King Fahd University of Petroleum & Minerals

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Project Quality Management

Term Paper
Benefits & Difficulties in Implementing TQM in the Construction Industry

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Content

1. INTRODUCTION

1.1 General

The construction industry is characterized being a highly fragmented and extremely competitive business. The contractual arrangement of the construction industry creates a large number of problems. The four major participants – owner, contractor, Architect/Engineer (A/E), and supplier – have different and conflicting interests and priorities. Total Quality Management (TQM) can help to bring all the parties involved in the construction industry closer to meeting their expectations. Also, it can help to reduce adversarial relations and increased litigations.

The construction industry differs from the manufacturing industry where TQM has proven its effectiveness, in a way that makes the introduction of TQM more challenging. While the manufacturing industry is characterized by a steady-state process, the construction industry is a one-time process. The construction industry is unique for the following factors: (1) the mobility of labour, (2) diversity in the types, forms and shapes of construction projects, (3) geographical dispersion, (4) the contractual relationships, (5) the susceptibility to weather, and (6) the fact that almost every job is a prototype.

Nesan and Holt (1999) indicated that the participants in the construction industry tend to be reactive to changes being imposed on them such as economics, political, and technological pressures, which results in poor performance in the industry. Love *et al* (1998) proposed that TQM can make the organization cope with the change as the norm, rather than being reactive to such pressures of change.

Love et al (2000b) suggest that the construction industry problems will remain until all participants in the construction take their responsibility for initiating changes within their own organization. Love *et al* indicated that such change can be initiated through the effective implementation of TQM.

Some of the construction problems such as fluctuation of demand (non-steady state) create difficulties in TQM implementation and TQM could only help the organization to cope with such fluctuations. In other words, while TQM could be a solution for the construction industry problems, some of the construction industry problems are themselves obstacles for TQM implementation. In fact, the problems of the construction industry can be classified into internal and external problems. Generally, an organization is in a position to deal with the resolve internal problems since they are related to the business processes of the organization and management. For example, a construction firm with a high rate of project re-work due to poor workmanship should be able to improve the situation and resolve such a problem. On the other hand, the resolution of external problems is a more challenging task, and in most cases the industry has no control over such difficulties. The possible negative impact of labour laws and taxes, for example, are

two of the external problems facing the industry. At the same time, many such external challenges could be resolved through direct Government involvement.

1.2 **Overview**

The literature review focuses upon recent definitions of TQM and the useful distinction to be made between TQM, Quality Assurance (QA) and Quality Control (QC). This is followed by a discussion of the various elements, which are typical (in one combination or another), of TQM implementation. The benefits of implementing TQM are discussed alongside the very real issue of obstacles to implementation. Implementation cost is also looked at prior to a discussion of TQM measurement.

1.3 **The Concept of Total Quality Management (TQM): Towards A Definition**

In 1980s and 1990s, the world witnessed what could be called a "quality revolution" due to the globalization of the marketplace and increased competition. As a result, Total Quality Management (TQM) became one of the dominant managerial themes in the 1990s. The successful experience of the manufacturing sector within both Japan and United States in implementing TQM in the 1980s encouraged other nations, as well as other sectors, to adopt the approach. Indeed, the widespread interest in adopting TQM has spread beyond profit-oriented organizations into public services organizations.

The British Standards (BS4778) defines TQM as:

> *A management philosophy embracing all activities through which the needs and expectations of the customer and the community and the objectives of the organization are satisfied in the most efficient and cost effective way by maximizing the potential of all employees in a continuing drive for improvement.*

The BS 4778 definition for TQM is a comprehensive and inclusive definition for TQM. The key word in this definition is that TQM is a *philosophy.*

The American Society for Quality (ASQ) defines 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 key word in this definition is that TQM is *approach*

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On the other hand, Integrated Quality Dynamics, Inc., a consultant firm defines TQM as:

> *A structured system for satisfying internal and external customers and suppliers by integrating the business environment, continuous improvement and breakthroughs with development, improvement, and maintenance cycles while changing organizational culture*.

This definition considers TQM as a *structured system*.

From the review of various definitions of TQM, it seems that academics and quality gurus perceive TQM to be a philosophy or concept; while consultants and practitioners prefer to think of TQM as structure or system. Perceiving TQM as a philosophy or concept liberates TQM from constraints. On the other hand, perceiving TQM as a structure or system could push TQM away from one of its main essences, which is continuous improvement and adaptability to change.

At the same time, it is necessary to translate TQM as a philosophy or concept into a set of actions in a form of structure or system in order to implement it. Therefore, it can be said that TQM is a *philosophy by definition and structure by implementation*. It is important, therefore, to have a reciprocal interaction between TQM as a philosophy and its structure or system.

Aims of TQM

The aims of TQM are to achieve customer satisfaction, cost effectiveness, and defect-free work. The customer will be satisfied only if the product has a very low rate of defect (literally none) and is competitive in price with offerings from other suppliers. TQM achieves customer satisfaction through focusing 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 TQM culture, does not mean only the final recipient of the organization's end product or services. The "customer" is also every individual or department stakeholder within the organization.

TQM can be viewed as a new way of thinking about organizational theory and a new approach to management. Adopting TQM as the guiding philosophy of an organization gives that organization a better chance of surviving and, further, flourishing in the present competitive market place. The impact of TQM implementation is not merely in enhancing the quality of the final product or service, which might have a substantial effect on marketing, but also goes to the foundation of the organization.

TQM and Construction Industry

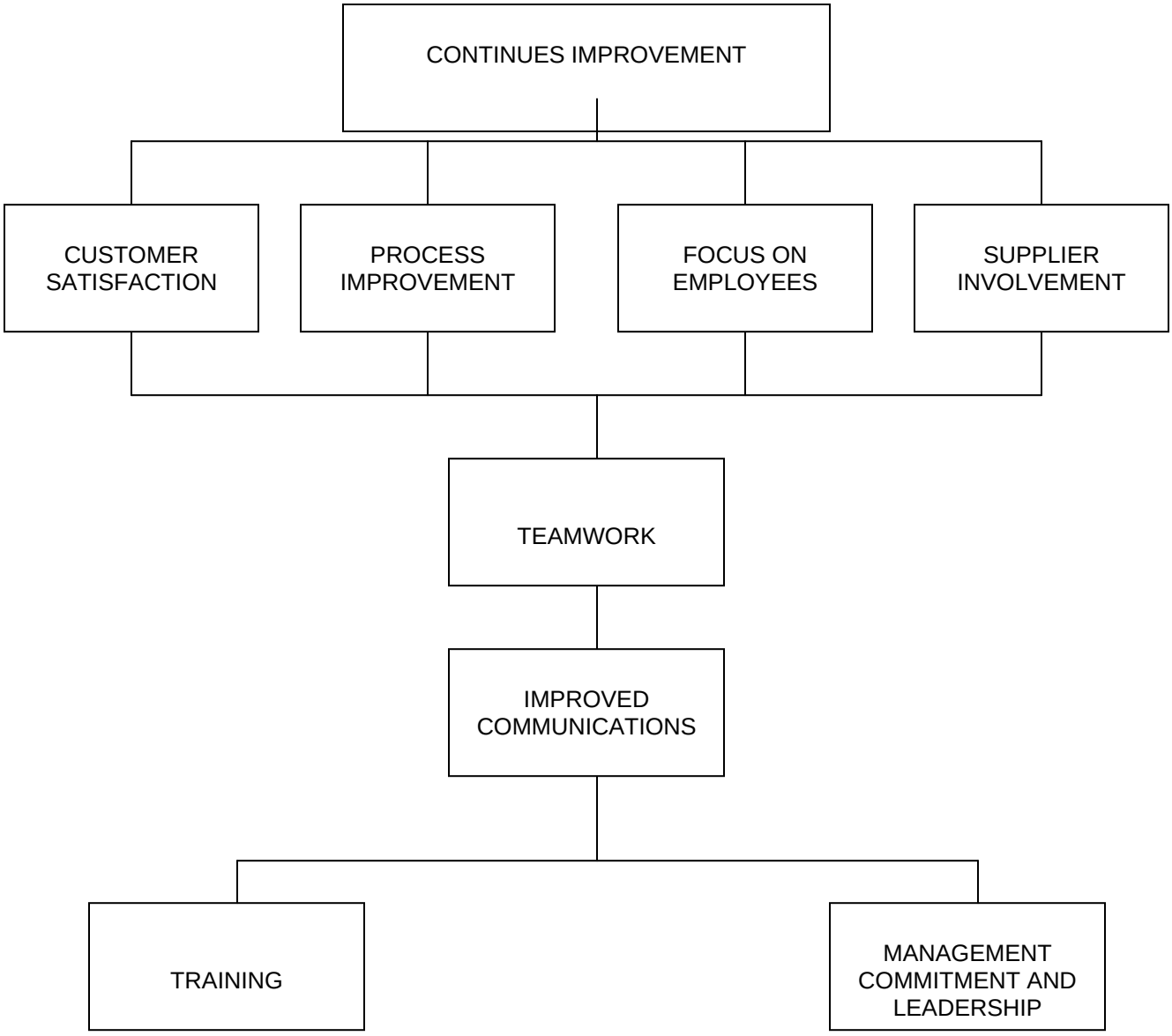
The construction industry has tended to confuse TQM and Quality Control (QC) and Quality Assurance (QA), believing that compliance with QA Standards is all that there is to the application of TQM on construction projects (Jaafari, 2001). This confusion has led to the use of these expressions interchangeably. QA and QC may be considered as separate sub-elements of TQM. However, QA and QC do not represent the only elements of TQM. TQM 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 TQM culture varies from one company to another and from one industry to another. However, the TQM 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, TQM objectives are dynamic in their nature and this dictates continues updating and upgrading.

2. Elements of TQM

TQM can be modeled by structure that consists of the basic elements of TQM. These elements represent the basic ingredients or the philosophical pillars of TQM. The number and priority of these elements vary from one author to another. Figure below shows the structure of TQM. The structure consists of nine elements where their importance might vary from one organization to another.

It is worth mentioning that most of the literature which addresses the elements of TQM elements is old. The recent literature to address TQM does not emphasize the elements of TQM, 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. The recent literature is more focused on difficulties and the appropriate approaches of TQM implementation.



The Structure of TQM (Modified from Chase, G.W. (1993))

Training and Management commitment and leadership represent the two basic elements for the structure and they can be considered to be the foundation for the TQM structure. Improved communication and teamwork represent the linkage between the foundation and the other elements of the TQM structure. The improved communications element lies below the teamwork element to indicate that improved communication has higher priority than teamwork. The customer satisfaction, process improvement, focuses on employees, and supplier involvement elements are parallel to indicate that they are equal in their importance. Continuous improvement lies on the top of the structure as an umbrella that covers the rest of the elements.

2.1 **Training**

Training is a fundamental element for any successful quality management programme. Quality experts and Chief Executive Officers (CEOs), who have successfully implemented TQM in their organizations, unanimously recognize the importance of training. The training programme must target everyone in the organization, since quality under TQM is everyone's responsibility. All employees from top management to labour should understand the need for TQM, understand what TQM is and how it works and its payoff.

Any training programme should include an orientation to the basic concepts and procedures of TQM. This provides employees with a fundamental knowledge which can be linked to more advanced topics. TQM requires a participative, disciplined and organized approach to improving process, thus team training is very important. The training programme should cover 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.

The training programme should be tailored to the group being trained. The training material should be relevant to the group's job function, so that abstract concepts can be realized as a concrete fact. The material objective in the training programme should be applied to the job as quickly as possible. Training should be continuous even during a crisis situation. Furthermore, management should demonstrate their commitment to the training programme through their participation and support.

2.2 **Management Commitment and Leadership**

Management commitment and leadership are absolutely essential for the success of any TQM programme. Prior to management commitment, management should have a thorough understanding of TQM. This commitment must be coupled with leadership and 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 statement and a mission statement, which summarizes the organization's philosophy with emphasis upon customer satisfaction and quality.

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 the 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.

2.3 Communication

Good communication is very important in achieving TQM. 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 the 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.

2.4 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 quality team is the Advisory Committee 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. The 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.

The major responsibility of a quality team is to identify the areas of improvement and the reasons for the problem. After this, team should select a specific goal for improvement. The solutions to overcome the cause of the problem should then be implemented. The effectiveness of the solution should be checked for any necessary corrective actions.

Once the solution proves its effectiveness a new standard should be developed and continuously tracked

2.5 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 programme that measures the level of customer satisfaction. Such a programme will help the organization to identify areas of dissatisfaction, so corrective action can be taken to eliminate the source of dissatisfaction. Two information gathering programme should be developed: one to measure external customer satisfaction, and another to measure internal customer satisfaction.

Customer satisfaction 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.
4. Take action to improve satisfaction.

2.6 Continuous Improvement

In the words of Thomas Oswald and James Burati, *"Total Quality Management is often termed a journey, not a destination."* This is because of its nature as 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 "plan-do-check-act" (PDCA) cycle is a systematic procedure for improving methods and procedures by focusing on correcting and preventing defects. Avoiding defects is usually less costly than the typical approach of attempting after the fact to determine defects. The PDCA cycle can maintain any improvement and prevent deterioration.

Continuous improvement entails focusing 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.

The American Productivity and Quality Centre in its publication "Planning, Organizing and Managing Benchmarking Activities: User's Guide" defines Benchmarking as (Lema, 1995).

> *a systematic and continuous measurement process; a process of continuously measuring and comparing an organization's business process against business leaders anywhere in the world to gain information which will help the organization to take action to improve its performance.*

2.7 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 (SPC) 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.

A quality improvement team 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 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.

2.8 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 make the working environment open, so honest comments can be made without fear of punishment. In fact, it is employees who know best what is right or wrong with a process, since they are the ones who do it. In addition, management should be responsible for providing extensive training to its employees to ensure that the system is used properly. Furthermore, management should encourage suggestions and a procedure should be developed for taking action on 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 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.

2.9 Supplier Involvement

TQM recognizes that the quality of any stage in a process is dependent on the quality of the previous stage. Thus, TQM pays attention to the suppliers or vendors of an organization. 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 supplier's 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.

Deming emphasized the importance of maintaining special relations with suppliers. Deming stresses this and states:

> *"End the practice of awarding business on the basis of price tag alone. Instead, minimize total cost by working with a single supplier."*

This point can be achieved through partnership relationships. Stuart (1993) defined a partnership as:

> *"a purchasing method and philosophy that expands the relationship with a supplier beyond traditional purchasing methods. A partnership involves many characteristics including long-term contracts, fewer supply sources and high degree of mutual trust."*

Contrary to the traditional procurement methods, which depend on multiple suppliers for each commodity, partnership requires a single or very limited number of suppliers. 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 high 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, 1992 and Stuart, 1993).

A task force of the Construction Industry Institute (CII), Austin, Texas, defines partnering as (Weston, 1993):

> *A long term commitment between two or more organizations for the purpose of achieving specific business objectives by maximizing the effectiveness of each participant's resources. This requires changing traditional relationships of a shared culture without regard to organizational boundaries. The relationship is based upon trust, dedication to common goals and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation and the continuous improvement of quality products and services.*

3. Benefits of TQM

In order to appreciate the importance of TQM and to have a feel for its impact, the benefits of TQM to the organization should be known.

Bardoel and Sohal (1999) reported the benefits achieved adopting TQM in seven Australian organizations based on case study research. The reported benefits are:

- Better control of processes resulting in consistency from design through to delivery.
- Reduced production time.
- A reduction in the quantity of goods damaged in transit.
- Reduced delivery time.
- Decreased set of chemicals.
- Increased measurement of performance, and
- Improvement in customer perceptions of the company.

However, the major benefits of a TQM programme are 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% increase in sale and Y% decrease in

costs can be achieved by embodying TQM ethics in all aspects of the organization, and those objectives become a natural consequence.

4. The Difficulties in Implementing TQM

The implementation of TQM into an organization requires fundamental organizational culture change. Changing an organization's culture is a very difficult task, which often faces resistance. The challenge of implementing TQM results from the fact that TQM is not a slogan, nor a tool, nor a programme; it is an organization paradigm. The concept of TQM is broad enough to be the frame-work or foundation of an organization's culture. Therefore, implementing TQM might deal with replacing, not only modifying, the organization's culture. Furthermore, the transformation from the traditional western paradigm to the TQM paradigm is a radical change.

Lakhe and Mohanty (1994) discussed a case of a TQM implementation in a company located in Bombay, India. The analysis of their case study demonstrated the major obstacles in implementing TQM, specifically in developing nations:

- Inadequate knowledge and information about TQM.
- Doubts of employees about management's intentions.
- Failure of management to maintain interest and commitment over a long period of time.
- Difficulty in measuring the effectiveness of TQM.
- Poor internal communication.
- Difficulty in assessing customer expectations and satisfaction.
- Insufficient training resources.

Furthermore, some individuals actually enjoy problems resulting from poor planning or poor performance. Thus, those personalities are not motivated by the assurance that TQM will provide in making their daily activities more rational and predictable. Special attention should be paid to those individuals since they might handle the TQM implementation process.

Among the other difficulties in implementing TQM is the failure to have some means of monitoring and managing the overall progress of the TQM implementation. In addition, the failure to provide training skills immediately before TQM is to be applied. Finally, regarding TQM only as an internal process and thus failing to involve suppliers, subcontractors, and others in the process chain creates a major difficulty in implementing TQM.

5. TQM Implementation

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.

Prior to TQM implementation, an organization might need to benchmark its current position. This can be accomplished in several different ways, such as a literature review to identify the state-of-the art for TQM implementation. A second benchmarking technique is to hire experts from outside the organization to review and assess current work process and recommend the best way for the tentative implementation. A third strategy is to visit other organizations that have successfully deployed TQM and take their accomplishments as a benchmark.

Lakhe and Mohanty (1994) suggest that organizations, prior to any attempt for TQM implementation, must ask the questions:

- What do we want from TQM?
- What are the implications (human and non-human) for the organization?

Sometimes, it is very helpful for the organization to hire a TQM consultant to provide the resources, experience, and discipline necessary for the process to start. The consultant should neither be perceived as an initiator of TQM and the improvement process nor as the "TQM champion" or the organization expert on TQM. The role of the consultant should be limited to the transfer of skills and knowledge; when the task is completed, the training and the knowledge provided by the consultant must remain within the organization in order for the process of improvement to progress and develop autonomously. The organization must select the consultant carefully to ensure that its choice is best suited for its needs.
Lakhe and Mohanty propose a framework for implementing TQM:

1. Identify the degree of commitment and area of key interest, and list the long-term changes required.
2. Define the objective of TQM.
3. Identify resources available and develop understanding of the organizational system with the quality system.
4. Specify top management commitment through quality policies, procedures and processes.
5. Create company-wide awareness and a participative work environment by emphasizing customer-oriented value. Encourage quality commitment.
6. Design action plans. Develop specifics about the future.

7. Identify key issues and constraints on implementation. Develop strategies for implementation.
8. Identify and allocate resources. Execute plans. Build momentum for change.
9. Implement and monitor.
10. Measure benefits in terms of achievement.

Other have proposed models for the implementation of TQM, including Burati *et al* (1992), Longenecker (1993), and Oakland (1994). However, these models are only guidelines and 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 transferable, each organization must develop its own framework and each manager his mind set of Quality Management (QM) and any tentative desire to theorize QM must take this into account.*

6. The Cost of TQM

There is a tradeoff between cost and quality which sometimes makes it difficult for the decision maker to adopt a quality programme. Two questions usually arise in the mind of the decision maker:

1. How much will it cost to improve quality?
2. How much will it cost not to improve quality?

Today, there is a disagreement about the value of quality costs, with views falling into one of the following three areas:

1. Higher quality means higher cost: This view believes that an enhancement in quality requires investment in terms of labour, materials, design and other costly resources. At the same time, the additional benefits from improved quality do not compensate for the additional expenses.
2. The cost of improving quality is less than the resulting savings: This view believes that the saving resulting from less rework, scrap, and other direct expense related to defects is the drive for continuous improvement of process. This view shares the above view to a certain degree in that the trade-off between costs and quality is not financially in favor of quality
3. Quality costs are those incurred in excess of those that would have been incurred if the product had been built or the service performed exactly right the first time. This view might be the nearest to what TQM advocates. Costs include the indirect (hidden cost) costs such as lost customers, lost market share, and many hidden costs and opportunities, which are not identified by cost accounting systems.

In 1999, Hendricks and Singhal published the results of their research on the link between TQM and financial performance in Quality Progress Magazine (ASQC). The research established the link between TQM and financial performance for firms that have implemented TQM effectively. The sample consists of 600 quality award winners in the U.S. from about 140 different award givers. The financial performance was examined over two year's periods. The research reported that no significant differences in performance are observed during the implementation period. This could suggest that the implementation costs may not be as high as widely believed. The results of the post-implementation period, which starts one year before and ends four years after the winner wins the first quality award, show significant growth in operating income. The research concluded that the benefits of TQM are achieved over a long period and it takes at least two years before the financial performance starts to improve.

7. TQM and Measurement

In order to discover the results of deploying a quality programme and the area of future improvement, a quality measure is necessary. Under TQM, a number of measures can be used to verify and control the output in order to meet the customer (internal/external) requirements. The measurement provides the organization with a measurement for both satisfaction before an action of quality improvement takes place and the degree of improvement after implementation. For example, increasing the employees' satisfaction with the intention of increasing productivity requires measuring employees' satisfaction and the productivity initially. Later, when the recommendations for the actions to improve employees' satisfaction are launched, both the employees' satisfaction and productivity must be re-measured. It is very important to examine the effectiveness of the improvement activities. The costs of increasing employee satisfaction versus the financial gains of the productivity increase are studied. This is important especially for profit oriented organization. TQM assumes that employee satisfaction increased without incurring great expense. Monetary incentive is not the only approach, which can be used to increase the employees' satisfaction in TQM. 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 Quality Measurements which may be achieved:

- To be able to attain and sustain reasonable objectives.
- To justify the use of resources.
- To provide standards for establishing comparisons.
- To determine priority areas that requires improvement.

- To provide a scale to allow people (employees) to monitor their performance level.
- To identify quality problems
- To detect any decline in performance.

The ingredients of any organization 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 TQM journey considers all these elements and tries to improve them. Different measures and the desired results should be designed for each element.

TQM Measurement in Construction Industry

For the construction industry, it might be appropriate to concentrate on the measurement of labourers' productivity since it is a labour-intensive industry. Furthermore, increasing labour productivity would result in a direct increase in profit, which justifies any investment in time and money. Other measures could be developed to measure the rework and the effect of the training on minimizing the rework, the effect of improvement in inventory and materials handling and equipment operation.

Measurements that are commonly used in the construction industry include cost, schedule, performance rating, customer satisfaction, policies and procedures, degree of attainment, return on investment, and non-conformance. The most quantitative measurements used in the construction industry are measures of cost and schedule. However, there is a trend in the construction industry to recognize items other than classical cost and schedule measurements as indicators of project success.

In the construction industry, there are three criteria for selecting measurement:

1. The measurement verifies progress toward project objectives.
2. The measurement can be used for continuous improvement.
3. The measurement results can predict something about the project's future.

The construction industry is one of the last industries to embrace objective performance measurement, because of the diversity of processes and products associated with the procurement of projects. However, numerous methods of measurement can be applied to help construction organizations improve their quality and even productivity. The cost of quality, for example, provides information about rework and activities for prevention. It is after the fact measurement which can be used as a mechanism to learn from the past to improve the future.

Benchmarking is one of the tools which may be used for obtaining quality improvement in TQM. Benchmarking in the construction industry is not used positively as a tool for servicing internal and external customer requirements but more for measurement such as

project time performance. It is suggested that organizations in the construction industry establish benchmark measurements that focus on:

- Effectiveness: measurements that determine whether the organization/project/process is achieving the desired results.
- Efficiency: measurements that determine performance and input such as labour/staff efficiency and material efficiency.
- Productivity: measurements that relate the process outputs to its inputs.
- Quality: measurements that have voice of the customer and quality cost.
- Improvement: measurements that lead to key performance indicators for the organization/project and include monitoring improvement such as rework and material waste.

8. TQM and the Construction Industry

The development of the TQM concept originally took place in the manufacturing industry. Thus, most literature addresses the manufacturing industry and this gives the misleading impression that the 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 industry in such a way that makes introducing TQM more challenging. While the manufacturing industry is characterized by a steady-state process, the construction industry is one time process (uniqueness). The construction industry is also unique in the following factors:

(1) The mobility of labour,
(2) Diversity in the types, forms and shapes of construction projects,
(3) Geographical dispersion,
(4) The contractual relationships,
(5) The susceptibility to weather,
(6) The fact that almost every job is a prototype

In the 1970s, Japanese construction firms, taking advantages of the successful experience of Japanese manufacturers, introduced TQM into their industry. Since the mid-1970s, three Japanese contractors have been awarded the Deming Prize for Quality Improvement.

In the late 1980s, as the U.S. construction industry began to develop an interest in TQM, many argued that TQM would not work in the U.S. construction industry. The successful experiences in Japan's construction industry could not take place in the U.S. or in Western countries due to the cultural differences between Japan and the U.S. Time has proven the fallacy of that belief. A few years later, many owners and contractors in the

construction industry implemented TQM successfully in the U.S. as well as in some other Western countries.

The Construction Industry Institute in the U.S.A. summarized the history of TQM in the engineering and construction industry as follows (Fisher, 1995):

> *The engineering and construction industry has followed the lead of the manufacturing and service industries in implementing Total Quality Management. Owners began to adapt TQM concepts to their engineering and construction programmes based on the experience of their main manufacturing businesses. Contractors….witnessed the owner's adaptations and were soon aware of changes in market conditions and the resulting increases in both domestic and international competition. Owners have directly challenged contractors to study the TQM processes and apply the techniques to their design and construction efforts. The industry, as a result, is experiencing growth in TQM.*

In May 1992, in Dallas, Texas, the Construction Engineering Programme at Iowa State University held its third "Total Quality Management (TQM) in Building Design and Construction Workshops". The objective of this Workshop was to share participants' experiences in implementing TQM in their businesses. Four topics were selected for discussion in the break-out sessions:
(1) Recommendations for beginning the Quality Journey
(2) Quality implementation in small and large companies
(3) Recommendations for improving job and site quality
(4) Recommendations for the development and use of quality – improvement teams.

The workshops developed lists of observations and recommendations for each of the four topic areas. Some of the participants were with companies with as much as 10 years of experience with TQM, which added substantial value to the workshop. The workshops reflected the increasing interest in TQM within the construction industry.

8.1 TQM and Construction Industry Problems

The construction industry in many parts of the world suffers from problems such as time and cost overrun. As a result, numerous Governments initiated reports such as the Gyles Report (1992) Australia; the Latham Report (1994) UK and Egan Report (1998) UK. These reports have been critical of the construction industry and its poor performance. A need for change becomes inevitable in order to improve the condition of the construction industry. According to Love et al (2000b) and Nesan and Holt (1999), 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 TQM.

In other words, adopting TQM by the major participants parties (owner, designer, contractor and supplier) in the construction industry will achieve the necessary change

required for industry's improvement. Under TQM, there is a chain of supplier and customer relationship and TQM pays attention to this relationship. The relationship among the four participants parties of the construction industry can be viewed in the context of the supplier- customer relationship. Each party has a reciprocal supplier-customer relationship, even the owner, who might be viewed as a customer to the contractor at first glance, is a supplier to the contractor in certain activities such providing the work permits or paying the invoices. This integrated relationship enhances the delivery of each party to the benefit of the entire business environment. Consequently, the improvement of the entire industry can be achieved. In fact, this research hypothesis is based on the idea that by adopting TQM in the construction industry, participant party relationships in the industry will improve and its problems will be greatly reduced.

8.2 Difficulties of TQM Implementation in the Construction Industry

Strange and Vaughan (1993), addressed the reasons why implementation of TQM in the construction industry is challenging. They stated the reason for the challenge is the point of view, or 'paradigm', that construction leaders have about their industry. The construction leaders, they argued, believe in what can be called the five "can'ts" (Strange and Vaughan, 1993):

1. You can't apply industrial management solutions to construction, because of the unique nature of the construction industry.
2. You can't do statistical analysis of construction processes, because they are unique and non-repetitive.
3. You can't invest in training at the job level, because individual employment is short-term, the people have no company loyalty and the environment is too difficult.
4. You can't spend money on management programmes, because there is too much competition and the margins won't allow it.
5. You can't take time away from doing the work for seminars, retreats or symposia.

Strange and Vaughan suggested that the solution to overcoming the challenge is to have a new definition for the two words "product" and "success". They believe that "product" must be redefined to be the management service provided in planning and executing a construction project instead of defining it as the finished building or project. Also, "success" should be redefined to mean meeting the goals of the customers of that product instead of defining it as meeting company goals for profit, growth and so on. Their suggested solution is more theoretical than practical. Redefining "product" and "success", would not be that simple, since the redefinition requires more than a new understanding. At the same time the reality of the construction situation might prevent new definitions and what they imply in a practical terms. The stakeholders' interests, for example, cannot be given away to the customer merely to be a TQM organization.

It might be true that the above five "can'ts" could create obstacles in a case that a construction firm decided to adopt TQM. Furthermore, it seems that the "can'ts" two through five are the result of the first "can't", which is the nature of the construction

industry. However, collective efforts could help to overcome the above barriers. For example, contractors could share the training cost and public bodies such as contractors unions, if such exist in the local environment, could also play an important role in coordinating or even conducting those collective efforts. The time and money needed for TQM efforts could be distributed among contractors in the industry rather than having the same efforts repeated by each individual contractor.

According to Yiwei and Eng (2000), one of the major difficulties preventing wider implementation and acceptance of TQM in the construction industry is the barrier caused by traditional or conventional practice. One example is the traditional way in which project bids are evaluated with the heaviest emphasis on price. It is widely known that the client usually selects the contractor base mainly on the lowest price with less consideration for past experience, current workload and reputation for quality. This situation does not give contractors any incentive to adopt TQM principles.

The long-term nature of a successful TQM implementation also creates a major problem, especially in the construction industry. The sudden change of the market, for example, that threatens the existence of the contractor could redirect the firm from the long-term objectives to the urgent corrective actions. The construction industry is known for its fluctuations, which has the effect of making construction firms reactive rather than proactive.

8.3 Partnership in the Construction Industry

Partnership is considered to be one of the concepts that fall under TQM. One of the main TQM elements is to enhance the relationship with the supplier through depending on a limited number of suppliers. Abudayyeh (1994) reported and discussed the California Department of Transportation (Caltrans) experience in implementing the partnering concept. The paper did not indicate that partnering is within the context of TQM. However, partnering is one of the effective methods to enhance and maintain suppliers, which is one of the main objectives of TQM. The paper described an example of partnering agreement between Caltrans and one of its contractors. The paper, also, indicated that partnering shows promise for improved relationships between contractor and owner. The paper summarized some of the benefits for both contractor and Caltrans (owner) in implementing the partnering concept. Some of Caltran's (owner) benefits in implementing partnering are:

1. Reduction in claims and improved conflict resolution strategies due to open communication.
2. Reduced cost overruns and delays due to improved cost and schedule control.
3. Increased opportunity for innovation through open communication that encourages proposals for new construction methods and for constructability improvement.

The contractor also gained benefits in implementing partnering such as:

1. Reduced costs related to potential claims and litigation.
2. Lower risk of cost overruns and delays.
3. Increased opportunity for financial success through innovative construction methods.

Weston and Gibson (1993) presented an overview of partnering as it applies to the U.S. Army Corps of Engineers and the results of a survey conducted to assess the status of partnering in the 37 domestic districts of the Corps of Engineers. In addition, the paper provided an analysis of project performance for partnering projects compared with similar samples of non-partnering projects. The Corps of Engineers, as a public agency, is governed by regulations which require the use of an open, competitive, low-bid contracting strategy. Therefore, the Corps defines partnering as:

> *"creation of a relationship between the owner and the contractor that promotes mutual and beneficial goals. It is a non-contractual but formally structured agreement between the parties leading to an attitude that fosters risk sharing."*

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 researcher believes that the results could be different and the impact more positive if a genuine partnership took place.

9. The Construction Industry in Saudi Arabia

The construction industry in Saudi Arabia, like anywhere else, is affected by the country's economic cycle. Prior to the oil price increase of 1973, Saudi Arabia was a poor country and government spending was very limited. The Saudi Arabia economy is dependent on government expenditure. The increase in oil prices and oil production during the 1970's and early 1980's led to a substantial increase in government revenue. These huge revenues gave the government an opportunity to overcome the limitations in the infrastructure of the country. Both the First (1970- 1975) and the Second National Development Plans (1975-1980) gave construction the first priority in spending which, in return, created a boom in the construction industry. The share of construction in GDP increased from 4.5% in 1970 to 14.4% in 1982.

During the boom period, the emphasis was merely on building and completing the projects, without any consideration for life cycle cost (operation and maintenance cost), the quality or even certain standards that fit the local environment. During that period, the government allocated a significant portion of its annual budget to be spent on building airports, transportation networks, schools, hospitals, and other facilities. Money was not an issue and the budget was very generous. At the same time, government expertise was

limited in building such huge projects. Consequently, contractors were operating at full capacity, realizing very large profit margins.

The Government's desire to build up the country in a short period of time resulted in opening the country to foreign construction companies, from all over the world, to conduct business. These companies had various methods of conducting business and they brought their own business culture, technology and management techniques. Furthermore, the inflow of foreign labour helped to surmount the existing labour shortage.

Foreign labour ranged from the highly skilled to unskilled. However, the unskilled labour represented the majority. They were paid low wages and came from high-unemployment countries such as Pakistan, Indian, Korea and Egypt. As a result, local nationals abandoned working in the construction industry and the industry became dominated by foreign labour. In this period, the government was the major source of construction expenditure and the private sector played a very limited role.

By 1983, the construction industry had witnessed a decline due to the decrease in government revenue and new priorities for the government which appeared on the horizon due to strategic policies. The sudden decrease in oil prices, which led to a sharp decrease in government revenues, forced the government to cut its expenditure. This economic situation provided beneficial lessons to the government. The government realized that the issue is not only to have the funds to build a certain project, but also to have continuous resources to maintain and operate it. In addition, it began to be recognized how much good planning and consideration of quality at the construction stage will pay off through the life of the project. Attempts have been made to enhance the construction industry and its effectiveness.

After the Gulf War, in 1991, the construction market in Saudi Arabia picked up. This time, the private sector, who considered construction to be an investment tool, played a dominant role. The construction industry benefited from the huge liquidity which was injected into the market during the war and the limited investment opportunities in the country. At same time, the private sector learned from the mistakes committed in the construction industry boom during the 1970's and early 1980's. The private sector paid attention to quality, which has been reflected in contractor practices.

9.1 Challenge of the Saudi Construction Industry

In 1989, the topic for the Fourth Saudi Businessmen's Conference was "The Progress of the Construction Industry in the Kingdom: Obstacles and Solutions". The conference was sponsored by the Chamber of Commerce and Industry in Jeddah, Saudi Arabia, between May 29 and June 1, 1989. The conference revealed that the construction industry in Saudi Arabia was very fragile despite the fact that it represents the biggest portion of the Gross National Product outside of the non-petroleum sector. The conference summarized the problems that face Saudi Arabian contractors as follows:

1. Fluctuation of demand for construction.
2. Foreign competition and the illegal conduct of many foreign companies apparently thought necessary to survive in the Saudi market.
3. The existing debts and accumulated interest of Saudi market.
4. The difficult procedures for transferring expatriate labour sponsorship for various professions between construction firms.
5. There is no agency dedicated to consider the solve contractors' problems.
6. There are no funds dedicated to finance Saudi contractors, other than from commercial banks, as is the case with other non-petroleum sectors (e.g. industrial, agricultural).
7. Non-compliance of foreign companies performing some construction projects in the Kingdom with the government rules which require foreign companies to subcontract 30% of their business to local contractors.
8. Covering up for illegal workers especially within small firms.
9. The unsuitability of the existing Saudi contractor classification system for the present situation which needs due reconsideration.
10. The lack of clarity of the language used in contracts.

However, the above problems, after fourteen years, are still present. One reason for this is that there is no governmental body that has the authority to resolve the above problems. Furthermore, the above problems are more related to the business environment rather than the participant parties of the industry.

The fact that many of the above problems could have been resolved through direct governmental involvement indicates that the construction sector in Saudi Arabia receives insufficient attention from the Government. For example, the Government could have formed an agency dedicated to a consideration of the problems facing contractors, since this could be an essential and initial step towards solving a variety of major construction problems. The problems and challenges facing the construction industry in Saudi Arabia do not appear to be of serious concern to the Government.

The ministry of Public Works and Housing and the local Municipalities are the only bodies who regulate the construction industry in Saudi Arabia. The Ministry of Housing and Public Affairs is responsible for the major public housing projects and contractor classifications..

Al-Barrak (1993) concluded that the major causes for contractor failure in Saudi Arabia are the following:

1. Insufficient experience of management at all levels.
2. Poor estimating which results in understanding the bid for a contract.
3. Lack of any restriction or criteria on those entering the construction market which results in unqualified contractors entering the business.
4. The recession of the national economy forces the profit margins to become very small and very difficult to maintain.

5. Delays in payments, as a result of slow economy, cause a cash flow problem for contractors.
6. Poor labour productivity.
7. The autocratic characteristics of the management.

Al-Barrak's study identified internal problems as well as external problems as causes for Saudi Contractor failure. Although solutions to these problems were not suggested, this study can be considered among the very few studies that addressed the Saudi construction industry and its challenges holistically. The solutions for those problems can not be thrown on the shoulder of the contractor only. Some of the problems need attention from the government or an independent institute supported by government.

9.2 Construction Management in Saudi Arabia

Al-Sedairy (1994) addressed the current state of project management among clients, consultants and contractors in public sector construction in the Kingdom of Saudi Arabia. He presented the results of a survey distributed among government agencies, design and engineering consultants, and the major general contractors in Saudi Arabia. The research revealed that the practice of project management in the industry varies from segment to segment and from owners to consultants to contractors. Owners appear to take the lead in setting standards for the industry because of their authority and their acquired expertise. Owners have been found to use sophisticated tools for project control. It is also found that owners place a high value upon the control of design quality. The research found that consultant has project management in place as a result of the pressure exerted by owners to develop well-defined routines for the logistics and scheduling and so on. However, the research found that contractors have matured sufficiently to adopt the state-of-art managerial techniques such as Total Quality Management. Al-Sedairy was positive and his findings were promising.

It is true that few owners in Saudi Arabia are using sophisticated tools for project management, such as Saudi Aramco. Saudi Aramco business practice as project owner is unique. The financial position of Saudi Aramco, in addition to its management style, makes its conduct of doing business an exceptional case. In fact, it sets an example for other organizations who strive for excellence. It is a noticeable observation that contractors, design offices and suppliers who deal with Saudi Aramco have a higher degree of professionalism and better quality than other firms as a result of dealing with Saudi Aramco because of its stringent requirements. However, it is not the case with majority of the owners. At the same time, even those firms who deal with Saudi Aramco suffer from the common industry problems and many of them have difficulty in dealing with other owners.

Saudi Aramco strives always to implement stat-of-the-art solutions when it comes to either managerial or technical innovations. It is usually influenced by the global trends, especially those in the U.S. It can be considered as a gateway for technology transfer.

10. Summary

This paper has addressed Total Quality Management (TQM) concept in general and the elements of TQM. The TQM elements that have been presented in this chapter will be utilized as a basis for the TQM data questionnaire. The literature review related to TQM in the construction industry has also been covered. A description of the Saudi construction industry has been provided.

11. References

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