

Implementation of Total Quality Management in a Construction Firm

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Abstract— Total Quality Management (TQM) is an approach that seeks to improve quality and performance which will meet or exceed customer expectations. This can be achieved by integrating all quality-related functions and processes throughout the company. TQM looks at the overall quality measures used by a company including managing quality design and development, quality control and maintenance, quality improvement, and quality assurance. TQM takes into account all quality measures taken at all levels involving all company employees. The paper aims at Implementation of TQM in a local firm “Kakkad Developments”. For the same initial assessments were made about the various parameters which influence implementation of TQM. Further questionnaires were prepared on each parameter namely, Top Management Commitment, Human Resource Management, Employee Involvement, Process Improvement and Customer Satisfaction. The questionnaires were then distributed amongst the selected firms, the questionnaires were distributed to top management, employees as well as the customers of the firms. The responses to questionnaires were then judged based on their performance indices and the firm that had the highest performance index for each parameter was taken as the benchmark firm. Comparing the scores of “Kakkad Developments” with other firms, parameters and sub-parameters were noted where they needed improvement. Further suggestions were made to “Kakkad Developments” on each noted parameter on how they could improve their performance and implement TQM.

Index Terms— Parameters, Questionnaires, Recommendations, Total Quality Management (TQM)

I. INTRODUCTION

The TQM philosophy was evolved in Japan after World War II. Edwards Deming, an American quality expert helped the Japanese to apply concepts of TQM. They concentrated on customer satisfaction and focused on understanding customer needs and expectations.

The construction industry is one of the major industries in Indian economy. A huge amount of firms and companies in construction have come up in a decade or so. With globalization happening, the customer has gained access to many firms willing to provide what they need. This increases pressure on the construction firms to perform better as an unsatisfied customer may cost the firm a lot of business.

Due to the information age that we live in, the consumer is very well aware of his right to ask more. Thus providing good

quality services becomes essential. The drive to maintain competitiveness by increasing performance has been an ever present goal of industries within the global market. In the 1980s quality level of the construction industry's performance was alarming, with 37% of all construction reporting major defects. No significant change was evident by the 1990s when the industry was reported to be in “total chaos” and suffering from major constraints. Furthermore, in 2005 the quality of the industry's performance actually appeared to decline, with 72% of industry professionals witnessing a significant increase in the number of change orders occurring for projects in the previous two years. As a result, the construction industry became inundated with serious problems in quality standards and excessive costs stemming from increased claims, counterclaims and litigation.

Total Quality Management is customer oriented management philosophy and strategy. It is centered on quality so as to result in customer delight. The word ‘Total’ implies that all members of the organization make consistent efforts to achieve the objective of customer delight through systematic efforts for improvement of organization.

II. FUNDAMENTALS OF TQM

Total Quality Management is an integrative philosophy of management for continuously improving the quality of products and processes. TQM is based on the premise that the quality of products and processes is the responsibility of everyone involved with the creation or consumption of the products or services which are offered by an organization, requiring the involvement of management, workforce, suppliers, and customers, to meet or exceed customer expectations. It uses strategy, data, and effective communications to integrate the quality discipline into the culture and activities of the organization. The factors are:

Customer-focused - The customer ultimately determines the level of quality. No matter what an organization does to foster quality improvement—training employees, integrating quality into the design process, upgrading computers or software, or buying new measuring tools—the customer determines whether the efforts were worthwhile.

Total employee involvement - All employees participate in working toward common goals. Total employee commitment can only be obtained after fear has been driven from the workplace, when empowerment has occurred, and management has provided the proper environment. High-performance work systems integrate continuous

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improvement efforts with normal business operations. Self-managed work teams are one form of empowerment.

Process-centered - A fundamental part of TQM is a focus on process thinking. A process is a series of steps that take inputs from suppliers (internal or external) and transforms them into outputs that are delivered to customers (again, either internal or external). The steps required to carry out the process are defined, and performance measures are continuously monitored in order to detect unexpected variation.

Integrated system – Although an organization may consist of many different functional specialties often organized into vertically structured departments, it is the horizontal processes interconnecting these functions that are the focus of TQM. Micro-processes add up to larger processes, and all processes aggregate into the business processes required for defining and implementing strategy. Everyone must understand the vision, mission, and guiding principles as well as the quality policies, objectives, and critical processes of the organization. Business performance must be monitored and communicated continuously. An integrated business system may be modelled after the Baldrige National Quality Program criteria and/or incorporate the ISO 9000 standards. Every organization has a unique work culture, and it is virtually impossible to achieve excellence in its products and services unless a good quality culture has been fostered. Thus, an integrated system connects business improvement elements in an attempt to continually improve and exceed the expectations of customers, employees, and other stakeholders.

Strategic and systematic approach - A critical part of the management of quality is the strategic and systematic approach to achieving an organization's vision, mission, and goals. This process, called strategic planning or strategic management, includes the formulation of a strategic plan that integrates quality as a core component.

Continual improvement – A major thrust of TQM is continual process improvement. Continual improvement drives an organization to be both analytical and creative in finding ways to become more competitive and more effective at meeting stakeholder expectations.

Fact-based decision making - In order to know how well an organization is performing, data on performance measures are necessary. TQM requires that an organization continually collect and analyze data in order to improve decision making accuracy, achieve consensus, and allow prediction based on past history.

Communications – During times of organizational change, as well as part of day-to-day operation, effective communications plays a large part in maintaining morale and

in motivating employees at all levels. Communications involve strategies, method, and timeliness.

These elements are considered so essential to TQM that many organizations define them, in some format, as a set of core values and principles on which the organization is to operate.

III. EVOLUTION OF TQM



Inspection: - Quality inspection is aimed at checking, measuring, or testing of one or more product characteristics and to relate the results to the requirements to confirm compliance. This task is usually performed by specialized personnel and does not fall within the responsibility of production workers. Products that don't comply with the specifications are rejected or returned to improve.

Quality Control (QC): - QC involves verifying the product or evaluating a product with the requirement specification. It is oriented to detection i.e. finding defects in products. Testing is the key technique used to perform product evaluation. QC is work product oriented; it measures the product, identifies deficiencies and suggests improvements.

Quality Assurance (QA): - QA involves the entire development of process, monitoring and improving the process, making sure that the agreed upon standards and procedures are followed throughout the life cycle and ensuring the problems are found and dealt with. It is oriented to prevention i.e. preventing the defects from occurring in the products. Audits are key techniques for process monitoring.

Total Quality Management (TQM): - Total quality management can be summarized as a management system for a customer-focused organization that involves all employees in continual improvement. It uses strategy, data, effective communications and involvement of all level employees to integrate the quality discipline into the culture and activities of the organization.

IV. LITERATURE REVIEW

Firms have arrived at the conclusion that effective TQM implementation can improve their competitive abilities and provide strategic advantages in the marketplace. Several researchers also reported that TQM implementation has led to improvements in quality, productivity, and competitiveness in only 20-30% of the firms that have

implemented it. A study conducted indicated that a 90% improvement rate in employee relations, operating procedures, customer satisfaction, and financial performance is achieved due to TQM implementation. Some researchers have examined the implementation of total quality management (TQM) and its positive impacts on organization performance.

In the research by Low (2010) outlined the following basic framework for implementing TQM in construction firms namely: customer feedback system, continuous improvement, encourage teamwork, reduce number of suppliers, process management and improvement through productivity study, effective communication system, top management, review organizational culture, produce training plans, establish monitoring process.

The paper by Ahmed pointed out how construction professionals implement TQM and its tools in their projects in the different stages (design and construction). The reason 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. After analysis and statistical sorting of data were based on extensive industry surveys via questionnaires and one-to-one interviews with key contractors of the existing market. The current practices infer the average attitude of the contractors towards the importance of adopting TQM. The aspects that were targeted such as quality in the organization employee training, and organizational culture, seem to be slightly appreciable. Also partnering is known by almost everyone in the industry but they show a low response in this regard. Lacking of having a concise and exact definition of quality was also observed. The fragmented nature of the industry is a big hurdle in TQM application. Lack of education is also one of the reasons why TQM would fail. In addition, corruption, negligence and irresponsibility are also critical issues. Contractors are apprehensive in adopting TQM philosophy as they have a myopic view and are unable to realize its long term benefit.

Implementing TQM requires a major organizational change that would transform the culture, process, strategic priorities and belief of an organization. Apart from commitment top management the organization must educate its employees on the need of TQM so that it will help to reduce the amount of work for employees if they no longer need to attend the customer complaints and defect problems.

Based on the comprehensive analysis and examination of existing TQM frameworks and literature, the paper proposes the 6 critical success factors (CSFs) of TQM for construction industry, namely, Top management commitment, Customer Satisfaction, Employee Involvement, Human Resource Management and Process Improvement.

V.METHODOLOGY AND RESULTS

The study was aimed at implementing TQM in the selected local firm known as “Kakkad Developments” and four other firms, namely, Mittal Builders, Ambience Developments, Maple Group and Shalaka Infra-Tech Pvt. Ltd. for the process of benchmarking and analysis. After selecting the parameters necessary for implementation of TQM; questionnaires were prepared in detail on each parameter. The

questionnaires were distributed to the 5 companies mentioned.

1. One form of “Top Management commitment” to the manager or the chairman of the firm.
2. One form of “Process Improvement” to the manager of the firm.
3. One form of “Human Resource Management” to the HR head of the firm.
4. Ten forms of “Employee Involvement” distributed amongst the employees at various levels of the firm.
5. Ten forms of “customer Satisfaction” distributed to the customers of the firm.

The responses were categorized based on each question to produce a performance index (P.I), based on the formula:

Performance Index = $\frac{N1 + N2 + N3 + N4 + N5}{N}$ Where,
 N1 = Number of ticks for Fully Disagree
 N2 = Number of ticks for Partially Disagree
 N3 = Number of ticks for Neutral
 N4 = Number of ticks for Partially Agree
 N5 = Number of ticks for fully Agree
 N = Number of forms distributed

Based on the performance indices for each parameter the company which was best in each parameter was selected. A comparison chart was prepared showing the performance indices for each sub-parameter of each parameter for comparison between the selected firms.

From the performance indices the company selected as the best for each sub-parameter was selected and was taken for benchmarking. The sub-parameters in which “Kakkad Developments” were lacking were selected and suggestions were made on how they could improve those parameters.

The performance indices for all the parameters are shown below with the firm that is excelling in that particular parameter.

1. Top Management Commitment

	TOP MANGEMENT						
	Kakkad	Ambienc	Shalaka	Mittal	Maple	Highest	
1.1	4	4	5	5	4	mittal shalaka	
1.2	5	5	4	5	5	kakkad mittal maple	
1.3	5	4	5	5	5	kakkad mittal maple	
2.1	4	5	4	5	4	Ambiience mittal	
2.2	4	4	5	5	3	shalaka mittal	
2.3	5	4	4	4	4	kakkad	
2.4	5	3	5	4	4	kakkad shalaka	
2.5	5	4	3	3	4	kakkad	
2.6	5	5	3	5	3	kakkad	
2.7	4	4	3	5	4	Mittal	
2.8	3	3	5	3	2	Shalaka	
2.9	5	4	5	5	4	Kakkad Shalaka Mittal	
3.1	4	3	4	5	5	Mittal Maple	
3.2	5	4	4	4	4	Kakkad	
3.3	5	5	4	5	4	Kakkad	
3.4	4	3	4	5	5	Mittal Maple	
4.1	5	3	5	3	4	Kakkad Shalaka	
4.2	5	4	5	3	4	Kakkad Shalaka	
4.3	4	5	5	3	5	Ambiience Shalaka Map	
4.4	4	3	5	5	3	Shalaka Mittal	
4.5	4	4	4	5	4	Mittal	
4.6	4	4	5	5	5	Shalaka Mittal Maple	

2. Human Resource Management

Human resource Management						
	Kakkad	Ambien	Shalaka	Mittal	Maple	Highest
1.1	5	4	4	5	2	Kakkad Mittal
1.2	5	5	3	4	2	Kakkad Ambience
1.3	4	4	2	5	3	Mittal
1.4	2	4	5	5	5	Shalaka Mittal
1.5	2	5	4	5	2	Ambience Mittal
1.6	5	4	1	5	4	Kakkad Mittal
1.7	1	4	5	5	3	Shalaka Mittal
1.8	5	5	2	4	4	Kakkad Ambience
2.1	5	4	4	4	1	Kakkad
2.2	2	4	4	5	1	Mittal
2.3	4	5	1	5	5	Ambience Mittal Maple
2.4	5	4	4	5	1	Kakkad Mittal
3.1	2	3	2	5	1	Mittal
3.2	5	4	2	5	5	Kakkad Mittal Maple
3.3	5	4	3	4	5	Kakkad Maple
3.4	5	5	4	3	5	Kakkad Ambience Maple
4.1	5	4	4	5	5	Kakkad Mittal Maple
4.2	4	3	5	5	5	Shalaka Mittal Maple
4.3	5	5	1	4	1	Kakkad Ambience
5.1	3	3	4	5	1	Mittal
5.2	5	4	4	4	5	Kakkad Maple
5.3	4	5	4	5	5	Ambience Mittal Maple
6.1	5	4	5	5	5	Kakkad Shalaka Mittal Map
6.2	3	5	4	1	5	Ambience Maple
6.3	4	3	5	3	5	Shalaka Maple
6.4	2	4	5	5	1	Shalaka Mittal
6.5	4	5	3	5	5	Ambience Mittal Maple
6.6	4	4	1	5	5	Mittal Maple
6.7	3	3	4	5	5	Mittal Maple
6.8	3	5	4	5	1	Ambience Mittal
6.9	3	3	5	4	5	Shalaka Maple
7.1	3	3	2	5	1	Mittal
7.2	5	4	2	4	5	Kakkad Maple
7.3	4	5	2	5	1	Ambience Mittal
7.4	2	4	2	5	5	Mittal Maple
7.5	3	2	2	5	1	Mittal
7.6	5	2	3	5	1	Kakkad Mittal
7.7	5	4	3	5	1	Kakkad Mittal
7.8	3	5	5	5	5	Mittal Ambience Shalaka
8.1	5	4	4	5	1	Kakkad Mittal
8.2	3	5	3	5	1	Ambience Mittal
8.3	4	3	3	5	5	Mittal Maple
8.4	4	5	3	4	1	Ambience

3. Process Improvement

Process Improvement						
	Kakkad	Ambien	Shalaka	Mittal	Maple	Highest
1.1	3	4	4	5	4	Mittal
1.2	4	3	4	4	4	Kakkad Shalaka Mittal Maple
1.3	3	5	3	5	5	Ambience Mittal Maple
1.4	4	3	3	5	3	Mittal
2.1	4	4	3	3	5	Maple
2.2	4	3	4	4	5	Maple
2.3	5	5	3	3	4	Kakkad Ambience
2.4	4	4	4	3	4	Kakkad Ambience Shalaka Maple
3.1	5	3	2	1	3	Kakkad
3.2	5	4	3	2	4	Kakkad
3.3	5	4	4	2	5	Kakkad Maple
3.4	4	5	4	3	4	Ambience
4.1	5	3	4	3	3	Kakkad
4.2	5	4	4	3	3	Kakkad
4.3	1	5	4	3	4	Ambience
4.4	4	4	5	5	3	Shalaka Mittal
4.5	5	4	5	5	3	Kakkad Shalaka Mittal
5.1	4	4	4	3	5	Maple
5.2	5	3	4	4	4	Kakkad
5.3	5	4	4	4	4	Kakkad
5.4	3	5	5	4	5	Shalaka Ambience Maple

4. Employee Involvement

Employee Involvement						
	Kakkad	Ambien	Shalaka	Mittal	Maple	Highest
1.1	3.1	4.2	3.6	4.5	3.2	Mittal
1.2	3.3	4.1	3.2	4.3	3	Mittal
1.3	3.5	4.3	3.3	4.1	3.4	Mittal
1.4	3.3	4	3.6	4.2	3.2	Mittal
2.1	3.6	4	4	4.4	3.4	Mittal
2.2	3.8	3.8	3.9	4.4	3	Mittal
2.3	3.4	3.9	3.9	4.3	3.6	Mittal
2.4	3.4	3.7	3.7	4.2	3.8	Mittal
2.5.1	3.9	4.1	3.3	4.2	3.9	Mittal
2.5.2	4.1	4.2	3.6	4.3	3.6	Mittal
2.5.3	4.2	3.7	3.2	4.2	3.3	Kakkad Mittal
2.5.4	4.4	4.2	3.8	4.1	3.7	Kakkad
2.5.5	3.9	4.1	3.9	4.1	3.6	Ambience Mittal
3.1	3.3	3.7	4.1	4.2	4.1	Mittal
3.2	3.2	4	4.2	4.1	4	Shalaka
3.3	3	4.3	3.6	3.8	3.8	Ambience
3.4	3.1	4.1	3.8	4.6	3.6	Mittal
4.1	3.5	4.2	3.8	3.6	3.8	Ambience
4.2	3.3	4.1	3.9	3.8	3.8	Ambience
4.3	3.7	3.9	3.7	3.7	3.6	Ambience
4.4	3.8	3.7	3.6	3.7	3.5	Ambience Mittal
5.1	3.6	3.9	3.9	3.8	4.1	Maple
5.2	3.6	3.7	3.6	3.9	4.1	Maple
5.3	3.8	4.3	3.7	4.4	3.9	Mittal
5.4	4	4.2	3.4	4.3	3.6	Ambience

5. Customer Satisfaction

Customer Satisfaction							
	Kakkad	Ambience	Shalaka	Mittal	Maple	Highest	
1.1	2.9	3.8	4.1	3.5	3.9	Shalaka	
1.2	2.6	3.7	4.3	3.5	3.7	Shalaka	
1.3	3.3	3.8	4.2	3.5	3.7	Shalaka	
1.4	3.5	3.5	4.3	3.3	4.2	Shalaka	
1.5	3.4	3.7	3.9	3.6	3.8	Shalaka	
2.1	3.3	3.9	3.5	2.8	3.6	Ambience	
2.2	3.2	3.8	3.6	3	3.8	Ambience Maple	
2.3	2.9	4.1	3.8	3.1	3.9	Ambience	
2.4	3.1	4.3	3.8	2.5	3.8	Ambience	
3.1	3.3	3.7	3.9	3.1	3.8	Shalaka	
3.2	3.5	3.7	3.7	2.8	4.1	Maple	
3.3	3.6	3.9	4.2	2.9	4	Shalaka	
3.4	3.1	3.5	4.3	2.6	4.2	Shalaka	
3.5	3	4	3.8	2.4	4.1	Maple	
3.6	3.4	4.1	3.8	3.1	3.9	Ambience	
3.7	3.6	4.2	3.4	3.4	3.8	Ambience	
3.8	3.4	4.3	3.4	3.3	3.9	Ambience	
3.9	3.9	4.5	3.9	3.3	3.6	Ambience	
3.10	3.7	3.9	3.3	2.9	3.7	Ambience	
3.11	3.8	3.7	3.2	2.6	3.8	Kakkad Maple	
4.1	3.8	4.2	3.5	2.7	3.9	Ambience	
4.2	4.1	3.9	3.6	2.5	4.1	Kakkad Maple	
4.3	2.9	4.4	3.8	3	4.1	Ambience	
5.1	3.3	3.9	3.6	2.4	3.6	Ambience	
5.2	3.6	3.8	3.5	2.1	3.8	Ambience Maple	
5.3	3.8	3.6	3.9	2.7	3.7	Shalaka	

VI. SUGGESTIONS BASED ON COMPARISON

After analysis and comparison, we see that “Kakkad Developers” lack in many of the parameters that were selected and that the overall quality of work can be improved based on the parameter wise suggestions given below:

SUGGESTIONS ON TOP MANAGEMENT COMMITMENT:-

- Quality policy of the firm is not up to standard adopted by the other selected firms and hence should reviewed taking into account the policies adopted by other firms.
- The number of management reviews conducted per month should be increased.
- Proper documentation methods should be adopted.
- Better and improved methods of training and quality workshops should be implemented.
- Customer requirements should be given due weightage during the planning of the project.
- Quick redressal of complaints.
- Various channels should be set up for better communication between management and the employees.
- Quality conscious employees should be given recognition for the quality of work carried out.
- The formal and informal chain of command should be the same.

SUGGESTIONS ON HUMAN RESOURCE MANAGEMENT

- Availability of wide network of computerized human resource information system with the latest software.
- The performance standard for the employees should be developed on the basis of their opinion.
- Innovation and creativity should be an important issue relating to work flow in the organization.
- Also there should be flexibility in the work flow.
- Psychological test should be carried out during employee selection.
- The induction program should help the employees to settle comfortably in the company.
- The employee training program should include development of the following:
 - 1) Communication skills
 - 2) Technical/knowledge based skills
 - 3) Use of new equipment
 - 4) Safety
 - 5) Productivity enhancement
 - 6) Customer service
 - 7) Product knowledge
 - 8) Employee motivation
- Also the training/development of the employees should have the following characteristics:
 - 1) Group orientation
 - 2) Individual orientation
 - 3) Task orientation
 - 4) Annual outcome driven
 - 5) Business driven
 - 6) Need based
- The results of the performance appraisal system should be used for employee development, determining reward and compensation and motivating the employees.

SUGGESTIONS ON PROCESS IMPROVEMENT METHODS

- Methods for collection of data should be reviewed.
- Better processes should be applied for analysis of collected data.
- Continuous improvement methods should be based on the analysis of data.
- The firm should adopt published standards and models explaining the contemporary processes.
- The contractors and suppliers should be rated by the firm using effective methods.
- Implementation of methods to ensure process completion in scheduled period of time.
- Adopt methods to reduce occurrence of problems.
- Every phase of the project should be timely completed.
- Suggestions from the employees regarding changes in the process should be welcomed.

SUGGESTIONS ON EMPLOYEE INVOLVEMENT

- Improvement of level of training and empowerment programs.
- Distribution of handbooks, references, check lists, etc. to the employees by the firm.
- Organization of workshops and betterment campaigns for the benefit of the employees.
- Provision of resources for employees at the firm for comfort and recreation.
- Improvement in the quality of equipments used for faster and efficient completion of work.
- Proper knowledge to the workers regarding the working of equipment.
- Proper maintenance of equipment so that they can be used throughout their life.
- The employees should feel that their suggestions are valuable to the firm.
- Availability of channels for the employees to question the decisions of the firm.
- Appropriate response should be given from the management to the employees regarding questions asked about the decisions made by the firm.
- Annual or periodic reward systems should be setup.
- Programs such as zero defect days and zero accidental weeks should be set up.
- The employees should be satisfied with the promotions and increments given to them.
- Improvement in methods adopted for periodic increments for the employees.
- Efforts should be taken to maintain a good social atmosphere by organizing trips, get together etc.

SUGGESTIONS ON CUSTOMER SATISFACTION

- Efforts should be taken to improve the customer service provided
- Effective costing of service or product provided.
- Quality of product/service should exceed expectation of the customers.
- Increment in the ability to meet the requirements and demands of the customer.
- Customer should be able to contact the employees easily using phone or email.
- The senior management should attend to customer needs and strive towards developing the services rendered to the customer.
- Parking and other amenities should be provided as promised.
- The employees should be co-operative with the customers and should support them.
- A certain level of flexibility should be maintained for the customer during the execution of the work.
- The field supervisors should be responsive towards customer queries.
- Manuals, documents, specification details and other information relevant to the services should be easily available to the customers.
- The employees should be fully aware of the duties and tasks assigned to them by the firm.

- Customer complaints should be given the proper attention and should be resolved as quickly as possible.
- The customer should be able to check the progress of the work whenever he pleases.
- Information regarding the company's services should be easily available.
- Improvement of process adopted for final feedback from customer at the completion of the project.
- Continuous improvement should be done based on customer feedback.

VII. CONCLUSION

In conclusion it can be said that Total Quality Management is practiced by many business organizations around the world. It is a proven method for implementing a quality conscious culture across all the vertical and horizontal layers of the company.

Implementing TQM will help the firm to achieve,

1. Improves Business Efficiency and Effectiveness
2. Provides Long Term Competitiveness
3. Produce desired outcomes to satisfy customers
4. Improved productivity of a process compared the resources used

Thus on actual implementation of the suggestions made to the "Kakkad Developments", can achieve TQM and compete with the best in the locality.

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