INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & MANAGEMENT

A STUDY ON QUALITY PERFORMANCE IN BUILDING CONSTRUCTION PROJECTS

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ABSTRACT

Quality Management Systems (QMS) are being operated in some sectors in India but it is rare to meet these systems in construction industry.There are many hindrances that make it difficult to apply the system effectively due to the nature of construction and therefore, no objective way to measuring the effectiveness of these of these systems exists in construction industry.The study commenced with literature review which lead to descriptive study method, questionnaire was floated to construction companies in and around Chennai and responses were collected. The collected responses were analysed using OriginPro software and results have been concluded.The construction Industry maintains low quality of standards, low level of communication, low level of inspection and testing, low level of training and level of customer satisfaction is very low and hence proper care should betaken to improve the above factors by maintaining proper quality records, improving the level of communication by conducting periodic meeting.**.**

INTRODUCTION

Construction quality can be viewed as one part of a triangle as shown in Fig.1. The contractor must attain the cost level as planned; meet the schedule deadlines while achieving the required quality level. There must be a balance amongst those three aspects because they define the project scope. However, quality may be the first of those components to be disregarded in favor of increased cost savings and time reductions.
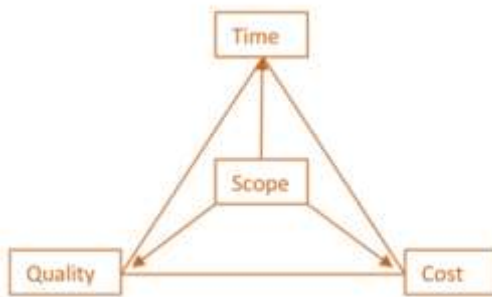
Fig. 1 Construction Triangle

Quality is involved in every stage and every aspect of construction. Construction projects and quality are inseparable parts of each other. Quality in construction cannot exist without a project and a construction project cannot exist without quality**.** The modern construction market requires construction companies to guaranty the quality of their product to their clients.

Fig. 2 shows various concepts that are considered to influence the quality of the product that can be associated with quality in construction. The figure reflects the product features, processes of production and organization, as well as company business/industry issues.

Fig. 2Aspects Involved in the Concept of Construction Quality

The key issues could be extracted from comparison in Table 1 that the quality today is everyone responsibly focusing on the customer requirements and is the wayof increasing profits by improving products quality.

Table 1 Changing View of Quality (Source: Kerzner, H, (2003))

Past	Present
Quality is the responsibility of blue collar workers and direct labour employees working on the product	Quality is everyone's responsibility, including white-collar workers, the indirect labour force and the overhead staff
Quality defects should	Defects should be

be hidden from the customer and management	highlighted and brought to the surface for corrective action
Quality problem lead to blame, faulty justifications and excuses	Quality problems lead to cooperative solutions
Corrections – to quality problems should be accompanied with minimum documentation	Documentation is essential for "lessons learnt" so that mistakes are not repeated
Increased quality will increase project costs	Improved quality saves money and increases business
Quality is internally focused	Quality is customer focused
Quality will not occur without close supervision of people	People want to produce quality products
Quality occurs during project execution	Quality occurs at project initiation and must be planned for within the project

REASON FOR IMPLEMENTING QMS

- ➢ To improve customer satisfaction in construction industry.
- ➢ To improve safe working condition.
- ➢ To reduce customer complaints.
- ➢ To reduce inspection efforts in construction industry.
- ➢ To reduce the quality cost in construction industry.

LITERATURE REVIEW

Mukherjee (2006) reported that quality satisfies three Fs- Fit, Form and Function.This is a conventional definition of quality which is basically confined to a product satisfying the need for the required dimensions, fitment, required form and aesthetics.The product should also be able to fulfil the functions desired to be performed by the Product.

Foster (2006) reported that achieving customer satisfaction depends on not only how well and how thoroughly quality actions in the several areas of the organisation work individually but also on how well and how thoroughly they work together.

Dale (2003) stated that all techniques have similar importance, but that they are different and applicable in different situations. This means that each technique has unique qualities and can present the same data in different ways. Dale also strongly maintains that an effective employment and a mix of

tools and techniques constitute the way to solve problems.

Delgado and Aspinwall (2005) conducted a comprehensive survey to determine whether the use of improvement tools in the construction industry are an importantaspect of continues improvement. Results showed that, in terms of use, quality, performance measure, and technology tools are common practice in the industry.

Burke (2007) defines quality control as: "the process companies go through toconfirm that the product has reached the required condition as determined by thespecifications, build-method and the contract." Quality control defines the method ofinspection (testing), in-process inspection, and final inspection to confirm the product hasmet the required condition. Quality control means monitoring whether specific projectresults comply with relevant quality standard and identify causes of unsatisfactoryresults. The method of testing should be outlined in the project quality plan. This could involve checklists, inspections, reviews, verification and validation against standards andrequirements. The project quality plan should also give a definition of deviation and state how to approach deviation.

Arawati (2004) aimed to identify the relationship between TQM and overall performance, showed there is a strong and positive association between TQM, overall performance and customer satisfaction and suggested that an emphasis on quality would result in organisation gains.

Brah et al. (2002) reported that the TQM is a set of guiding principles and practices, as well as a philosophy, which address not only the management of quality but also the quality of management.

Jha and Iyer (2006) addressed the determination of the critical factors affecting quality performance in construction projects. A preliminary survey was based on Indian construction projects. The critical success factors obtained were: project manger's competence; topmanagement's support; monitoring and feedback by project participants; interaction amongproject participants; and owners' competence. On other hand, conflict among project participants; hostile socio-economic environment; harsh climatic condition; PM's ignorance& lack of knowledge; faulty project conceptualization; and aggressive competition during tendering, are the factors that most adversely affected the quality performance of construction projects.

Cofee (2010) This review has also examined how a company's strong organizational culture profile can actually improve construction outcomes and organizational effectiveness when operated in conjunction with proper QMS implementation. It has been undertaken focusing on QMS implementation

inconstruction companies globally, as well as more specifically in Indonesian construction firms.

OBJECTIVES
The main objective of this study is
- ➢ To evaluate the effectiveness of QMS in construction industry.
- ➢ To improve the quality policy, quality system and quality procedure in
    construction companies.

RESEARCH METHODOLOGY
- ➢ Data Collection
- ➢ Questionnaire Survey
- ➢ Statistical Analysis

QUESTIONNAIRE DESIGN
The questionnaire used in this research is descriptive. The descriptive design produces information on groups and phenomena that exist.The survey gives information collected from a group of participants in a standardized form. An appropriate sample of people is formed and respondents are asked to givetheir answers in a standardized form.

The questionnaire design was a result of information that had been collected during the literature research and its goal was to shed further light on the research topic and the research questions asked.

DATA COLLECTION
The purpose of data collection is to obtain information to keep on record, to make decisions about important issues or to pass information on to others. Data are primarily collected to provide information regarding a specific topic.

QUESTIONNAIRE SURVEY

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents.Although they are often designed for statistical analysis of the responses, this is not always the case.

ANALYSIS
The respondents were asked to give their responses against a five-point Likertscale. The typical form of this scale is to ask participants to specify their level of agreement or disagreement with a statement. Another version used in the research was a Likertscale as

1. Strongly Agree
2. Agree
3. Disagree
4. Strongly Disagree
5. None

The Likert scale has proven to be very useful in measuring whether people have a positive or negative attitude towards an object or a statement, and is therefore suitable for this study. The collected responses from questionnaire survey were subjected statistical analysis using OriginPro software and the results were obtained and conclusions were drawn out of it.

Quality audit in organization
First the pie chart is drawn to find the main key factors in this set of questionnaire and using this main key factors the cross tab is done. And the majority of people in construction industry concrete on conformance to requirements, drawing specifications & quality records, cost estimation and standard of work in systematic manner. But only 30.8% of the construction industry does both conformances to requirements, drawing specification and quality records. This means only 30.8% of the organization do conformance to requirements and drawing specification and quality records effectively.
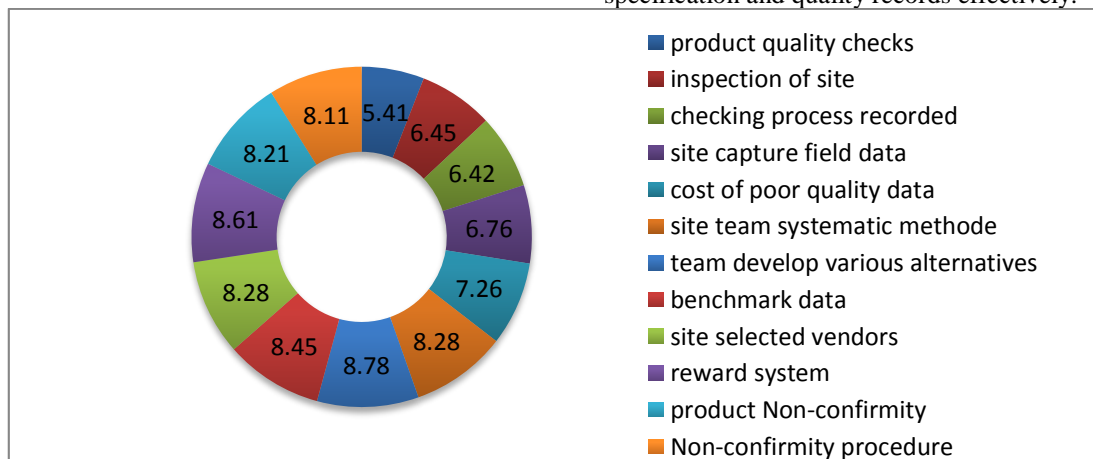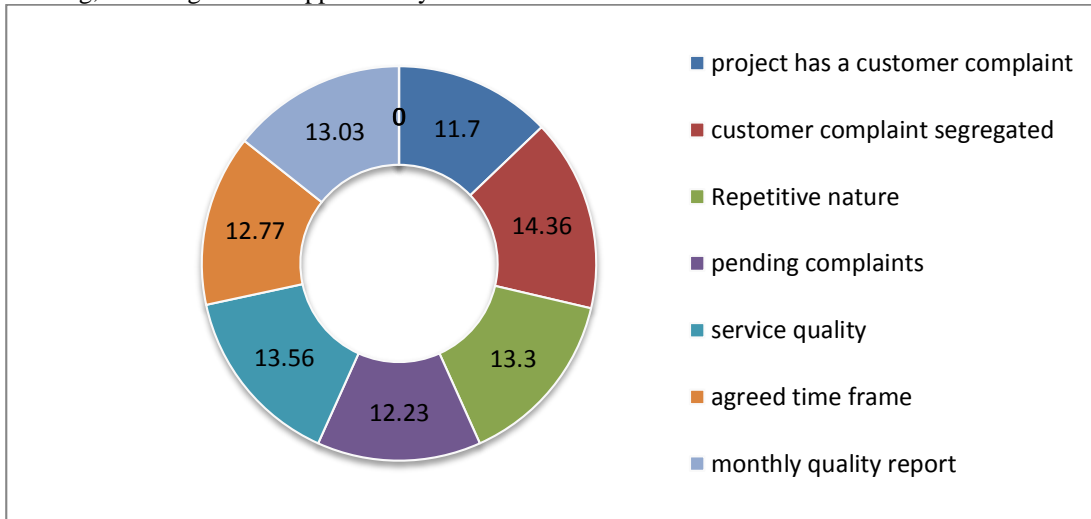

Legend:
- ■ product quality checks
- ■ inspection of site
- ■ checking process recorded
- ■ site capture field data
- ■ cost of poor quality data
- ■ site team systematic methode
- ■ team develop various alternatives
- ■ benchmark data
- ■ site selected vendors
- ■ reward system
- ■ product Non-confirmity
- ■ Non-confirmity procedure

Values: 5.41, 6.45, 6.42, 6.76, 7.26, 8.28, 8.78, 8.45, 8.28, 8.61, 8.21, 8.11

Fig. 2   Quality Audit in organization

Fig. 2 represents the percentage classification of quality in organisation. According to statistical analysis only 27% of the construction industry maintains quality standards in organization.

Communication and meetings in construction industries

The analysis on this gives the main key factors as direct meeting, meeting with supplier only when requirements are not met, and document such as drawings. In case of cross tab between suppliers specifications and standard of organization, is evaluated around 85% this means 85% of the organization meet with suppliers technical and organization requirements.
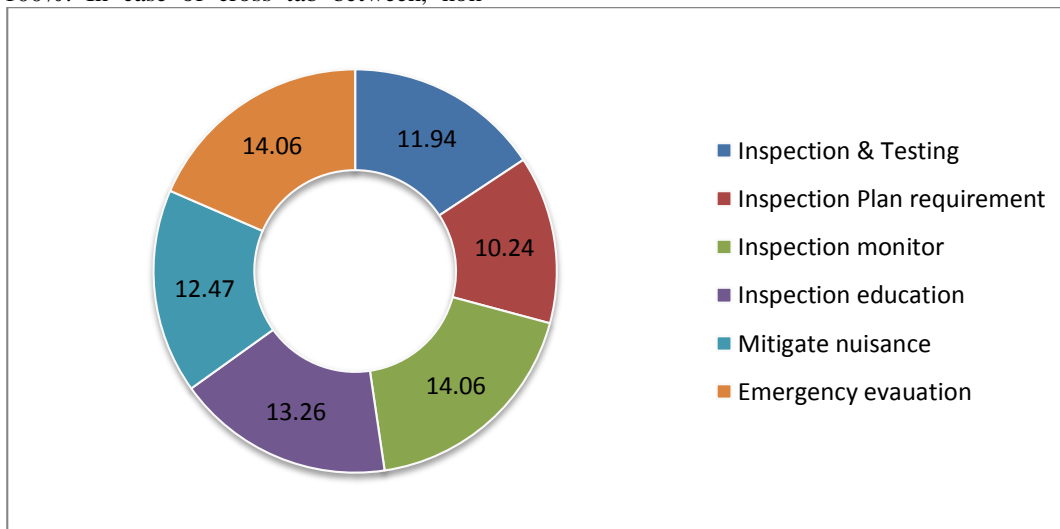

Legend:
- project has a customer complaint
- customer complaint segregated
- Repetitive nature
- pending complaints
- service quality
- agreed time frame
- monthly quality report

Values shown: 0, 11.7, 14.36, 13.3, 12.23, 13.56, 12.77, 13.03

Fig. 3 Communication and meetings in construction industries

Fig.3 represents the percentage classification of Communication and meetings. According to statistical analysis only 30% of the construction industry maintains quality standards in organization.

Inspection and Testing

In this, the cross tab between standard for inspecting raw materials and standards are documented and circulated to all inspecting officer, is evaluated around 100%. In case of cross tab between, non-conformance of raw materials and records of compliance with relevant work code is evaluated about 93.3%, and the inspection of materials purchased from vendors and the internals of inspection both evaluate around 93.3%. This means 93.3% of the organization maintains and non-conformance of raw materials and records of complaints with relevant work code.

Legend:
- Inspection & Testing
- Inspection Plan requirement
- Inspection monitor
- Inspection education
- Mitigate nuisance
- Emergency evauation

Values shown: 11.94, 10.24, 14.06, 13.26, 12.47, 14.06

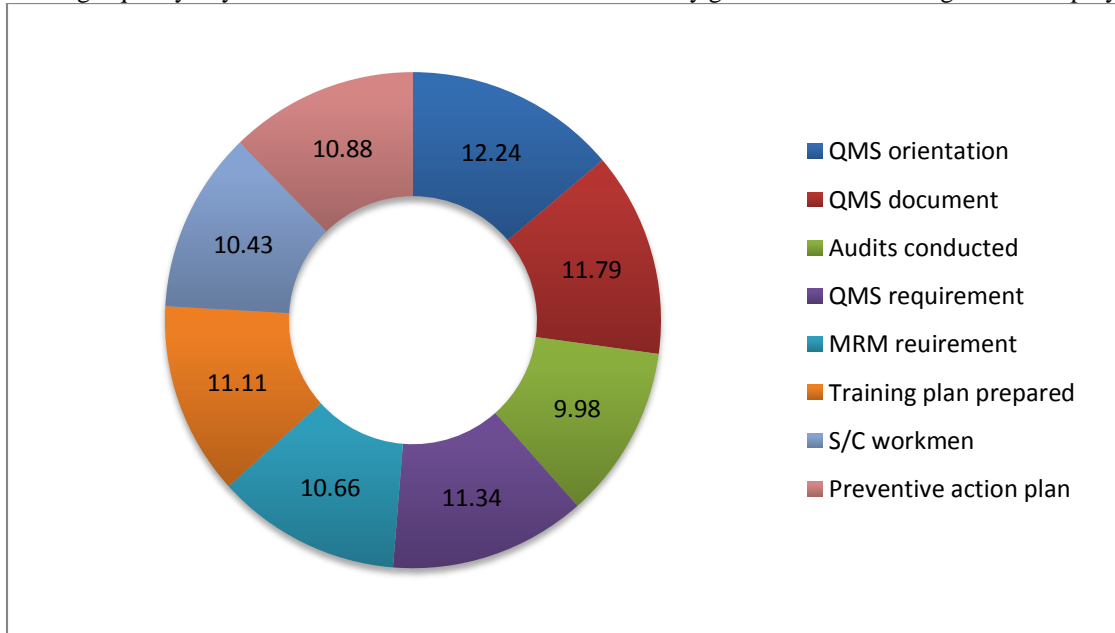*Fig. 4 Factors relating to Inspection and Testing*

Fig.4 represents the percentage classification of Inspection and Testing. According to statistical analysis, only 30% of the construction industry maintains quality standards in organization.

Training for professionals

Here above the main key factors are, training for professional, Training for maintenance, training for implementing quality system this is the most important key factor taken for ANOVA. According to pareto analysis only 25% of the construction industry gives effective training for the employers.

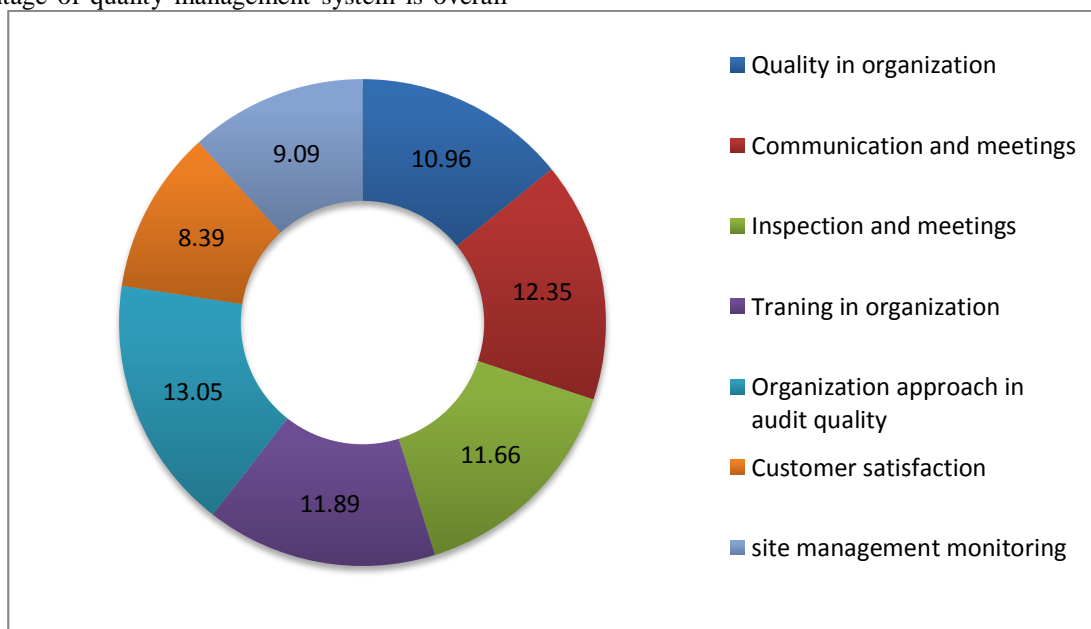*Fig.5 Factors relating to Training for professionals*

Fig. 5 represents the percentage classification of Training. According to statistical analysis, only 25% of the construction industry maintains quality standards in organization.

Overview in Construction Industries
From the over view of the analysis, the average percentage of quality management system is overall construction industry with respect to the factors such as

- Quality in organization
- Communication and meetings
- Inspection and testing
- Training
- Organization approach
- Customer satisfaction

Fig. 6 Overview in construction industries

Fig. 6 represents the percentage classification of Review. According to statistical analysis, only 15% of the construction industry maintains quality standards in organization.

(Average = 132/6 = 22%) is evaluated around average of 22%.

CONCLUSIONS

The main conclusions drawn from the Project are given below with respect to the following factors.

In **Quality audit In Organization,** only 27% of construction industry maintains quality standards and others doesn't due to the quality of the product is not conforming to requirements.All the documents such as drawing specifications, quality records are not maintained properly. Lack of improving the standards of work in systematic manner.

In **communication meetings,** only 15% of the construction industry has communication meetings and other doesn't due toLack of Direct meeting among employers. Meeting with materials supplier not regular only when requirements not met. The lack in level of communication between management heads.

In Inspection and Testing only 15% of construction industry has proper inspection and testing and other doesn't due to lack inspection of raw materials and their intervals inspection and testing, lack of laboratory facilities and their maintenance of laboratories, lack of following the standards when inspection and damages and nonconformance and the raw materials are not properly recorded and documented.

In Training only 25% of construction industry has proper training and others doesn't due to the lack frequency in period of training, lack training for professional for implementing quality system and lack of awareness program conducted and period of program conducted.

In Organization Approach only 20% of construction industry has proper Organization Approach and others doesn't due to no proper decision of organization against non-conforming materials and work., lack of consistency in internal audit and lack of statistical technical adoption

In Customer Satisfaction only 15% of construction industry has proper customer satisfaction and other's doesn't. The customer satisfaction very low and due to following reasons no proper maintenance of the records for customer satisfaction, lack of proper tool for collecting customer complaints, lack of proper action against the customer feed back and lack of proper response to the customer against complaints.

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