Experimental Investigation of Factors Influencing reworks in Construction

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ABSTRACT

Rework in construction project is referred to as an unnecessary effort of redoing a process or activity that was incorrectly implemented in the first instance. In constructions, rework can result from an array of factors such errors, omissions, failures, changes, poor communication. In this paper, the significance of reducing rework and overrun cost due to rework has been arrived.

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INTRODUCTION

GENERAL

The construction industry is almost as old as nature itself and unlike many manufacturing industries, is concerned mostly with one-off project. The construction is a sector that is sensitive to change in both fiscal and monetary disturbance. The construction industry is very important in the economic development of any nation especially in an expanding economy like India. An efficient construction sector is a pre-requisite to effective national development since building, civil and industrial engineering works areusually a major contribution to Gross Fixed Capital Formation, Gross Domestic Product and National Employment. The growth of construction industry in India in the past two decades indicates its success in greatly contributing to the country's Gross National Product. This industry sector is the second most important for absorbing human resources after the food.

The importance of the construction industry is not limited to the different measures of economic development alone, slumps or upsurges in its activities, have a high multiplier effects on almost every phase in the social and economic structure of the nation. It has been concluded that the high cost of house ownership in India and other housing problems of the lower income groups are results of the defect in the construction industry. “There is no gainsaying that the twin problem of cost and time overruns may not yet be over as they still characterize construction projects in most parts of the world especially in developing countries like India”. Cost and time overruns are common occurrences in the construction industry and these have continued unabated. This is no exception as in the case of rework, as rework contributes to time and cost overruns. Earlier studies have shown that rework costs vary between 3 and 15 per cent of project’s contract value. In addition, Rethinking construction stated that: up to30% of construction is rework, labour is used at only 40-60% of potential efficiency and at least 10% of materials are wasted. It was posited that rework costs could be significantly higher than figures reported in the previous literature . Indeed, Barber, Sheath, Tomkins and Graves suggested that rework costs could be as high as 23 per cent of the contract value. Typically, previous research efforts have focused on determining the performance of construction industry with referenceto time and cost overrun, of which rework is one of its causes and little or no attention hasbeen directed towards this area whose effect is capable of increasing the contract sumand duration significantly. Love who sought to address this in Australia, found tha tindirect costs of rework could be as much as five times the cost of rectification.

Since rework has been seen as an ill wind that may blow no good to the construction industry because of its contributions to cost increases and time-delays couple with the facts that it cannot be totally avoided. Therefore, the evaluation of rework and identification of significant factors leading to the occurrence of rework with a view to determining its impact on building projects to enhance project delivery processes is essential.

1.4Based on all this foregoing, this paper therefore intends:

1. To identify and evaluate the variables of the

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factors influencing the occurrence of reworks on building projects,

2. To identify the variables with specific group and
3. To assess the relationship of the identified factors to enable fully appreciation ofthe study.

To improve quality it is necessary to understand the root causes of rework, that is, the basic reason for its existence or set of conditions that stimulate its occurrence in a process. A process consists of a number of activities or operations which acting on inputs in a given sequence transforms them into outputs. A process may consist of both value adding or non-value adding activities. The former are activities that convert materials and/or information towards that which is required by the customer and the latter are activities that take time, resources or require storage and do not add value to the output. In other words, a non-value adding activity is waste and origin of waste is as contained in figure ii below.There has never been any systematic attempt to observe all wastes in the construction process. That the figures that have been presented tend to be conservative in as much as the motivation to estimate and share these figures has been by leading companies that have been attempting to implement best practice. Rework, however, has become an accepted part of the construction process. Those involved in the procurement of buildings invariably do not realize the extent of rework that actually occurs. There is an increasing need to improve the quality of operations throughout the procurement process, and therefore reduce the incidence of rework. It has been suggested that the major cause of rework is uncertainty . This uncertainty is generated by poor information, which often is missing, unreliable, inaccurate, and conflicting. The authors suggest that uncertainty is a consequence of numerous interrelated factors and not solely information. Therefore, to reduce rework we must identify what its causes are, then understand how these causes are

1.5 Construction waste was classified into three main categories as

materials, labour and machinery waste. However, any effort in terms of

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labour,materials and machinery which is directed towards the construction of a part or elementof a building and which has to be done again due to non-conformity to the designconstitutes a waste which is also seen as rework. Andy, Andrew and Simon viewedcauses of waste at the design and construction process as: building complexity, poor coordination,fast tracking, inadequate communication, inefficient management practices and design process, poor quality anagement, lack of harmonious relationship among participants on the project and poor site management team. Many authors have different opinions as to the causes of rework as a waste. Koskela suggested that it ‘‘sometimes seems that the wastes caused by design are larger than the cost of design itself,’’ and he further stated that ‘‘even if there is a lack of data on internal waste in design, it can be inferred that a substantial share of design time is consumed by redoing or waiting for information and instructions.’’ Rounce suggested that much of the design-related rework generated in projects is attributable to poor managerial practices of architectural firms.

REDUCING COSTS BY ELIMINATING WASTE

Rework costs are determined from the point where rework is identified to that time when rework is completed and the activity has returned to the condition or state it was in original. The duration of the cost tracking includes the length of the standby/relocation time once rework is identified, the time required to carry out the rework, and the timerequired to gear up to carry on with the original scope of the activity.Waste in construction is prolific. The lead article of this issue refers to the report‘Rethinking Construction which states that:

• up to 30% of construction is rework

• labour is used at only 40-60% of potential efficiency

• at least 10% of materials are wasted

Task force on the scope for improving quality and efficiency in construction. Since Latham, the industry as a whole was underachieving even with the fundamental and radical change proposed by this report. With the economic meltdown the industry had experienced low profitability; low investments in research and development, low levels of training with too many clients were

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dissatisfied with the present performance of the industry.

In summary, the Egan report identified several shortcomings with the construction

industry, and they includes;

- Underachievement of the industry as a whole
- Lack of predictability within the industry as a whole
- Unacceptable level of defects
- Lack of contractor profit
- Lack of investment in capital , research, and development and training
- Level of dissatisfaction amongst the industry's clients

Reflecting experience with similar occurrence where the industry as a whole were underachieving which is evident in the down turning nature of the industry's contribution to the nation's Gross Domestic Product (GDP).

OBJECTIVES OF THE PROJECT

- To identify the maximum possibilities of occurrence of rework in construction.
- To study the factors affecting rework in construction project.
- To analysis the rework factors in construction project.
- To identify the cost overrun due to rework.
- To reduce the construction rework cost.
- To minimize the over runof time.

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Total 14 factors affecting construction rework identified through literature study & experts opinion. A questionnaire survey is conducted on building construction projects for find out factors influencing rework in construction projects. The study received 7 respondents the collected data was analyzed through Microsoft excel. According to their rank indexes the top 5 factors has been ranked accordingly for 7 completed surveys. The top 5 factors are quality are Client influence, Lack of labor work knowledge, Speedy construction, Lack of communication and Construction

error. Rework analysis was done in three different sites. Quantity and cost of rework has been arrived from quantity survey and cost analysis. Implementation of ideas to avoid top five factors that influence rework had been done to improve the quality of construction and also to reduce the cost and time taken for rework

1.1 OVERVIEW OF COST OF REWORK

There is a lack of uniformity in the way in which rework cost data have beencollected because of the various interpretations as to what constitutes rework. Arguably, the measurement of rework costs in itself does not result in improvement; it merely provides the starting point for establishing new knowledge.The design and construction organizations must implement a quality management system, supported by a quality cost system, in order to reduce the costs of rework. Only when organisations begin to measure their rework costs carefully willthey fully appreciate the economic benefits of achieving high quality. That substantial reductions in appraisal costs can be achieved by eliminating the root causes of rework. Likewise, the BREstated that 15% savings on total construction costs could be achieved through the elimination of rework, and by spending more time and money on prevention. To improve the performance of construction organisations and reduce costs. Comparatively, the costs of quality deviations in civil and heavy industrial engineering projects have been found to be significantly higher. Nine major engineering projects to determine the cost associated with correcting deviations to meet specified requirements. Quality deviations accounted for an average of 12.4% of the contract value. A significantlylower figure was reported. Who found non-conformance costs (excluding material wastage and head office overheads) in a highway project to be 5%of the 25contract value. from anational questionnaire survey in Australia,stated that the total cost of rework is a function of both direct and indirect rework costs.While there has been a plethora of research seekingto determine the direct (tangible) costs of rework, the indirect (intangible) costs remain unexplored in construction. This is because itis difficult, if not impossible, to quantify such costs in purely monetaryterms. Typically, research efforts have focused on determining direct rework costs at the expense of

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indirect costs which consequently remain relatively unknown.

1.2CAUSES OF REWORK

The rework occurs when a product or service does not meet the requirements of the customer. Consequently, the product is altered in accordance with customers' requirements. No organisation participating in a project produces a substandard product or poorly performs a service intentionally; nevertheless, this is accepted as part of human nature. For a building to be procured, not only does it have to be produced to a desired quality, but it has to be constructed and delivered on time, in the right market and at minimum cost. Asserted that in order to improve quality there is the need to understand the root causes of rework, that is, the basic reason for its existence or set of conditions that stimulate its occurrence in a process. that the root causes of rework can be categorised into different groups: client-related, design-related and contractor-related factors including site management and subcontractor factors. Rework, however, has become an accepted part of the construction process.that the major cause of rework is uncertainty. emphasised that this uncertainty is generated by poor information, information which often is missing, unreliable, inaccurate and conflicting. But the authors suggest that uncertainty is a consequence of numerous interrelated factors and not solely poor information. Therefore, to reduce rework, it is imperative to identify what its causes are, and then understand howthese causes are interrelated,the level of rework in construction projects would depend on externa lfactors such as excessive workload and market conditions. For example increased defects and poor workmanship may arise from limitations on the availability of good subcontractors and workers, and additional or unwarranted pressures for early completion. The Construction Owners Association developed the fish-boneclassification system for categorising the causes of rework. The COAA used the fish-bonediagram, technically called the 'cause and effect diagram', to explore all the actual causes of rework. At the conclusion of a pilot study aimed at developing a standard methodology for measuring and classifying construction field rework. The fish-bone consists of five broad areas of rework and four possible causes in each of these areas.

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1.3The five broad areas include the following:

1) human resource capability,

2) leadership andcommunication,

3) engineering and reviews,

4) construction planning, and schedule and

5)material and equipment supply

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