

# **Inhibiting Factors of Implementing Total Quality Management on Construction Sites**

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## **Abstract**

Quality systems entail having the organizational structure, responsibilities, procedures, processes and resources for implementing quality management such that there is a guiding framework to ensure that every time a process is performed the same information, method, skills and controls are used and practiced in a consistent manner. Total Quality Management (TQM) has been defined as a comprehensive systematic, integrated, consistent, organization-wide effort dedicated to customer satisfaction through continuous improvement. With its primary focus being the involvement of everyone, TQM has the potential to improve business results, greater customer orientation and satisfaction, worker involvement and fulfilment, team working and better management of workers within companies. Its ability to adapt to new ideas, tools and methods suggest that it can be applied albeit in an altered form to construction field operations involving workers at levels traditionally regarded as below middle management. However, the construction industry has been slow to embrace the concept of TQM. Construction firms have been continually struggling with its implementation. Historically construction has been an industry reluctant to implement change. Consequently it has remained behind where it should be on the implementation of TQM. Generally the principles of TQM are not applied beyond management levels within general contractors. There are few contractors that have fully implemented TQM at every level within their field organization, and even fewer at the field level of their subcontractors and suppliers. This paper reports on a study to identify those factors that hinder the implementation of TQM principles in the actual field operations of a construction jobsite. These inhibitive factors were identified through a literature review and a survey of a sample of contractors.

**Keywords: TQM, customer satisfaction, management commitment, paperwork, worker participation**

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## **Introduction**

A cultural and behavioral shift in the mind-set of all participants in the construction process (Love and Heng, 2000; Kanji and Wong, 1998) especially top or senior management is necessary if the construction industry is to improve its performance and competitiveness. For innovation and continuous improvement to be encouraged and become a norm traditional practices need to be

unlearned. Historically the construction industry has been reluctant to implement change. This process of change is especially difficult in the competitive environment in which construction takes place and where the bottom line is still the primary motivation of construction companies. Further, companies are prepared to only implement those aspects of Total Quality Management (TQM) programs that will provide them with competitive advantage and improve their overall financial performance. Ironically, research conducted by others such as Zantanidis and Tsiotras (1998) identified quality as being the most significant provider of competitive advantage. Construction companies clearly have not bought into this finding in their daily operations on site.

A review of the essential elements of TQM gained from attendance at several construction-related TQM seminars revealed a lack of actual application of the processes that have made TQM successful in other industries. These included a lack of adequate budget, failure to plan adequately for quality, inadequate training at all levels except for top or senior management positions, and little recognition given to those who strive for quality improvement on their projects.

Once a project was awarded it seemed that all efforts focused on getting started with construction quickly, getting the subcontracts written on a timely basis, and then progressing the work in a manner that would produce the greatest revenue in the shortest amount of time. Quality was primarily achieved through the inspection process. However, quality cannot be inspected into a product, it must be built into the product from the outset.

The authors conducted a study in the United States to identify those factors that hinder the implementation of TQM principles in the actual field operations of a construction jobsite. These inhibitive factors were identified through a literature review and a survey of a sample of contractors. This paper reports on these findings.

### **Research Methodology**

In social research surveys are one of the most frequently used methods of data gathering (May, 1997). The survey protocol of random sampling procedures allows a relatively small number of people to represent a much larger population (Schuman and Presser, 1981; Sonquist and Dunkelberg, 1977; May, 1997; Ferber et al., 1980). The opinions and characteristics of a population can be explained through the use of a representative sample (May, 1997).

Surveys are an effective means to gain data on attitudes on issues and causal relationships. However, they can only show the strength of statistical association between variables. Surveys do not explain changes in attitudes and views over time. They also provide no basis to expect that the questions are correctly interpreted by the respondents (May, 1997).

The authors decided that a questionnaire survey would be appropriate for achieving the objectives of this exploratory study.

### **Questionnaire Design**

Several key members of Coastal Construction were selected to “brain-storm” the issues, which, if implemented, could lead to more attention being given to improvement in the quality of site operations. From this meeting of managers, the initial draft of the questionnaire was developed. These included a cross-section of the company management structure and included project executive, project manager, estimator and project superintendent.

Construction executives from 10 different companies reviewed the draft questionnaire and provided input. This review centered on development of questions relating to their companies' current use or level of implementation of TQM, and the obstacles or hindrances which kept TQM from being more effectively implemented at the field level. This pilot study was conducted to validate and improve the questionnaire, in terms of its format and layout, the wording of statements and the overall content. The draft questionnaire was revised to include the suggestions of these participants. In short the questionnaire was validated through this process and provided the authors with improvement opportunities before launching the main survey.

### **Sample Selection**

It was the intent of the survey to gather information relating to the utilization of TQM from as broad a geographic area within the United States as possible. For this purpose, it was determined that two sources of potential participants would be used – one on a national level, and one within the state of Florida.

On a national level, one recognized standard for measuring the size of a construction company is the annual ranking of the 400 largest construction companies by the publication, *Engineering News Record (ENR)*. For the purposes of this survey, the mailing list for the year 1998 was obtained listing the name, address, and title of principal officer for each of the firms listed.

Within Florida, one of the leading trade organizations is the Associated General Contractors (AGC), which is the oldest such organization in the country. Due to the large number of firms within this organization, a random selection of 80 of these firms was made from each of the five (5) different geographical chapters throughout the State of Florida using the systematic sampling technique, with a total of sixteen (16) firms from each region selected to achieve a cross-section of the entire state. A total of 480 questionnaires were sent out.

### **Survey response**

As a result of two mailings and a follow up phone survey, a total of 87 questionnaires were completed by the *ENR 400* contractors, or a total of 21.75% of those surveyed. On the Florida level, there were a total of 23 completed questionnaires out of the 80 that were solicited, for a response rate of 28.75%. Overall, the response rate for the 480 questionnaires mailed was 110 completed questionnaires, or 22.92%. A review of the responses from both the national and statewide surveys indicated no measurable differences in the respondents' answers to the questions. The two groups were therefore combined for the analysis of this survey.

### **Discussion**

Participants in the study were asked to respond to several questions relating to the importance of certain criteria to the successful implementation of TQM in their companies. While only selected responses are discussed in this paper, the complete ranking of responses is shown in Table 1.

### **Success Criteria**

#### **Management Commitment and Involvement**

In recent times there has been an unprecedented preoccupation by managers in more organizations than ever with quality issues. Top management is one of several major critical factors or organizational requirements for effective quality management. Successful quality performance

requires top management to be dedicated to that goal.

Almost all of the 109 valid<sup>1</sup> responses to the questionnaire survey regarded as important the commitment and involvement of their top or senior management in the TQM process for its successful implementation.

<sup>1</sup> SPSS labels those respondents “valid” that are included in the analysis after adjustment for non-responses

This finding accords with those of several other studies (Reed et al., 2000; Kathuria and Davis, 1999; Miller, 1996; Anderson et al., 1994; Tata and Prasad, 1998; Douglas and Judge, 2001; Saraph et al., 1989; Rahman, 2001). Those in top management must provide the initiative for successful quality assurance practices and must support quality programs for them to be successful. Management leadership is regarded as one of the categories needed for adoption as determined by the Malcom Baldrige National Quality Award in the United States. Haupt (2001) confirms the pivotal role of management commitment by citing Petersen (1996:278) as follows:

‘Management’s reaction to change determines success. When upper management ‘buys in’ to the changes, it ensures success.’

Further, management must have the capacity and willingness to introduce and support the TQM process if it is to succeed. According to Petersen (1996:266)

‘Another way in which behavior is strongly influenced is through modeling (learning by imitation). The research on modeling tells us that if we want to maximize approach (rather than avoidance) tendencies in workers, we must exhibit that behavior ourselves.’

Table 1. Ranking of responses of all respondents to TQM criteria

Rank Full Sample	Criteria	Mean <sup>2</sup>	Std. Dev.	CV(%) <sup>3</sup>
1	Top management commitment	3.98	1.20	30.2%
2	Top management involvement	3.78	1.29	34.1%
3	Primary customer focus	3.76	1.07	28.5%
4	Well developed planning	3.40	1.29	37.9%
5	Participative management style	3.22	1.28	39.8%
6	Continuous improvement measurements	3.04	1.33	43.8%
7	Rewards for TQM contributions	2.99	1.45	48.5%
8	TQM applied to all field operations	2.85	1.41	49.5%
9	Workers trained in TQM	2.71	1.35	49.8%

The pivotal role of top management for quality improvement programs is embodied in the working definition of Whiteman (2002) of TQM for construction firms which states that

“TQM is a continuous process whereby the top management of construction firms take whatever steps are necessary to enable everyone in the organization, especially construction field supervisors and construction workers in the course of executing all their activities on construction sites to establish and achieve standards, which include completion on time, within budget, to optimum quality

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<sup>2</sup> On the scale used, 1= totally disagree, 2= generally disagree, 3= somewhat agree, 4= generally agree, 5= totally agree

<sup>3</sup> Coefficient of Variation (CV%) is a quantity designed to give a relative measure of variability. The CV expresses the standard deviation as a percent of the mean. standards, and without loss of life or limb, and exceed the needs and expectations of their clients, both internal and external.”

Several studies have shown that the lack of upper or top management involvement or commitment to TQM is a stumbling block to its successful implementation (Schriener et al., 1995; Glover, 2000).

#### **Customer Focus**

All respondents regarded primary customer focus as the next most important requirement for successful TQM implementation. Several authors by definition consider customer focus as equally important as upper management involvement and commitment to TQM principles (Kelemen, 2000; BS 4778, 1991; Anfuso, 1994; AGC, 1992). In many studies, the issue of customer satisfaction or focus featured prominently as a defining concept or critical element of TQM implementation (Anderson et al., 1994; Shamma-Toma et al., 1998; Tata and Prasad, 1998; Douglas and Judge, 2001; Black and Porter, 1996; Rahman, 2001).

#### **Participative Management Style**

Participative management was an important criteria to the respondents in the implementation of TQM. This finding is well-supported in the literature (Kathuria and Davis, 1999; Young and Wilkinson, 2001; Ho et al., 2000; Stashevsky and Elizur, 2000). The importance of participative management is suggested by the notions of relationship oriented practices (Kathuria and Davis, 1999), employee fulfilment (Anderson et al., 1994), teamwork (Shamma-Toma et al., 1998; Black and Porter, 1996), employee involvement, empowerment and teamwork (Tata and Prasad, 1998; Kols and Sherman, 1998), employee relations (Saraph et al., 1989), people (Rahman, 2001; Yusof and Aspinwall, 2000), and human resource development (MBNQA). The lack of integration between TQM and human resource practices has been cited as a major barrier to achieving full-blown TQM (Glover, 2000).

#### **Transfer of TOM from the Home Office to Field Operations**

Most of the respondents had made efforts to implement the principles of TQM within their management operations. Relatively few of these firms (34%) had been successful in transferring this effort to their field operations. Unless TQM can be effectively implemented into field operations on site its benefits to the construction industry at large will be minimal. Since profits

and losses are generated by construction activities on sites, improvement efforts have to be targeted at this essential area. In construction most of the workers of companies are employed on construction sites. Several authors maintain that workers need to be empowered and involved in TQM principles. They have argued for a shift in power from management to field operations (Richbell and Rasiatou, 1999); increased involvement of workers and increased contextual application of TQM principles (Glover, 2000); increased training of supervisors and hourly paid workers (Kassicieh and Yourstone, 1998; Chandler, 2000); and increased training in problem-solving and statistical process control (Marler, 1998).

**Major Hindrances**

Several key elements as shown in Table 2 were found to be major hindrances to the transfer of TQM to the field operations of construction companies.

Table 2. Ranking of responses to TQM problem areas

Rank	Criteria	Mean <sup>4</sup>	Std. Dev.	CV (%)
1	Too much paperwork	3.44	1.26	36.6%
2	Subcontractors and suppliers not interested	3.39	1.24	36.6%
3	Low bid subcontracting	3.39	1.29	38.1%
4	Difficulty in measuring results	3.35	1.33	39.7%
5	Field employees regard TQM as irrelevant	3.31	1.20	36.3%
6	Transient work force	3.28	1.21	36.9%
7	Low education level of field forces	3.13	1.28	40.9%
8	Focus on short term cost savings	3.05	1.29	42.3%
9	Too tight scheduling	3.02	1.36	45.0%
10	No operations to benchmark	2.90	1.37	47.2%
11	TQM just a buzz word	2.83	1.39	49.1%
12	Too many uncontrollable factors	2.81	1.33	47.3%
13	Unique nature of construction	2.81	1.31	46.6%

The first six of these problem areas are briefly discussed in the next section.

**Too Much Paperwork**

Most of the respondents (77%) regarded the generation of too much paperwork through implementation of TQM principles as the most inhibiting issue to its success in the field. Most construction projects already involve large amounts of paperwork. These include voluminous contract documents, records of plans and amendments, architects’ instructions, steel bending schedules, change orders, forms to record the requisition, order, delivery and movement of material, plant and labor, and material safety data sheets. Several authors support this view. Harari (1993a and 1993b) was concerned about the creation of cumbersome bureaucracies due to increases in paperwork to track the benefits of TQM programs. Lilrank et al. (2001) argue that excessive paperwork is prohibitive.

### **Transient Nature of Workforce**

Similarly, most of the respondents (74%) stated that the transient nature of the workforce was restrictive to the implementation of TQM on construction sites. By its nature construction to a certain degree necessitates a transient workforce. Each project is built on a new construction site. Usually that site is not close to where workers had previously worked. Consequently workers will seek employment closer to home or have to relocate where this is not possible. Crosby (1990) suggests that companies need to work as hard on employee relationships as they do on their customer interfaces.

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<sup>4</sup> On the scale used, 1= totally disagree, 2= generally disagree, 3= somewhat agree, 4= generally agree, 5= totally agree

### **Field Employees Regard TOM as Irrelevant**

A large proportion of respondents (79% of the sample) indicated that workers on construction regarded TQM as irrelevant to their performance. Schriener et al. (1995) suggested that obsession with the bottom line and seeing quality as merely an overhead might be contributory to this attitude. Further the exclusion of employees from quality improvement efforts and especially decision making relative to this improvement is a serious problem (Richbell and Rasiatou, 1999; Chandler, 2000; Senge et al., 1994). Other exacerbating factors include lack of proper training and continuous skills development (Katz, 1995; Wruck and Jensen, 1998; Reed et al., 2000), difficulty in generalizing training to opportunities to apply what has been taught (Marler, 1998), motivation of workers to want to improve their work (Hackman and Wageman, 1995; Katzenbach, 2000), and effective communication and project coordination (Shammas-Toma et al., 1998). Both construction managers and workers require a paradigm shift to a team approach (Shammas-Toma et al., 1998; Allan and Kilmann, 2001; Reed et al., 2000).

### **Difficulty in Measuring Results**

Most of the respondents (75%) noted the difficulty in measuring results on construction sites as problematic for TQM implementation on those sites. Schriener et al. (1995) have suggested the lack of meaningful measurements as a major stumbling block. Whalen and Rahim (1994) and most TQM patriarchs from Deming to Juran echo these views. The assessment of quality is cited in the Malcolm Baldrige Award as being a critical feature of TQM (George and Weimerskirch, 1998). Wruck and Jensen (1998) suggested several performance measurement systems that could be used such as construction cycle time, late delivery rates, and order lead times.

### **Low Bid Subcontracting**

Similarly, most of the firms (74%) reported that low bid subcontracting presented a serious challenge to the successful implementation of TQM on construction sites. Low bid strategies have been the basis for awarding the majority of construction projects, especially subcontracts. This occurs despite the general contract being awarded on a different basis. Deming specifically advises that the practice of awarding business on price tag alone should be ended (Yong and Wilkinson, 2001). Schriener et al. (1995) also refer to this issue when they describe the obsession of companies with the bottom line as a stumbling block to TQM. Shammas-Toma et al. (1998) support this view.

Glover (2000) refers to this tendency as businessshort-termism. According to Lahndt (1999), the construction industry's inherent competitive bid process and competitive environment has led to an emphasis on quick work and short time horizons, and a lack of long term viability and quality.

### **Subcontractors and Suppliers Not Interested in TQM**

This issue was identified by the majority of respondents (65%) - only slightly below that of low bid subcontracting. For a TQM program to be successful, it has to be all-inclusive and comprehensive. In the overall sample, 26 of the 109 of respondents indicated that they utilized TQM principles in their operations. They did not have any formal TQM plans in place confirming the tendency of firms to only use selected parts of TQM programs. Wruck and Jensen(1998) and Douglas and Judge (2001) argue that the implementation of only selected parts of TQM programs threatens its successful implementation. Reed et al. (2000) contend that cross- functional communication that in the case of construction must include subcontractors and suppliers is necessary to solve quality problems. Shammass-Toma et al. (1998) suggest that effective teamwork is essential. To this end they argue that all parties must be bound together by mutually set and internalized goals rather than by contractual arrangements alone. The development of quality teams on the job site will lead to better support and quicker response to all members of the supply chain. By being part of quality teams subcontractors and suppliers will be more responsive to the needs of the general contractor, becoming more cooperative and displaying a better performance record (Wong and Fung, 1999). Subcontractors should be treated as partners (Kanji and Wong, 1998). As such they must be provided with all the information and support to enable them to carry out their work. A participatory approach involving all parties is advocated by the CIOB (1995) based on evidence in the Japanese construction industry. Ulrich et al. (1999) maintain that the value of the whole should be more than the sum of its parts. Kale and Arditi, (2001) point out that the General Contractor to be successful must consider the subcontractors and suppliers on the project as a strategic asset critical to the project, and the ultimate perceived performance of the General Contractor by the customer.

### **Conclusion**

It is apparent that if TQM is to be implemented successfully on construction sites the inhibitive issues that have been identified from the literature and the contractor survey need to be addressed on a comprehensive and integrative basis. The principles of TQM should be applied beyond management levels and include workers on construction sites. These workers must be empowered, involved and trained in problem solving. Companies need to work on improving worker relationships in the same way that they do for their external customers. Through effective communication and improved project coordination workers must be motivated to improve their work. Contractors must move away from their obsession with the bottom line. They need to bind all parties together including subcontractors by mutually set and internalised goals. However, any attempt to bring about meaningful change with respect to implementing TQM on construction sites will only succeed if top or senior management commit and involve themselves in the TQM process.

It is significant that 4 of the nine "success" criteria in the survey could be grouped together as leadership attributes. These are top management commitment and involvement, well developed planning throughout the company, and participative management style. Another criterion, namely

TQM applied to all field operations, is also related to the role of management in deployment of TQM principles. This finding serves to confirm the pivotal role of top management in TQM implementation.

The authors are currently investigating the strategies followed by construction firms that have implemented TQM widely to overcome the hindrances identified in this study.

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