Cost of Quality Defects In Construction Industry

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Abstract- *The cost of quality is cost associated with the prevention, discovery, and resolving of defects. These costs can arise whether the product is in design stages, manufacturing plants, or in customer's hand. It is important to identify the cost of quality so that one can determine the expenses associated with producing a quality product. Theoretically, it seems easy to apply the quality cost concept into the design and construction phases of a civil engineering project. In practice, it is quite complex and can be difficult.*

The present paper aims at making a review associated with use of quality in construction industry. Data necessary to achieve the objective of the paper is collected from ongoing project. The paper focus on construction defects on respective projects and poor-quality cost measurement. It also shows that defective building construction not only contributes to added construction cost of the project but also the cost of maintenance, which can be substantial.

Keywords- Building defect, Quality, Cost of quality

I. INTRODUCTION

Successful companies must deliver projects on time and within budget; as well as meet specifications while managing project risks. Achieving project objectives and completing project within pre-defined time, cost and quality constraints is not an easy task in the construction of buildings. During construction, contractors are often required to re-work portions of the project due to unacceptable quality. Quality is evident in the amount of re-work and in the overall expenditures of a project. Quality failure can occur during any stage of the construction process. These conditions have led studies and practitioners to rethink models and frame works that consider the cost of quality failure as not only a performance measure in the manufacturing plant or for a specific process, but also for an entire supply chain. Regardless of time occurrence, the impact of quality failure can erase the projected benefits of development programs. However, many companies are not aware of the cost that quality failure can incur, and the real harm it can cause, because these costs are not properly assessed. Consequently, quality failures continue to occur during construction process, while some are repeated in several projects. Therefore, understanding the underlying causes of these failures and developing strategies to eliminate or to mitigate their occurrence are important to increase the probability of achieving the project objectives. The first step in reducing the occurrences of quality failure is to study its causes and to develop subsequent effective prevention strategies. For this purpose, this paper provides a deeper understanding of the causes of quality failures in construction projects. A literature review was conducted to identify the possible causes of quality failures, which were then associated with the lack implementation of cost of control (COC) activities. The findings of this research significantly contribute to the understanding of the necessity of COC activities. This understanding particularly helps people involved in the construction process to obtain a true picture of the impact of implementation of COC activities and directs efforts to mitigate quality failures.

Need of quality in construction industry

Errors on construction sites occur frequently and can be costly for the contractors and owners of constructed facilities. In fact, 6-15% of construction cost is found to be wasted due to rework of defective components detected late during construction and 5% of construction cost is wasted due to rework of defective components detected during maintenance. The nature of these errors is quite diverse. 20-40% of all site defects have their roots in errors arising during the construction phase, 54% of the construction defects can be attributed to human factors like unskilled workers or insufficient supervision of construction work. Furthermore, 12% of the construction defects are based on material and system failures. These observations suggest that a thorough inspection of construction sites is needed and that current site inspection approaches need to be improved in identifying defects on construction sites effectively. Since the main causes of construction errors, e.g. human involvement in the construction process and changing environmental conditions resulting in discrepancies in material behaviour are uncontrollable, it is critical to improve the inspection and assessment of the quality of construction projects.

Research Aim:

The main aim of this research is measure on –site execution plan which affects the quality of work. Identification of the causes that leads to poor quality and to improve quality of work as well as minimize the cost of quality (COQ) in the construction industry by using Quality Assurance and Quality Control as a tool

Among reaching to the aim of the research clear identification of the general quality outputs which impact on cost. Giving clear idea about negligence, lack of knowledge to quality can impact in terms of cost. Normally this cost shows impact on contractor 's bill and organization reputation. However, it is essential to study the benefits of delivery of quality product by contractor.

The research also will study the causes and remedies for poor quality different types.

II. LITERATURE REVIEW

In recent decades, due to the competitiveness in the market places worldwide companies have realized that a good product quality is a key area for the commercial success and its development. Even when approved plans exist, the developers/owners refuse to follow standards and specifications as contained in the plan and cut corners probably because quality assurance is not always a cost-effective activity though it is essential if fitness for purpose is the measure of performance and where the satisfaction of the client or customer is to be placed first and foremost. Quality assurance is firmly dependent upon clients knowing their specific needs and communicating these unambiguously to the designer, upon the designer accurately representing these requirements in the design concept, upon the contractor faithfully reproducing these requirements in the work on site, and taking quality assurance to its end, upon the occupier using the building correctly to achieve maximum performance (Griffith, 1990). quality assurance system is developed to address the public concern, safety, durability and functionality. The identified major problems where inadequate budgetary allocation for quality control, non-enforcement of quality control clauses by authorized agencies, insufficient quality control laboratories. So, addressing these problems will greatly improve the level of quality assurance in the industry (Y.A. Abdul Kareem 2006). The factors affecting the quality performance in construction projects where conflicts among project participants, hostile socio-economic environment, bad climatic conditions, project manager 's ignorance, faulty project conceptualization and aggressive competition during tendering. So, to rectify the factors possible remedial measures has been suggested to improve the quality (K.N. Jha 2006).

III. OBJECTIVE

1) To identify the defects in construction at early stage work and
2) Its cost implication.
3) To give Remedies to minimize defect by improving quality.
4) To identify how tools can intervene to improve the quality of execution of work with minimum cost.

IV. PROJECT METHODOLOGY

To meet the requirements of the objectives set above, the following approach was devised:

The initial stage of this research involved a literature review to confirm the research objectives. The need to develop a performance improvement and evaluation technique construction industry was identified. The first methodology of the research is the literature review carried out and directed towards the research aim and objectives, the literature review should include different views and previous researches' findings from relevant books, journals and previous reports which had studied the topic, and this will be as starting point of the research.

Second step will be collecting data about various quality outputs causes' poor quality of work in initial stage of construction through daily monitoring of resources required to repair or handing over the work as per requirement. And then process these data to determine total cost required to repair and handing over the work.

Finally, to suggest remedies over poor quality work. Importance of quality in work and its benefits.

V. RESEARCH DESIGN AND DATA COLLECTION

construction defects and to understand the quality cost concept. The data collected is from ongoing construction site project. nature of data collected is defects on construction site and cost of rework done to remove this defect.

It's industrial building project having total area of 24000 sqm. In which following activities are found defective. The cost of quality is calculated depending on parameters such as material wastage, labour etc.

1) Wall cladding are damaged after the installation due to the un-proper movement of machine, materials etc.
2) Due to the undulation in ground surface clean panels are not properly installed. Gap is remains between

ground surface and panels. Which is after filled by using silicon and packing sim. due to which material cost and manpower cost is increased.

3) Similarly, due to ground undulation and cracks epoxy material used more than required as per design. The reason for cracks is Shrinkage of concrete (natural behavior of concrete), insufficient curing, slab movement, inconsistent finishing etc.

The cost required to repair the above defects is calculated based on material required for repair and manpower used.

Sr no.	Activity	Material cost	Manpower cost	Total Rs.
1	Epoxy work	720000	60000	762000
2	Wall cladding	25860	25500	51360
3	Clean panel	184371	3600	187971
			Total cost	**1001331**

Construction Area = ~16000Sqm
Additional Cost to cover quality defects per sqm **= ~62 Rs /Sqm**

In the above observations, project is ongoing,so cost of poor quality associated in this case internal failure cost. In this case does not consist of external failure cost as project is still in under construction.

VI. CONCLUSION

It is clearly understood that quality doesn't happen by chance, it should be managed at every stage of the product. Quality of work can be achieved by proper quality control process at a minor cost when compared with the total cost of the project.

The more you invest in prevention and appraisal, the less you will have to spend on internal and external failures.
Quality of a work can be easily achieved by proper quality control process at a minor cost when compare with the total cost of project

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