TQM IN CONSTRUCTION INDUSTRY IN INDIA-STATUS

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ABSTRACT

With present policies of liberalization, privatization and globalization the economic scenario has completely transformed in last one and half decade. By way of the perpetual 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 philosophy 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 paper TQM philosophy and the key elements for implementation of TQM process is discussed with reference to construction industry.

KEYWORDS: TQM, Construction Industry, India

Due to present policies of liberalization, privatization and globalization, the economic scenario has completely changed. With the perpetual 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 philosophy 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.

For Indian Construction Industry aiming for global contracting in the global market and wishing to capture sizeable international market share in the new millennium, how can the global capacities help these corporate unless their completed structures match the quality standards of competitors who have embraced Total quality management (TQM) ?

Construction Industry is service Industry, whose responsibility to convert plan and specification into finished product; it's exceedingly complex and highly individual in character. The impact of construction industry on economy of our country is considerable. There are large numbers of companies, ranging in size from small proprietorships with one to two employees to huge design/ construction firms employing many thousands of employees and handling work in billions of rupees. Construction projects are to be executed at site and in-situ the final product is not under stringent factory control but it faces unpredictable problems under varying circumstances. It employs huge labor force (may be skilled or unskilled) and engineers have to work under tough job conditions unlike glamorous Air Conditioned office jobs of software engineers. It also involves a good team work with proper coordination between Architects, Engineers, supervisors, labor force and the client. Meeting target schedule by execution of projects under such complex conditions with expected cost, time and quality is a Herculean task.

Implementation of TQM philosophy can provide a solution which is all encompassing. It aims at work culture, Employee empowerment, SQC techniques and finally customer satisfaction. It is not limited to material testing or quality assurance of end product only but it aims at the

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process of quality planning, quality improvement and quality control at each and every phase. TQM is not a structured certification process like ISO 9000 series which emphasizes on procedural aspect only, it in-fact emphasizes the human element and processes to achieve quality.

An engineer must understand the application of TQM to technical activities. TQM is the application of the scientific method to business (pick an important problem, get the facts, analyze the facts, find the underlying truths, systematically test it to verify that it works, standardize the new method, and then cycle round again). The complexity of modern business and technology requires a teamwork approach rather than each engineer doing his own thing, thus TQM needs to be applied to the business of the company and to engineering methods.

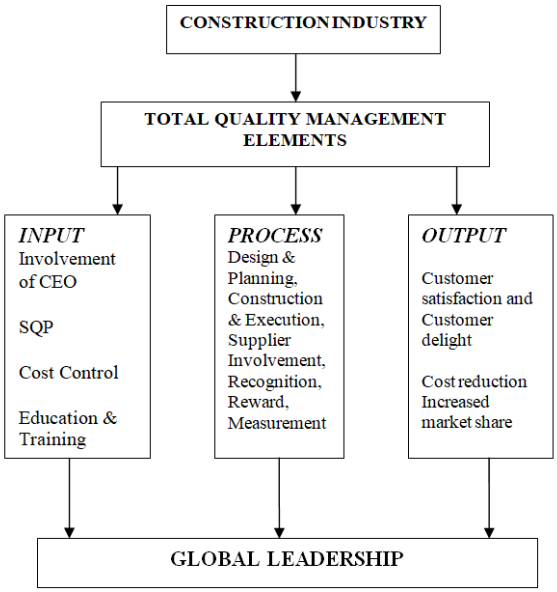

Figure 1: TQM for Construction Industry

HISTORY AND ORIGIN OF TQM

'Quality' is a familiar word to us all; however, it has a variety of uses and meanings. Some may claim it's over used, there is little doubt that we all use it much more than was the case a few years ago.

In linguistic sense, quality originates from the Latin word 'qualis', which means 'such as the thing really is'. In today's business world there is no single accepted definition of quality. "Conformance to agreed and fully understood requirements". This definition is attributed to **Crosby**. He believes that quality is not comparative, and there is no such thing as high quality or low quality, or quality in terms of goodness, feel, excellence, luxury etc. A product or service either conforms to requirements or it doesn't. In other words, quality is an attribute (a characteristic which by comparison to a standard or reference point, is judged to be lowest or incorrect) not a variable (a characteristic which is measurable) "Fitness for purpose or use" This is a standard definition of quality used by **Juran.**

WHAT IS TOTAL QUALITY MANAGEMENT?

- It involves everyone in an organization and associated business processes cooperating to furnish products and services that meet their customer's needs and expectations.
- It's an all-encompassing dynamic process in an organization to promote never-ending improvement in the effectiveness and efficiency of all elements of a business.
- TQM is a philosophy, a set of tools and a process whose output yields customer satisfaction and continuous improvement. It expouses "win-win" attitude differentiates cost versus price and provides added value.
- TQM is the integration of functions and processes within an organization in order to achieve continuous improvement of the quality of goods and services. The goal is customer satisfaction.

A Company's continued success requires repeat business, which in turn depends upon the customers. A strong customer focus is therefore imperative. TQM is a means to this end, and an attribute of good management. TQM is essentially customer driven. It takes a total system view. TQM measures are not merely confined to traditional reject reworks, down grades and the like. It also includes global, balance sheet parameters such as profits, stock in trade, market share, etc. The approach touches every operation, every individual and every activity. Each is a link with the ultimate purpose to provide durable satisfaction to the existing and potential customers.

Major Objectives of a TQM system

- Quality policies ,objectives and design Customer focus.
- Quality activities.

- Organization wide integration of people, machine and information.
- Continuous control of TQM systems by comparisons of standards with actual performance by continuous improvements.
- Periodic audit of system activities to access the progress in the field of TQM

Some common principles that run through TQM interpretations;

- Every one in the organization is involved continuously improving the process under his or her control and takes responsibility for his or her own quality assurance,
- Each person is committed to satisfying his or her customer (internal or external),
- Teamwork is practiced in a number of forms. There is a commitment to the development of employees through involvement.
- Participation by everyone in the business is positively encouraged and practiced.
- A formal program of education and training is in place and this is viewed as an investment in developing people's ability and knowledge and helping them realize their potentials.
- Suppliers and customers are integrated into the improvement process.
- Honesty, sincerity, and care are an integral part of daily business life and Simplicity in process, systems, procedures and work instructions is pursued.

THE KEY ELEMENTS OF TQM

The following is the brief outline of the key elements of TQM:

- Commitment & leadership of the chief executive officer
- Culture Change
- Planning & Organization
- Education and Training
- Involvement, recognition and measurement
- Customer focus and Satisfaction
- Strategic Quality Planning
- Cost of quality
- Supplier involvement

Commitment and Leadership of The Chief Executive Officer

Without the total commitment of the CEO and his or her immediate executive and other senior managers, nothing much will happen and anything that does will not be permanent. They must take personal charge and exercise forceful and personal leadership. There is a strong relationship between an organizations business achievements and the CEO's understanding of the TQM philosophy and commitment to continuous and company wide quality improvement. In superior performing companies, TQM is a way of life, and people within the organization are observed with quality, only the CEO can ensure that this becomes a reality. Survey shows the cost of nonconformance is likely to be 5 to 25% of annual sales turnover and when compared to profit as a percentage of sales turnovers the key question is: can the CEO afford not to get involved in TQM?

The CEO is the primary internal change agent for quality improvement and in this capacity he has two key roles. Shaping organizational values, and establishing a managerial infrastructure to actually bring about change. To show commitment, top management should make sure that everybody within the organization from top to bottom is clear about the long term goals - this affects management style, the quality of communications and everything that is done within an organization.

Culture Change

What is Culture? Concept of culture is defined as a pattern of artifacts, behaviors, and values, beliefs and assumptions that a group develops as it bands to cope with internal and external problems of survival and prosperity.

An organizational culture which is conducive to continuous quality assurance needs to be integrated into all the processes and functions of an organization.

This requires changing people's behaviour, attitudes and working practices in a number of ways such as:

- Accept that there is no ideal state, and never take the view that their level of process, performance and service is as good as it possibly could be;
- Inspect their own work;
- Not pass on defects to the next process;

- Recognize the internal customer relationship (everyone for whom you perform a task or service is a customer); and
- View mistakes as an improvement opportunity – in the words of the Japanese, every mistake is a pearl to be cherished.

Considerable thought needs to be given to facilitating and managing culture change. Changing people's behaviour and attitudes is one of the most difficult tasks facing management, who must develop their powers and skill of motivation and persuasion. Managers must realize that cultural forces operate within organizations just as in the larger Society.

Culture emerges in organizations, because of the organizations need to deal with the external and internal problems of survival and prosperity. Achieving external adoptions and achieving internal integration can do this emergence of culture.

Planning and Organization

Many facets of the quality improvement process, feature planning and organization for building product and service quality into designs and processes,

- Developing prevention based activities,
- Putting into place quality assurance procedures that facilitate closed loop corrective actions,
- Planning the approach to be taken to the use of quality systems, procedures and quality management tools and techniques,
- Developing the organization and infrastructure and allocating the necessary resources to support the improvement activities.
- Standardization, systematization and simplification of work instructions, procedures and systems.

The typical company operates with a vertical; functional organization structure based on reporting relationship, budgeting procedures, and specific and detailed job clarifications. Departmentation is by function and communication, rewards, and loyalties are functionally oriented. Processes are forced to flow vertically form of the top, down, creating costly barriers to process flow.

The system approach to organizing suggests three significant changes, one and two requiring organizational realignment.

- The concept of the inverted organizational chart
- A system of intra-company internal quality
- Horizontal and vertical integration of functions and activities.

Construction Industry being a service Industry with the end product to be created in situ planning starts right from the inception and scheduling of the projects is required for its execution in the scheduled time period to avoid delays in the project completion. Organization varies with each site and nature of project thus there is no tailor made organization structure but it has be developed as per the project requirements.

Education and Training

Employees need to be provided with the right level of education and training to ensure that their general awareness of quality management concepts, skills and attitudes is appropriate and suited to the continuous improvement philosophy. Education and Training also provide a common language throughout the business. Training needs to be planned and provided on a timely and regular basis to enable people to solve increasingly complex problems. Without it changes in behaviour and attitude will not take place. The training must also focus on helping managers to identify improvements available in their areas of responsibility. Every organization must keep aside certain percentage of their budget annually for training.

The benefits of training can be included as:

i. Improved communications.
ii. Change in corporate culture.
iii. Demonstration of management's commitment to quality.

Top companies commonly address the following topics in quality training curricula:

- Quality awareness
- Quality measurement (performance measures/quality cost, bench marking, data analysis)
- Process management and defect prevention.
- Team building and Quality Circle Training
- Focus on customer and markets
- Statistics and statistical methods.

The quality study was conducted among 20 companies. Quality training was found to have the greatest

impact when coupled with other practices, such as measurement and reward system.

It must also be recognized that not all employees will have the necessary education levels. The structure of the training may incorporate some updating of basic educational skills in numeracy and literacy, but it must promote continuing education and self-development. This will help to release the latent potential of many employees and the best use made of each individual's ability.

Construction Industry needs revamping with education and continuous training to deal with its complex nature with work specifications from planning, design to completion stage, construction techniques, Soft wares, Workmanship quality, source of materials etc. changing from project to project depending on the sight conditions. e.g. Take the example of bituminous road construction …. If the compaction of sub-grade, sub-base layers is not properly done as per the specification and the methods specified for quality it can lead to severe problems of road maintenance.

Involvement

All available means, from suggestion schemes to various forms of team work, must be considered for achieving broad employee interest, participation and contribution in the process of quality improvement, management must be prepared to share some of their powers and responsibilities. This also involves seeking and listening carefully to the views of employees and acting upon their suggestions. Part of the approach to TQM, is to ensure that everyone has a clear understanding of what is required of him or her and of each job's relevance to the business as a whole. The more people understand the business, the greater the role they can play in the quality improvement process. People must be encouraged to manage and improve the processes within their sphere of responsibility.

The managerial role must shift towards teamwork for continuous improvement, flexible team participation, integration for synergy and continuous learning about the constituents and the systems of the organizations.

Recognition

Positive performance and achievement must be recognized, and success rewarded. People must see the results of their activities and be constantly encouraged through active communication. For TQM to be successful it is essential that management must communicate as never before.

Recognition, promotion, compensation, reward and feedback process supports quality and performance objectives. Any organization must recognize both business success and personal growth. Each department can have its own instant recognition program consisting of a thank you card and small gifts (e.g. gift cheques etc.)

Managers should look for positive behaviors to recognize and reward, rather than for negative conduct to criticize. It is a question of emphasis – applauding success rather than always berating failure.

Measurement

Progress must be continually measured against a series of key results indicators, internal & external. A total quality program needs to be regularly evaluated in order to create an environment for continuous improvement. Also measurements are vital where customer focus and satisfaction is to be measured. The key measures of customer satisfaction or dissatisfaction must be identified. Customers must be continuously asked whether they are satisfied with the output or the customer requirements have changed.

There are seven generic ways (in addition to the cost of quality) in which the quality outputs can be measured:

1) Defects (work not to specification)
2) Rework (work requiring correction)
3) Scrap (work thrown away)
4) Lost items (work done again)
5) Backlogs (work behind schedule)
6) Late deliveries (work after agreed time)
7) Surplus items (work not required)

The above measurements apply to 'outputs' (such as defects left in concreting, Inadequate prestressing of girders, Scrap in the form of steel bars, work repeated because of wrong technique used etc.) as well as to the outputs of finished structure (such as leaking slabs, pots and ruts on bitumen concrete roads, cracks in the concrete pavement etc.).

There are five key measurements for each output:

i. Target: the budget or target level of performance to be achieved.
ii. Forecast: the forecast level of performance, which may be better or worse than the target depending on current business situation. The forecast also shows when the target will be reached.
iii. Actual: The actual level of performance achieved to date.
iv. Problem: The difference between the actual and target level of performance where 'actual is worse than 'target'.
v. Opportunity: The opportunity for improving quality better than target at no extra cost.

Customer focus and Satisfaction

TQM companies focus on customers and on satisfying their needs.

Customer requirements change, so it is necessary to take feedback from the customer and processes to improve the product overtime. The Japanese call this improvement as Kaizen.

Finally the market-in concept includes the idea of a process for improvement aimed at continuing customer satisfaction.

TQM companies offer have an explicit process or set of guidelines for dealing with customers e.g., the steps can be:

i. Who are my customers?
ii. What are their needs?
iii. What is my product or service?
iv. What are my customer's measures or expectations?
v. What is my process for meeting their needs?
vi. Does my product or service meet their needs or expectations?
vii. What actions are intended to improve my process?

Therefore, Market – in needs to be institutionalized by senior executives through proper planning & sequencing the activities concerned. In our country, Construction industry has got a boost in the residential sector because of this market in concept the flat schemes are planned and developed by keeping customers at the focal point. Now the residential areas are being developed with the concept of town planning with parks, gardens, gymnasium, open areas, schools, temples roads communication networks, security arrangements etc.

Supplier Involvement

A revolution in the relationship between buyer and suppliers has emerged in the form of supplier partnerships. Research shows that poor quality of supplier items results in almost half of the quality problems. Also with just in time, inventory management concept, it's imperative that purchased product meet quality requirements.

For modern products, quality-planning starts before a contract is signed. Such planning must recognize two issues.

i. The buyer must transmit to the supplier a full understanding of the use to be made of the product communicating usage requirements can be difficult even for a simple product.
ii. The buyer must obtain information to be sure that the supplier has the capability to provide a product that meets all fitness for use, requirements.

Supplier selection is an important decision, with a decision to buy the number of suppliers for each item are then decided upon. Assessment of supplier quality capability is also an important step, which involves one or both of two actions.

i. Qualifying the supplier's design through the evaluation of product samples.
ii. Qualifying the supplier's capability to meet quality requirements on production lots through supplier quality survey and supplier's manufacturing process.

Every construction company has to be particular about the supplier because it's the input quality which will contribute to the final product. Variety of materials from various sources is required for construction projects eg. Construction of residential building requires materials ranging from sand, cement aggregates, wood to door, windows, flooring tiles, plumbing materials, paints etc. from different sources and having different characteristics.

Strategic Quality Planning

Preparing for the future is crucial. In today's highly competitive and changing market place the margin for error is decreasing, hence planning for the future is necessary for survival and successful planning and

executing the plan are key activities in a company done by its managers. If done well, this process will give the desired results. Formal strategic planning provides many benefits, including systematic thinking, better co-ordination, sharper objectives, improved performance standards, and management involvement. All of these result in a planned approach to tackling the market place that can end in higher sales and profits. For construction industry Strategic Quality Planning is the foundation which can efficacy of any organization can be measured.

A good planning process needs to exist throughout an organization. It should be standard process, and everyone should be a trained in it. Once in place it provides a common planning language with common formats. As managers and employee's transfer or move within the company, they need only worry about the planning content, the process having been standardized. A good planning process will consist of a long-range plan and an annual plan. The long-range plan includes analysis of current situation (reviews of strengths and weakness, competitors, customers, opportunities) and then defines broad objectives and strategies that must be pursued.

Before any planning starts, the organization's purpose and vision should be prepared and clearly understood which define the fundamental set of reasons for the organizations existence. It should be inspiring, give a clear sense of direction and provide a basis for decision making.

a. Customer needs issues and channels of distribution.
b. Rigorous analysis is required, based on data of customer needs and trends. This analysis allows us to discover new market segments and to build a data based model of the market.
c. Competitive situations: Here the focus is on a competitive analysis. We need to understand the competition, their strategies, how they differentiate their products and services, and their financial strengths.
d. Products and services: Based on customer needs and target market segments, we determine our proposed products and services. This includes continuing with current offerings and planning for new offerings with the help of key technologies or core competencies.
e. Development of partners and purchase plan: A plan is defined for developing products and services that we need to purchase from third parties and partners. In addition to products, this may include services, such as after sales support and product distribution.
f. Financial Analysis: Here analysis is done of revenues, cost of goods, expenses, investments, (including R & D), overhead costs, and profits. We must also determine the return on investment for the proposed products and services. Five years projections for these items should be available.
g. Potential problems Analysis: It's important that a risk analysis be conducted and appropriate contingency plans proposed. Areas of risk and the possible competitive response should be reviewed.

Five-year plan: 5-year plan according to major functions of the organization is listed. This would include product plans and objectives for marketing, design and manufacturing along with plans for quality and human resource development.

Quality Circles

This isn't a device of top management to seek improvement as per target and plans. Management constitutes QIT and deploys them to work towards customer – driven targets and objectives. Top management however, welcomes and nurses QC, aids and motivates them for enhancing the morale and promoting knowledgeable participation in-group improvement exercises.

QC started in Japan in 1961 and JUSE (Japanese Union of Scientists and Engineers) was a nodal agency in this effort. A group normally consisting of four to eight workers with the foreman as its nucleus was termed a quality circle. It is voluntarily formed with people in the same work area. Each circle conducts improvement activities independent of several such circles. The circles objectives is to:

a. Increase the level of worker consciousness to wards improvement and quality,
b. Manage and improve construction, and
c. Develop the managerial capability of the foremen

Imparting appropriate training to workers is an essential step. To train the workers in troubleshooting, simple data collection and evaluation procedures could form the core of training. Control charts, graphical methods of presentation and analysis such as tally, Ishikawa, Pareto

and scatter diagrams, frequency distribution and histogram are useful tools for the workers. Such programs in construction industry will surely help to improve the quality awareness level of the labour force actually performing the task.

Cost of Quality

Historically there was the mistaken notion that achievement of better quality requires higher cost. It was this false myth that prevented many company's to invest strongly into quality activities and programs. However, the fact of matter is that poor quality implies waste of material, waste of the effort of labor and waste of equipment utilization and thereby results in higher costs. On the other hand good quality ensures optimum utilization of man, machines and materials and thereby lowering costs.

The costs can be primarily divided into two major categories

i. Costs of control which includes prevention costs and appraisal costs.
ii. Cost of failure of control which includes internal failure costs and External failure cost.

The prevention cost component in costs of control is meant to prevent unsatisfactory quality products to be manufactured and include costs on quality and organization and training of employees on quality concepts. In many organizations some employees will need to be convinced that their senior management are serious about TQM. Quality costing is a way of highlighting to all employees the importance of product and service quality to business profitability.

Usefulness of quality costs display the importance of quality related activities in meaningful terms. They can also be used to educate staff in concept and principles of TQM and explain why the organization is insisting on it. Knowledge of quality related costs enable business decisions about quality to be made objectively. It permits the use of sensitivity analysis, discounted cash flow and other accounting techniques for the evaluation of expenditure projects, as in any other area of the business. In this way it helps companies to decide how, when and where to invest in preventive activities and/or equipment.

Construction Industry must control and slash down it's project cost and TQM can surely help to move towards zero defects and hence help to compete in the national and international bidding and contracting.

Supplier Involvement

A revolution in the relationship between buyer and suppliers has emerged in the form of supplier partnerships. Research shows that poor quality of supplier items results in almost half of the quality problems. Also with just in time, inventory management concept, it's imperative that purchased product meet quality requirements.

STEPS OF IMPLEMENTING TQM

- Organize a workshop to appraise top management about the concept, principles, tools and techniques of TQM.
- Conduct another workshop similar to above for senior managers.
- Senior managers to identify key areas where management actions are required.
- Set up a cross-functional team of departmental heads to address areas of actions.
- Appoint a committee consisting of top management and TQM co-ordinator to monitor TQM progress.
- Publicize results of success of TQM.
- Set up improvement groups/task forces.
- The participation of all people in the organization begins with training and preparing their supervisors. Most individuals ultimately, receive training in, and opportunities to apply quality tools.

CONCLUSION

TQM helps in achieving business leadership through customer satisfaction and employee empowerment. Construction projects which are complex in nature, which require construction in situ, which require varied materials, huge labour force, team work, technical; excellence and which are planned and designed to function for a long period.(60 to 100 yrs) have to attack the competition of inefficiency by adopting new technologies, update mechanism and one of the solutions to all ills is the practice of TQM to compete in the national and international market arena.

TQM can help to deliver customer satisfaction with improved organizational performance of a particular construction firm with increased market share, reputation, cost reduction ,lower inventory investment, reduction in product development cost, lesser cost of procurement and

lower cost of inspection and above all sustained growth of the conduction Firm.

In TQM the word total is very important in this expression because it states that we seek comprehensive ways of dealing with complex sets of interacting issue - involving every one at all levels, addressing all major issues. Construction industry must realize that the organizational objectives of customer delight, employee involvement, productivity and profitability are closely inter-linked with the implementation of TQM. Acceptance and use of TQM is the only tool to ensure competitiveness in domestic and global markets (Fig 1.0)

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