most has been "measurement". The main aim of this work was to produce a measurement model - with tools and methodologies for the recognition and measurement of construction processes for continuous improvement and client satisfaction. Analysis of questionnaire survey indicates that the major obstacle to implement a TQM program is changing the behaviour and attitude, lack of expertise/resources in TQM, lack of employee commitment/understanding, lack of education and training to drive the improvement process. The Client Satisfaction Index, the Cause and Effect Diagram and the Improvement Index were developed to find out the major sources of client satisfaction and dissatisfaction in the construction industry. The outcomes of this survey show that customer satisfaction can be greatly raised by improving construction underestimation, project management, coordination, pattern changes by clients and change orders from procurement department. For the local construction industry, this project has the potential to demonstrate tangible benefits of using TQM in their organizations. [5]

Sharma Pankaj et. al. (2013) point outs that, though the concept of TQM originated few decades ago but it has not been implemented in every industrial sector. Most of the small scale industries especially in developing countries consider investments required in TQM implementation as a burden and thus try to

avoid it. They instead go for ISO certifications which generally look effective on paper. Until and unless organizations don't focus on basic principles given by the concept of TQM like involvement of top level management, creation of suitable working culture, proper training and empowerment of employee etc. no new concept/technique can do wonders for quality improvement. The implementation of TQM in construction industry is complex as the construction industry is different from other sectors.

Construction industry is distinctive in its operations like:

- Mobility of staff.
- Diversity in the types, forms, and shapes of construction projects.
- Geographical location.
- Contractual relationships.
- Change in work force.
- Variation in materials properties and standards.
- Change in machineries.
- Plants and equipment's for different projects. [6]

James Harrington et. al. (2012) focused on quality assurance and quality control and its application during project implementation, while TQM is a strategic philosophy adopted by an organization and implemented on a continuous basis, even if the organization is waiting to carry out a new project. Many models developed for the implementation of TQM in construction industry were reviewed and opined that these models are only guidelines as it is difficult to devise a universal "cookbook" for TQM implementation. It is also pointed out that TQM gives a great amount of flexibility for developing solutions and each organization must develop its own structure and each manager should develop his mind set of quality management system and the solutions which are not directly transferable from one organization to another. It is concluded that implementing TQM is one of the most challenging tasks for any organization and successful TQM implementation requires a systematic, pragmatic, and well-structured approach. [7]

Ahmed S. Agha (2012) states that, the construction industry has arrived late to TQM is that the construction professionals unaware of the TQM principles and techniques. To bring these benefits to the construction industry, more efforts must be made to spread the culture of TQM among the construction professionals and TQM courses must be in the engineering under graduated programs. [8]

Abu Hassan Bin Abu Bakar et. al. (2011) aimed to identify aimed to identify the level of effectiveness of the implementation of TQM principles by the construction contractors in the Sultanate of Oman in the top grade construction company as per classified by the Chamber of Commerce and Industry of Oman. Important factors were taken into account relating to the internal customers (the staff) of these companies. A quantitative research approach was adopted in this study, where the questionnaires were distributed to 114 top staff of excellent and one grade contractors to identify the level of quality practices in their organizations and ascertain that they follow the rules of total quality management or not. For analyzing purpose, chi square test, frequencies and response rate are used in this paper. They found that these companies generally take into account the principles of total quality management. [9]

Kazemi (2011) investigated the implementation of TQM within small and medium size construction enterprises (SMEs). It presented information about the current practice in the construction industry, critical success factors for implementing TQM, primary barriers to the implementation process, and a general proposed framework for TQM implementation in construction related organizations. He indicated that TQM is generally believed to be of certain significance rather than great importance to the construction organizations and there is need to change view point of owners, project managers, engineers and government bodies in implementing TQM. [10]

SinaAvsar et. al. (2006) pointed out how construction professionals implement TQM and its tools in their projects in the different stages (design and construction) from the results and conclusions from case study of „the construction of a 22-km² reclamation area in New Doha international airport (NDIA) it's clear that TQM is not a fad and how much benefits that TQM can bring to your construction business (improve business quality, increase customer satisfaction, reduce cost, save time and much more). [11]

Enno Ed et. al. (2003) stressed about QES (Quality Environment and Safety) management systems concerned with actions that can create an organizational setting in which workers can be trained and motivated to perform safe, healthy, and productive construction work which satisfies customer needs. They indicated that the process is a plan-do-check-action (PDCA) process which is nothing but a part of TQM. [12]

Pheng et. al. (2004) indicated that the problems that construction firms may face during the implementation phase of TQM include managers failing to understand the TQM concept and philosophy, contractors being more inclined towards profit, initial costs of implementing TQM being perceived to be high though these are offset in the long run. Also TQM may not be so feasible for small firms, employees within the organization may be resistant to change, which will render TQM education and awareness more difficult. He opined that, in spite of these problems, TQM embraces the philosophy, principles, procedures, and practices necessary for providing customer satisfaction as well as achieving productivity and business performance in the construction industry. [13]

Ngowi (1997) conducted a survey that targeted both management and an artisan category to know the impact of TQM application. It covered 100 construction companies in Botswana. Two sets of interviews, one for managerial staff and the other for artisans were conducted. The questions were based on the key features of TQM. The survey results indicated that, in general the adopting the key features of TQM often are at variance with the national culture. It does not mean that, the latter should change in order to be consistent with the former. The essential thing is to create the awareness of this inconsistency and to develop a tool that can find out the items that should be addressed so that conflicts can be minimized. [14]

Deffenbaugh (1993) opined that major challenge in implementing TQM in the construction industry is applying its principles on the jobsite. [15]

Faihan et. al. (1992) studied the relationship between total quality management practices and contractors Competitiveness Purpose was to ascertain correlation among TQ management tradition as well as contractors competitiveness. He Examined the correlations among diverse total quality management traditions with competitiveness. [16]

Jha and Chockalingam predicted the quality performance using artificial neural network, with evidence from Indian construction project. The purpose was to allow construction project team members to comprehend the factors that must closely observe complete projects with an anticipated quality and to predict quality performance of a project. He Investigated answers and conclusions, and factors including, project manager's competence, observing and response of project participant, good direction between project participant and availability of taught resources significantly affects quality performance criterion. [17]

Erande and Pimplikar TQM in Indian construction industry. The purpose of the study was to find out whether weather TQM is transforming customer needs into proper technical requirements for each stage of process development. Study is conducted in quest of finding solutions for TQM implementation in construction industry. [18]

Harrington et. al. Applying total TQM to the construction industry Purpose explained quality and output problems with progress opportunities sighted in construction industry. It concludes to show lack of good research to improve approaches in construction work as an undesirable profession, also determines a slow change from quality control (QC) to total quality management (TQM). [19]

Joubert et. al. The implementation of total quality management system profit South African construction companies. Purpose was to explore reasons for poor quality South African construction industry and if implementation of a TQM system will improve the situation. Workers in South Africa construction industry do not have adequate training to deliver the anticipated results. [20]

Acknowledgment

We would like to place on record our deep sense of gratitude to **Prof. Aditi Sonawane** for her generous guidance, help and useful suggestions. We express our sincere gratitude to **Prof. Aditi Sonawane** for her stimulating guidance, continuous encouragement and supervision throughout the course of present work and also for providing us infrastructural facilities to work in, without which this work would not have been possible. We also wish to extend our thanks to all the staff members of MITCOM and MIT ADT University for their insightful comments and constructive suggestions to improve the quality of this work.

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