

A REVIEW OF QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECT

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Abstract: *The best quality, time and cost are the important aspects of successful construction project which fulfills the main goal of construction industry. The quality management has to provide the environment within which related tools, techniques and procedures can be deployed effectively leading to operational success for a construction project. The role of quality management for a construction company is not an isolated activity, but intertwined with all the operational and managerial processes of the construction project. The quality management system (QMS) in construction industry refers to quality planning, quality assurance and quality control. Quality is one of the aims of standardization. The quality of a product or a complete building or other constructions is the totality of its attributes that enable it to perform a stated task or to fulfill a given need satisfactorily for an acceptable period of time.*

Keyword: - Construction industry, Construction project, Quality Management Practices.

1. INTRODUCTION

The concept of quality management is to ensure efforts to achieve the required level of quality for a product which is well planned and organized. From the perspective of a construction company, quality management in construction projects should mean maintaining the quality of construction works at the required standard so as to obtain customers' satisfaction that would bring long term competitiveness and business survival for the companies. [1] Further to this, another researcher also reiterated that the term quality management as used in the construction industry is all encompassing and embedded in the phenomenon itself and are concepts such as quality control, quality assurance, quality improvement, quality standards etc. [2] In addition to the aforementioned, opined that quality management practices include all the means employed by managers in an effort to implement their quality policies. [3] These activities include quality planning, quality control, quality assurance and quality improvement.

Construction quality is a critical factor in determining project acceptance and resultant contractual payment levels. [4] This has made participants in the construction industry to become notably conscious of the role of quality as an essential means to achieve client satisfaction and gaining competitive advantage in the industry. It was revealed that acceptable quality levels in construction have long been a problem in attaining on time and within budget projects in a highly dynamic, complex, and competitive environment. In advanced view that Quality management has increasingly been adopted by construction companies as an initiative to solve quality problems and to meet the needs of the final customer. [5] Quality has remained in the forefront amongst factors used to determine the degree of success or failure of a project. This long term development has made it imperative for all parties involved in construction projects to strive at all times to produce commendable structures). [6] As many researcher indicated that performance on a global level represents results of activities undertaken. They proceeded further to explain that performance of a project is measured as its ability to deliver the building or structure at the right time, cost and quality as well as achieving a high level of client satisfaction. It therefore stands to reason that quality performance in construction is results oriented and seeks evidence of quality awareness within the operations and output of a building/construction team. Quality performance is also defined over the long term for the effect to be permanent. In other words, quality performance improvements are expected to increase the productivity and profitability of contractors as well as increasing client satisfaction.

2. OVERVIEW OF QUALITY MANAGEMENT

Quality is one of the aims of standardization. The quality of a product or a complete building or other constructions is the totality of its attributes that enable it to perform a stated task or to fulfill a given need satisfactorily for an acceptable period of time. For a building and civil engineering work, a satisfactory product, although essential in itself, is not on its own sufficient. It must be incorporated in the design and construction in a correct manner. In buildings, more defects and failures arise from inadequacies in the treatment of products in design and construction than from shortcomings in the products themselves. [7] Another researcher stated that Quality Management has seen a transition from reacting to the outcome of site production activities to becoming a strategic business function accounting for the raison d'être of construction companies. [8] Unless a construction company can guarantee its clients a quality product, it cannot compete effectively in the modern construction market.

3. QUALITY MANAGEMENT SYSTEMS

If properly implemented, formal quality management systems provide a vehicle for achieving quality (i.e. conformance to established requirements). As researcher defined, quality system is "the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management". [9] In other words, Quality management systems refers to the set of quality activities involved in producing a product, process, or service, and encompasses prevention and appraisal. It is "a management discipline concerned with preventing problems from occurring by creating the attitudes and controls that make prevention possible". [9] Quality activities include the determination of the quality policy, objectives, and responsibilities and implementing them through quality planning, quality control, quality assurance, and quality improvement, within the quality system. [10]

In other views of researcher expressed that, a quality management system is a management technique used to communicate to employees what is required to produce the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications. These activities interact and are affected by being in the system, so the isolation and study of each one in detail will not necessarily lead to an understanding of the system as a whole. The main thrust of a QMS is in defining the processes, which will result in the production of quality products and services, rather than in detecting defective products or services after they have been produced.

3.1. THE ISO 9001 STANDARD

The term "quality system" is defined (ISO 8402) as: Organizational structure, procedures, processes and resources needed to implement quality management. According to ISO 9001, the scope of the standard is that it specifies quality system requirements for use where a supplier's capability to design and supply a conforming product needs to be demonstrated. The model for quality assurance in ISO 9001 is structured into scope, normative reference, definitions, and quality system requirements.

3.2. PURPOSE OF QUALITY MANAGEMENT IN THE CONSTRUCTION INDUSTRY

The U.S. Army Corps of Engineers, (2004) states that Construction Quality Management "CQM" is the performance of tasks, which ensure that construction is performed according to plans and specifications, on time, within a defined budget, and a safe work environment. For purposes of this study, quality is defined as conformance to properly developed requirements. For a construction project, quality begins with requirements carefully developed, reviewed for adherence to existing guidance and ultimately reflected in criteria and design documents which accurately address these needs. Therefore, the designer establishes the quality standards and the contractor in building to the quality standards in the plans and specifications, controls the quality of the work. The purpose of CQM is the Government's efforts, separate from, but in coordination and cooperation with the contractor, assure that the quality set by the plans and specifications is achieved. CQM is the combined effort of the contractor and the Government. The contractor has primary responsibility for producing construction through compliance with plans, specifications, and accepted standards of the industry.

3.3 PROJECT QUALITY PERFORMANCE MEASUREMENT

Performance measurement is a fundamental building block of quality management and a total quality organisation. Historically, organisations have always measured performance in some way through the financial performance, be this success by profit or failure through liquidation. However, traditional performance measures, based on cost accounting information, provide little to support organisations on their quality journey because they do not map process performance and improvements seen by the customer. In a successful total quality organisation, performance will be measured by the improvements seen by the customer as well as by the results delivered to the shareholders. According to the researcher, performance measurement in the manufacturing and construction industries is used as a systematic way of judging project performance by evaluating the inputs, outputs and the final project outcomes. [11] However, very few companies systematically measure their performance in a holistic way. Moreover, the existing systems tend to focus more on product and less on process and design. This can lead to the suboptimal quality of the performance measurement system, the misjudging of relative performance, complacency and the denying of appropriate rewards to the deserving. Previous studies have revealed that performance can be measured in terms of financial and non-financial measures, or the combination of both. When measurements are being implemented, contractors, consultants and the management team's performances are blamed as the major reasons for the failure of a particular project. The other project stakeholders such as client, suppliers, trade contractors and the community at large are neglected.

3.4 QUALITY PLANNING

According the researcher defined, quality planning as a set of activities whose purpose is to define quality system policies, objectives, and requirements, and to explain how these policies will be applied, how these objectives will be achieved, and how these requirements will be met. [12] Subsequent to this definition, that quality plan is different from a test plan. The study continued that quality plan defines the quality goals, is realistic about where defects come from, Selects appropriate detection and prevention methods, and has means not to "go dark". The Project Management Book of Knowledge "PMBOK" 4 also addressed quality planning from a different position to enhance the thoughts earlier expressed. It said that quality planning has a process input generated by predecessor processes referred to as the Project Scope Statement and Project Management Plan. These processes are introduced by external units like Enterprise Environmental Factors and Organizational Process Assets. PMBOK4 further defined quality planning as the process for "identifying which quality standards are relevant to a project and determining how to satisfy them": In other words, it means planning how to fulfill process and product (deliverable) quality requirements: "Quality is the degree to which a set of inherent characteristics fulfill requirements". By planning the quality one has to respect some principles, and these are:

- Customer satisfaction comes first: Quality is defined by the requirements of the customer.
- Prevention over inspection: It's better to avoid mistakes than to inspect the result and repair the defects.
- Management responsibility: Costs of quality must be approved by the management.
- Continuous improvement: Becoming better is an iteratively structured process.

3.5 QUALITY ASSURANCE

In recent years, increasing concern has been expressed at the standards of performance and quality achieved in building works. The need for structured and formal systems of construction management to address the aspect of performance, workmanship and quality has arisen as a direct result of deficiencies and problems in design, construction, materials and components. Many of the problems experienced in building appear as a range of inadequacies from minor technical and aesthetic aspects to major building defects. Irrespective of their degree of severity, such problems are known to cost the industry so much annually, yet, many difficulties might be alleviated through greater care and attention to standards of performance and quality at the briefing, design and construction stages of the building process.[13] If buildings are to be trouble-free, more attention needs to be given to applying quality assurance principles to design and site-work, including project selection and specification, and to supervision of the handling and protection on site.

According the researcher defined quality assurance as a set of activities whose purpose is to demonstrate that an entity meets all quality requirements. [12] Quality Assurance activities are carried out in order to inspire the confidence of both customers and managers, confidence that all quality requirements are being met. The main objective of quality assurance measures in information processes is to fulfill a required quality level. By using described probabilistic model, cause and effect diagram, one is able to analyse existing processes and to detect existing quality gaps within these processes. Harris and McCaffer, (2001) [12] continued that Quality assurance (QA) emphasizes defect prevention, unlike quality control that focuses on defect detection once the item is produced or constructed. It was further established that quality assurance concentrates on the production or construction management methods and procedural approaches to ensure that quality is built into the production system.

4. QUALITY ASSURANCE IN CONSTRUCTION

The importance of Quality Assurance is based on the principles of getting things right first time. By implementing, maintaining, reviewing and continually improving a Quality Assurance System, a construction company can achieve and reap the benefits of having such a system in place. Quality Assurance exists because of the degree of dissatisfaction experienced by the industry's clients over a long period, combined with a growing impatience by some of their advisers to achieve value for money. An increasing number of building companies are also frustrated by the inadequacy of a system which however valiantly they try, leaves their efforts lacking in some regards. A revolution has occurred in the assembly of buildings from what was a craft process to one where the critical work of connecting interdependent units is done in the main by semi-skilled labour from a multiplicity of separate employers. This makes great demands upon supervision and management systems.

A Quality System is designed to provide an assurance to Clients, which can be supported through documented records, that all contracts will be completed in accordance with the agreed time, cost and specification. It should also further ensure that the company personnel, sub-contractors and key suppliers are aware of customer requirements and that they are fully met. Conformance with requirements of the detailed procedures developed in accordance with the Quality Manual has to be mandatory for all staff employed in the company. It is essential to the system that encouragement is given to each employee to develop and maintain an attitude of continuing quality improvement and customer satisfaction. Quality Assurance is concerned with developing and planning the necessary technical and managerial competence to achieve desired results. It is also about attitudes, both of management and of all those for whom they are responsible.

4.1 QUALITY CONTROL

As the researcher defined 'Quality Control' as a process through which a business seeks to ensure that product quality is maintained or improved and manufacturing errors are reduced or eliminated. Quality control requires the business to create an environment in which both management and employees strive for perfection. This is done by training personnel, creating benchmarks for product quality, and testing products to check for statistically significant variations. A major aspect of quality control is the establishment of well-defined controls. These controls help standardize both production and reactions to quality issues. Limiting room for error by specifying which production activities are to be completed by which personnel, reduces the chance that employees will be involved in tasks for which they do not have adequate training. Quality Management Systems, (2013) stated that, quality control is the process of evaluating whether construction projects adhere to specific standards. The main objective of quality control is safety. Additionally, quality control is also meant to ensure that buildings are reliable and sustainable.

The ISO definition also states that quality control is the operational techniques and activities that are used to fulfill requirements for quality. This definition could imply that any activity whether serving the improvement, control, management or assurance of quality could be a quality control activity. What the definition fails to tell us is that controls regulate performance. They prevent change and when applied to quality, it regulates quality performance and prevents undesirable changes in the quality standards. It continued that quality control is a process for maintaining standards and not for creating them. Standards are maintained through a process of selection, measurement and correction of work, so that only those products or services which emerge from the process meet the standards. In simple terms quality control prevents undesirable changes being present in the quality of the product or service being supplied. The simplest form of quality control is illustrated in the Figure below. Quality control can be applied to particular products, to processes which produce the products or to the output of the whole organisation by measuring the overall quality performance of the organisation.

It is often deemed that quality assurance serves prevention and quality control detection but a control installed to detect failure before it occurs serves prevention such as reducing the tolerance band to well within the specification limits. So quality control can prevent failure. Assurance is the result of an examination whereas control produces the result. Quality Assurance does not change the product, Quality Control does. According to the researcher defined quality control as a set of activities or techniques whose purpose is to ensure that all quality requirements are being met. [12] In order to achieve this purpose, processes are monitored and performance problem are solved. In other words, quality control is critically important to a successful construction project and should be adhered to throughout a project from conception and design to construction and installation. Inspection during construction will prevent costly repairs after the project is completed. The inspector, engineer, contractor, funding agency, permit agency, and system personnel must work together to inspect, document, and correct deficiencies.

4.2. IMPORTANCE OF QUALITY CONTROL IN CONSTRUCTION

Quality Control (QC) in construction is the process of verifying that the project is built to plan, that the tolerances allowable by industry standard and engineering practices have been met or bettered, and that the finished project (and all phases to get there) meet with the quality standards of the architect, engineer, owner, and general contractor. On construction projects there are dozens of subcontractors, all of which have specific responsibilities. Superintendents and project managers try to maintain high quality standards but they can't be everywhere at once. Required inspections by cities and counties (as well as other jurisdictions, depending on the project) help to ensure safety and code issues. In addition, a good general contractor or developer will have on staff a QC person, someone who is responsible for going through the building or project, ensuring compliance, and maintaining an ongoing list of corrective items that must be accomplished before the contractor who installed it is paid or leaves the job. QC technicians generally keep a very detailed binder, separated by areas/rooms/phases of the project with notes of items that must be either verified or corrected, with sign-off as each is accomplished. This binder becomes part of the project record and is an important element to completing the project on time and with expected quality maintained.

5. QUALITY IMPROVEMENT

According to the researcher said there is no single definition of quality improvement and no one approach appears to be more successful than another. [14] However, there are a number of definitions that describe quality improvement as a systematic approach that uses specific techniques to improve quality. The most important ingredient in successful and sustained improvement is the way in which the change is introduced and implemented. According to ISO 9000:2000 Quality improvements is "Part of quality management focused on increasing the ability to fulfill quality requirements." Empirical studies on quality management in construction have shown that various quality improvement practices are common among non-residential builders and developers. Most of these practices have been collectively grouped under a successful management philosophy termed, "Total Quality Management".

5.1 SUMMARY

Finally, I have recommended that in the planning stage of any construction project, larger efforts should be exerted on the planning preparation; so quality is the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management. In other words, Quality management systems refers to the set of quality activities involved in producing a product, process, or service, and encompasses prevention and appraisal. It is a management discipline concerned with preventing problems from occurring by creating the attitudes and controls that make prevention possible. Quality activities include the determination of the quality policy, objectives, and responsibilities and implementing them through quality planning, quality control, quality assurance, and quality improvement, within the quality system. Similarly, during the construction stage of projects careful organization and management processes should be applied to fulfill the requirements of the projects' plans. Successful management of construction projects may need to adopt procedures to avoid problems and to adopt contingency plans to reduce the effects of problems when they occurred. Changes are facts of the construction process. They are issued to respond to newly developed circumstances. Extensive and poorly managed changes may have significant negative impacts on project time quality and cost performances. In today's highly competitive economic environment, the need for completing construction projects within the stipulated cost, quality and time frame, and expected performance expectations is becoming increasingly important.

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