



**RESEARCH ARTICLE**

**A STUDY ON FACTORS INFLUENCING TOTAL QUALITY MANAGEMENT PRACTICES IN CONSTRUCTION INDUSTRY**

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**ABSTRACT**

The present study is carried out to discuss the aims of TQM, basic factors influencing and benefit of implementing TQM in construction industry. In the recent literature much has been written about what constitute the basic ingredients or philosophical pillars of TQM the number and priority of the element vary from one another to another and their importance might vary from one organization to another.

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**INTRODUCTION**

With the ISO 9000 standard gaining popularity worldwide total quality management (TQM) has become strategic and survival approach for most firms in every industry. TQM is a complete management philosophy that emphasizes overall satisfaction through the continuous improvements to products and processes. Notably, TQM is concerned with customer satisfaction and is not merely a slogan. Since 1988, TQM has been codified in a national award (the Malcolm Baldrige National Quality Award) in the United States, "customer satisfaction," once the most criteria in TQM evaluation, has been transformed into "customer relationships and satisfaction" in the category of customer and market focus. Obviously, customer satisfaction is a key factor in achieving quality improvement. The construction industry has many characteristics common to manufacturing and service industries. In the construction industry, customer satisfaction demands on performance are in accordance with contractual duties, obligations and responsibilities. Total customer satisfaction has never been a goal for designers, construction managers, subcontractors and material suppliers. It is hard to achieve higher satisfaction level by any single project participant. However, there is no doubt that making customer (client) as satisfied as possible is an essential task for any firm in the construction industry regardless of the construction-related products or services they provide.

The construction industry in many parts of the world suffers from problems such as workmanship defects, time, and cost overrun. Consequently, beginning in the 1990s, numerous governments and business organizations initiated reports, such as the Yeldham and Gyles' report (1992) in Australia and the Latham report (1994) and Egan report (1998) in the UK. These reports have been critical of the construction industry for its poor performance and history of waste and rework, coupled with chronically low levels of customer satisfaction.

A need for change becomes inevitable in order to improve the condition of the construction industry. According to Love *et al.* (2000) and Nesan and Holt (1998), the industry problems will remain until each organization in the procurement of construction industry begins to take the responsibility for initiating changes within their own organization. Such change can be initiated through the effective implementations of a total quality management (TQM) system.

**Aims of TQM**

**The International Academy of the American Society for Quality has defined TQM as**

The management approach of an organization centered on quality, based on the participation of all of its members and aiming at long-term success through customer satisfaction and benefits to all members of the organization and to society.

The aims of TQM are to achieve customer satisfaction, cost effectiveness, and defectfree work through a relentless pursuit of the "war on waste." The customer will be satisfied only if the product has a very low rate of defects (literally none or zero) and is competitive in price with offerings from other suppliers. TQM achieves customer satisfaction through focussing on process improvement, customer and supplier involvement, teamwork, training, and education. TQM is a culture advocating a total commitment to customer satisfaction, through continuous improvement and innovation in all aspects of the business. The customer, in the ideal culture, does not mean only the final recipient of the organization's end product or services.

The "customer" is also every individual or department and stakeholder within the organization.

**TQM and the construction industry**

The development of the TQM concept originally took place in the manufacturing industry. Thus, most literature addresses that industry and this gives the misleading impression that the

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TQM concept cannot be applied to any industry other than manufacturing. One of the main principles of the TQM concept is to achieve customer satisfaction and this is an important objective for any organization, including construction firms. However, the implementation of TQM might differ from one industry to another.

The construction industry differs from the manufacturing in such a way that makes introducing TQM more challenging. While the manufacturing industry is characterized by steady-state processes, the construction industry is usually a onetime process (uniqueness). Construction industry is also unique in the following ways:

1. The mobility of staff;
2. Diversity in the types, forms, and shapes of construction projects;
3. Geographical dispersion;
4. The contractual relationships;
5. Frequent prototyping of projects; and
6. The subtle forms of waste that often go unnoticed.

The construction industry has tended to confuse TQM with quality control (QC) and quality assurance (QA), believing that compliance with QA standards such as ISO 9001 and 9002 is all that there is to the application of TQM on construction projects ( Jaafari, 2001). This confusion has led to the use of these expressions interchangeably. QA and QC may be considered as separate and related sub-elements of total quality (TQ).

However, QA and QC do not represent the only elements of TQM, as it is a much more comprehensive and broader concept. QA and QC are applied 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 perform a new project.

The TQ culture varies from one company to another and from one industry to another. However, the TQ culture, regardless of its differences, aims to achieve common objectives: namely, removal of waste, reduction of costs, improvement of reputation, and increased market share. As can be observed, TQ objectives are dynamic in their nature and this dictates continued updating and upgrading.

### **Basic elements of TQ**

Much has been written about what constitutes the basic ingredients or the philosophical pillars of TQM. The number and priority of these elements vary from one author to another and their importance might vary from one organization to another.

Also, most of the literature which addresses the elements of TQM is old. The recent literature to address TQM does not emphasize the elements, since these elements have been exhaustively addressed in the literature that appeared when the TQM was in its introductory stage. Sufficient writings about TQM and its elements appeared in late 1980s and early 1990s and its eventual morphing into the Lean Six Sigma movement, as it is known today. If there was a consensus, it would include the following ten components.

### **Leadership and management commitment**

All implementations should begin with leadership and management commitment. They are absolutely essential for

the success of any TQM program. Prior to management commitment, management should have a thorough understanding of TQM. This commitment must be coupled with support to make it happen. Once management is committed to TQM, it will provide the necessary resources of time and money to permit improvement. Senior management, in the form of a Quality Steering Committee, might need to draft a vision and mission statements, which summarizes the organization's philosophy with emphasis upon customer satisfaction and quality.

An advisory committee is responsible for establishing and developing the policies and procedures for the TQM implementation process. The committee members should be capable of determining the needs of the organization, opportunities for improvement, and goals for improvement initiatives.

TQM requires employees to do things differently; therefore, participation by management is essential. To achieve the changed behavior of the staff and improve quality, it is very important to change the organizational environment. Without these fundamental cultural changes, an organization's attempt at TQM will fail. This fundamental change cannot be achieved unless management has a long-term obsession with quality work and continued improvement (Culp, 1993). Management should learn to deal with challenge. They should cause changes and not continue to execute policy and cope with existing organizational systems.

### **Training**

Training is a fundamental element for any successful quality management program. All of the current band of "quality experts" or "gurus," along with many chief executive officers who have successfully implemented TQM in their organizations, unanimously recognize the importance of training. The training program must target everyone in the organization, since quality under the TQM umbrella is everyone's responsibility. All employees from top management to labor should understand: the need for TQM, understand what TQM is, how it works, and its payoff.

Any training program should include an orientation to the basic concepts and procedures of TQM. This provides employees with a fundamental knowledge which can later be linked to more advanced topics. TQM requires a participative, disciplined, and organized approach to improving process, thus team training is also very important. The training program should cover topics as cause-and-effect analysis, team problem solving, interpersonal communication and interaction, rudimentary statistical methods, cost of quality measurement, and the collection and evaluation of quantitative information.

### **Communication**

Good communication is very important in achieving TQM levels of performance excellence. Good communication will result in eliminating fear. Fear makes employees reluctant to voice their opinions or question policies, procedures, and decisions. In other words, fear prevents employees from being involved. Deming's advises, "drive out fear." This requires a change in management behavior. An employee should know the reasons for rejection of his/her work. The employees should also know the use and the importance of the work he/she produces. If the message is not clearly communicated to

the employee, then this could be interpreted to mean to him/her that he/she has no value.

TQM is a conscious process of improvement, and thus good communication and a good feedback system are important to convey ideas to management and to incorporate the necessary changes. One effective strategy might be open lines of communication that allow direct access for any employee, at any level, to contact upper management regarding an idea for improvement or a particular concern. Prior to adopting open lines of communication, employees and management should be trained in this system. Otherwise, it will be an ineffective theoretical approach. It is very important that management reacts to the concerns and ideas of the employees.

### **Teamwork**

Under TQM, teams are very important in achieving an organization's goals. It has been noticed that individuals working together in teams or groups toward common goals are generally more effective than individuals working alone. TQM recognizes that the team approach should not be limited to the internal organization's team, but it should cover vendors and external customers under its umbrella. TQM benefited from the successful experience of "quality circles" in Japan. The essence of quality circles is to have collective awareness and efforts to achieve quality.

The construction project team leader should not play the authority role but rather act as facilitator for these meetings. It is assumed that the team leader should be skilled in such areas as communication, group dynamics, statistical methods, problem-solving methods and techniques, and group leadership.

### **Customer satisfaction**

The main objective of TQM is to achieve customer satisfaction whether the customer is internal (e.g. department in the same organization) or external (e.g. final product recipient). The first step in achieving customer satisfaction is to define the customer's needs and wants and then translate these needs and wants into standards. Customer satisfaction should be limited to meeting the customer's expectations, but it should try to exceed then through continuous improvement. In order to meet the customer's expectations, the organization must adopt an information-gathering program that measures the level of customer satisfaction. Such a program will help the organization to identify areas of dissatisfaction, so corrective action can be taken to eliminate the source of dissatisfaction. Customer satisfaction in the construction industry can be achieved by implementing the following steps:

1. Make the customer (internal and external) aware of the organization's quality management initiative;
2. Determine customer expectations;
3. Measure the customer's degree of satisfaction; and
4. Take action to improve satisfaction.

### **TQ and measurement**

In order to discover the results of deploying a construction quality program and the areas of future improvement, construction-related quality measures are necessary. Under a construction industry TQ program, a number of measures can be used to verify and control the inputs and outputs in order to meet the customers' (internal/external) requirements. The

measurements provide the organization with baselines for current performance and the degree of improvement after implementation. For example, increasing the employees' satisfaction with the intention of increasing construction project productivity requires measuring employees' satisfaction and initial productivity. Later, when the recommendations for the actions to improve both stakeholders' and employees' satisfaction are launched, both the satisfaction and productivity levels must be remeasured. It is very important to examine the effectiveness of the construction project improvement activities. The costs of increasing employee satisfaction vs the financial gains of the productivity increase are studied.

Improved communication, recognition, removing fear, and leading employees to work with pride result in an increase in employee satisfaction, which, in turn, materialize in their work quality and quantity (productivity). Furthermore, the satisfaction of the employee reflects on his attitude toward others namely his customers and this is important in some businesses (e.g. services) where the attitude of the employees is the marketing tool. In fact, there are a number of reasons for adopting construction project-related quality measurements which may be achieved:

- To be able to attain and sustain reasonable construction project objectives;
- To justify the use of construction project resources;
- To provide standards for establishing construction-related comparisons;
- To determine construction project priority areas that require improvement;
- To provide a scale to allow people (employees) to monitor their performance level;
- To identify construction-related quality problems; and
- To detect any decline in performance.

The main components of any organization, construction or otherwise, are – human resources (employees), process, external customers, suppliers, and other resources (material and equipment). All these elements are governed by management and organization policies and procedures. The construction quality journey considers all these elements and tries to improve them, and different measures and the desired results should be designed for each element.

### **Continuous improvement**

In the words of Oswald and Burati (1992), "Total Quality Management is often termed a journey, not a destination." This is because of its nature as a collection of improvement-centered processes and techniques, which are performed in a transformed management environment. The concept of "continuous improvement" holds that this environment must prevail for the life of the enterprise, and that the methods will become routinely used on a regular, recurring basis. The improvement process never ends; therefore, "no true destination is ever reached." Management under TQM must be supportive to the advancement of technology and management techniques. Major shifts in the levels of performance can be achieved through innovation. Deming's (2000) "plan-do-check-act" (PDCA) cycle is a systematic procedure for improving methods and procedures by focussing on correcting and preventing defects. Avoiding defects by building in quality

is usually less costly than the typical approach of attempting after the fact to determine defects through inspections. The PDCA cycle can maintain any improvement and prevent deterioration.

Continuous improvement entails focussing on processes so that they can be changed to be more efficient. The degree of success can be determined by comparing the progress against certain criteria. The process of measuring and comparing the degree of success against predetermined criteria is known as "benchmarking." Benchmarking is a systematic search for best practices that leads to superior performance.

### **Process improvement**

Process improvement has a mutual relationship with continuous improvement. In some literature, process improvement is referred to as statistical methods or statistical process control because measurement and analysis of data are very important for process improvement. Accurate data are very important for both employees and management to make better decisions regarding process improvement. Quality improvement teams can be formed in any organization to examine the processes. The quality improvement team should consist of a representative from each area that might be involved in a process.

The team has to identify and separate causes of quality problems and propose solutions. The proposed solutions should then be screened and the best solution(s) should be selected for implementation. Subsequent performance should be measured and evaluated to determine if further action is necessary. Several tools can be used by the quality improvement team to assist it in studying processes. These tools include histograms, cause-and-effect diagrams, check sheets, Pareto diagrams, graphs, control charts, and scatter diagrams.

### **Focus on employees (empowerment)**

TQM views employee satisfaction as an essential factor in improving the contribution of each employee. TQM considers the employees as internal customers with whom the company exchanges information and services. TQM promotes the concept that employees are customers of each other. As a result, each employee should try to satisfy his or her internal customers. This can be achieved through training and management emphasis.

Management should encourage suggestions and make the working environment open, so honest comments can be made without fear of punishment. More specifically, management should implement a procedure for taking action on those suggestions. Failure of management to act on suggestions within a reasonable time will discourage employees from spending time in preparing their suggestions. Recognition and reward should be extended for valuable suggestions to the organization. It might be also helpful for an organization to conduct an employee survey to determine employee attitude about quality, management, safety, and working conditions. Such a survey will serve two purposes. First, it will send a message to the employees that the management cares about the needs of its employees; second, it will identify areas that need to be improved. The survey can be conducted as a one-to-one interview or it can be a written survey. The result of the survey

should be shared with top management and with employees. Sharing the results with employees will indicate to the employees the management sincerity.

### **Supplier involvement**

TQM recognizes that the quality of any stage in a process is dependent on the quality of the previous stage. For example, carpenters frequently complain that they must adapt to work done by electricians or plumbers. There must be careful identification of requirements and respect for each others' valid needs. Thus, TQM pays attention to the suppliers or vendors of both labor and materials. Maintaining close and long-term relationships with suppliers results in achieving the best economy and quality. Having close working relationships with a small number of suppliers means that each supplier can be given larger orders, which helps win their loyalty. Conducting frequent and routine visits and other communications can help to enhance the relationship between the supplier and the organization. Maintaining a close relationship and open communication with the suppliers help them to have a good understanding and a feel for their customers' requirements. This can result in better products satisfying the needs of the organization.

Although multiple sources can provide the organization with flexibility in case of problems or supplier's failure to meet the delivery date, multiple suppliers require sizeable resources of the organization to service a large supply base, and this results in higher cost. The high cost of servicing a large supply base can be more than the possible saving yielded from the competition among multiple suppliers (Burati *et al.*, 1992; Stuart, 1993).

### **Benefits of TQM in the construction industry**

However, many of the major benefits of a TQM program have not been achieved in construction, such as the increased awareness and focus of all employees on satisfying internal and external customers. Management objectives such as customer satisfaction, meeting specifications, larger market share, higher productivity, zero defects, X percent increase in sale, and Y percent decrease in costs can be achieved by embodying TQM ethics in all aspects of the organization, and those objectives become a natural consequence.

### **General findings about TQM implementation**

A 12-month research project conducted in 2002 (and updated in 2009) revealed that substantial improvements in meeting quality requirements can be achieved by the use of quality management practices in the construction industry (Rumane, 2010). Implementing TQM is one of the most challenging tasks for any organization. There is no definitive procedure for implementing TQM. However, there are some common steps that have proven to be effective. The first step in any attempt to implement TQM is to determine where to begin. Determining where to begin is a very difficult step. Successful TQM implementation requires a systematic, pragmatic, and well-structured approach. There have been many different approaches suggested for TQM implementation. Those different approaches complement each other.

Early advocates in the construction industry have proposed models for the implementation of TQM, including Burati *et al.* (1992), Longenecker and Scazzero (1993), and Oakland

(1994). However, these models were only guidelines as it is difficult to devise a universal “cookbook” for TQM implementations. The effectiveness of each TQM implementation guideline differs from one industry to another and from one organization to another. Teixeira (1999) concluded his paper “How to navigate in the sea of quality management literature” by stating:

The fact that TQM does not have a universal definition leaves a great amount of freedom to those developing solutions under its main guidelines. As solutions are not directly set of Quality Management (QM) and any tentative desire to theorize QM must take this into account.

### **Summary and new direction**

This paper has addressed the TQ concept in general and the elements of TQ as they can be applied to the construction industry. The TQM elements that have been presented in this paper will be utilized as a basis for a TQ in Construction Data Questionnaire. The partial literature review related to TQ in the construction industry has also been covered. The underlying principles of construction systems must never be put aside and their content should be considered carefully. For example, the construction industry does not enjoy the same “steady-state” conditions found in manufacturing so TQM tools must often be applied more flexibly. That said, the ten elements of TQ are still applicable and essential to the implementation of a successful quality system in construction organizations as part of the ongoing “war on waste.” Specifically, facilitative leadership and training are essential and a renewed focus on meeting customer requirements is long overdue. Also, a focus on process and measurement would greatly accelerate reductions in cost, defects, and time delays. Based on the analysis and results of a survey, the paper concluded that partnering has a positive impact on project performance, terms of cost growth, schedule growth, change-order cost, claims cost and value engineering savings for these projects.

The authors believe that the results could be different and the impact more positive if a more “genuine” partnership takes place at the project onset. Finally, TQM in construction would be greatly enhanced with more focus on “Lean” concepts including work simplification of Lean Tools and Methods application. We believe that a quality-based process improvement focus could greatly improve the construction industry, but it is no guarantee of future success as it is no substitute for leaders making the best possible strategic decisions. TQM can only help ensure that organizations do the right things right in their never-ending “war on waste.”

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