

Rework Management in Construction Projects

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ABSTRACT:

Time and cost are very important factor for successful and profitable construction project. Any construction project becomes success when it is finished within estimated cost and Time. Schedule and cost overrun are becoming a headache for owner as well as the other parties involved the project. The major contributor for schedule and cost overrun is rework. Rework has negative impact on the quality of work and on the parties involved in the construction project. Construction projects are divided into various stages and these stages includes various task due to this the project becomes complex in nature. Errors, omissions, defects etc are clearly going to happen when complexity is involved. Rework is a result of these error, omission and changes. Project's cost, time and productivity gets affected negatively when rework is involved in the project. Supervision plays vital role in reducing on field rework. Whenever rework occurs a proper documentation about the rework should be prepared and stored so that in future same rework can be avoided. Study on rework shows that the rework cost may increase to 10% of project cost. So rework cannot be ignored in a construction project. Performance of project gets adversely affected by the added cost and tight schedule due to rework.

Keywords: Rework, Cost and Time Overrun, Questionnaire, Direct cost.

I. INTRODUCTION

Construction projects are divided into various stages and the stages include various task due to this the project becomes complex in nature. When there is complexity errors are bound to happen. Errors results into rework. Rework is performance of certain activity more than one time. Rework leads to waste of material which results in loses so special attention should be given towards avoiding rework in the project. Rework might not be totally eliminated however it is preventable. The construction industry faces lot of problems such high cost of construction, overrunning schedule and late deliverance of project

to owners all this projects are mostly results of rework in the project. Reworks are the non value adding events in the project which affect the productivity and performance of the construction project. Rework can be reduced if proper supervision kept on the daily work done and maintain the regular record of work. Communication plays key role in preventing the reworks, the basic idea of work should be properly understood between the two parties working together so the future correction and changes are avoided. As rework directly affect the cost of project, quality and time of completion of project so greater attention should be given for avoiding the rework in the project. Rework is defined as the needless effort of redoing an activity that was wrongly done the initially. The undesirable penalty of rework comprise reduced profit, damaged to status, amplified turnover of management and workforce, lesser productivity, high costs, and finally, costly legal action between parties involved in the project over accountability for overruns and delays. Occurrence of the rework has adverse impact on the factors project such as cost, time, and shareholders dissatisfaction etc. If proper attention on supervision is not kept rework may affect the final cost of project and may hamper the reputation of the organization. Many times same mistakes are repeated on the number of projects so proper data collection about rework should be kept and it should be made easily available for future work to avoid same mistakes. This requires systematic record of the rework incident and easily accessible information system for collection the data during or before performance of work. In time identification and correction of rework are important for limiting the impact of the rework.

The impacts cause due to rework has adverse effect on the construction project so proper preventive measure should be taken to mitigate the rework. Proper supervision is also a precautionary measure for reducing the errors caused by unskilled and unprofessional works. Regular checks on rework after completion of major activity or milestone throughout

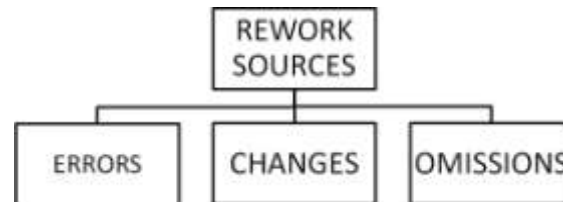
the construction phase are important for early detection of rework.

With checks, quality supervision also helps in reduction of rework on site. Documentation also contributes to rework in construction. The documentations should be written in clear language and easily understandable to reduce confusion.

Tracking of rework occurrence on site should maintain and records of such event should be easily made available for future reference

REWORK SOURCES:

Basically, rework can be obtained from various sources like errors, changes and omissions.



A. ERRORS:

The Researchers has indicated that rework is worsen by errors made during the design process, errors which then appear downstream in the procurement process. The Researchers has argued that the longer an error goes undetected, the greater the possibility of rework occurring that significantly impacts cost and schedule. The Construction Industry Institute (CII)(1989) study of nine large industrial construction projects found that rework due to design error contributed an average of 79% of total rework cost. In relation to Busby and Hughes (2004) and Cooper (1993), errors are often not readily identifiable and often only become manifest after a period of incubation in the system. The extent of rework required, then, depends on how long the error has remained unnoticed. For instance, a dimensional error or spatial conflict contained within design credentials may not arise until the project is being physically constructed on-site. According to the researchers, errors occur as a result of a complex range of interactions, and hence attempting to segregate a singular causative variable is an unseemly strategy to undertake. Once an understanding of the typical nature and underlying dynamics of errors is acquired, only then can error reduction and error restraint strategies be implemented in projects.

B. CHANGES:

Many of them stated that a change is in essence a directed action that alters current established requirements. Changes can have an effect on the aesthetics and well-designed aspects of the building, the scope as well as the nature of work, or its working aspects. According to CII, rework, exclusively in the form of changes can have a negative impact on productivity and project performance. Moreover, stated that a design-change client, for example, would indicate that a client would initiate a change to the design of the building and therefore require rework due to redesign. Design-related rework in the form of

change orders is the major source of rework in construction projects.

C. OMISSIONS:

According to Reason (2002), omission errors arise when the mental process of action control is subjected to strain or distraction. Reason (2000) opined that omission errors are a result of pathogens within a system that translate into error-provoking conditions within the firm and project. Examples include time pressure, understaffing, fatigue and inexperience. He further lamented that pathogenic influences contribute to unworkable relationships and procedures as well as design and construction deficiencies which consequently contribute to rework. Failure to undertake procedural tasks during the design process and continual design reuse (Busby, 1999) are leitmotifs that emerge as practices contributing to omission errors. The work practices are implemented by organisations can aggravate similar errors, regardless of the skills and experiences of the people involved in a project.

PREVIOUS STUDIES ON REWORK

The State of the South African Construction Industry's report compiled in June 2011 revealed that the gross fixed capital formation in non-residential buildings in South Africa in 2010 amounted to R41 928m which constitutes 2.3% of gross domestic product (GDP). Based upon prior research undertaken and among general contractors in South Africa which determined that rework constituted on average, 13% of the value of completed construction, the cost of rework in non-residential buildings could have been 5 m. Rework in construction projects is attributable to lack of skills, quality management issues, lack of communication and coordination during design and construction, and emphasis on time and cost. In their status report, the Construction Industry Development Board (CIDB, 2004) revealed that design professions do not have enough knowledge of construction

processes, and consequently, are not able to stay abreast of the changes in construction technologies. Furthermore, consultants do not provide sufficient design and construction process details, resulting in unnecessary design rework by contractors and construction delays. The CIDB (2004) also raised the issue of discounting of fees as a commonplace practice in the industry, in the order of 15 to 25%, with extremes of up to 50%. This discounting of fees places pressure on the quality of the work produced by consultants, who tailor their service to suit the price. Various studies conducted by Smallwood and among architectural practices and general contractors consistently identified construction and procurement-related barriers as the dominant barriers to the achievement of quality, often together with design-related factors as additional barriers.

- Design-related factors identified by the authors include inadequate details, inadequate specifications and poor design coordination.
- Procurement-related factors include emphasis on time and budget, shortened project periods, lack of prequalification, competitive tendering and awarding of contracts primarily on price.

II. QUESTIONNAIRE AND RESPONSE

A. INTRODUCTION

This chapter presents the analysis of the data gathered in the survey using the questionnaire. It was an exploratory study aimed at gaining more insight

into the causes and impact of rework during construction.

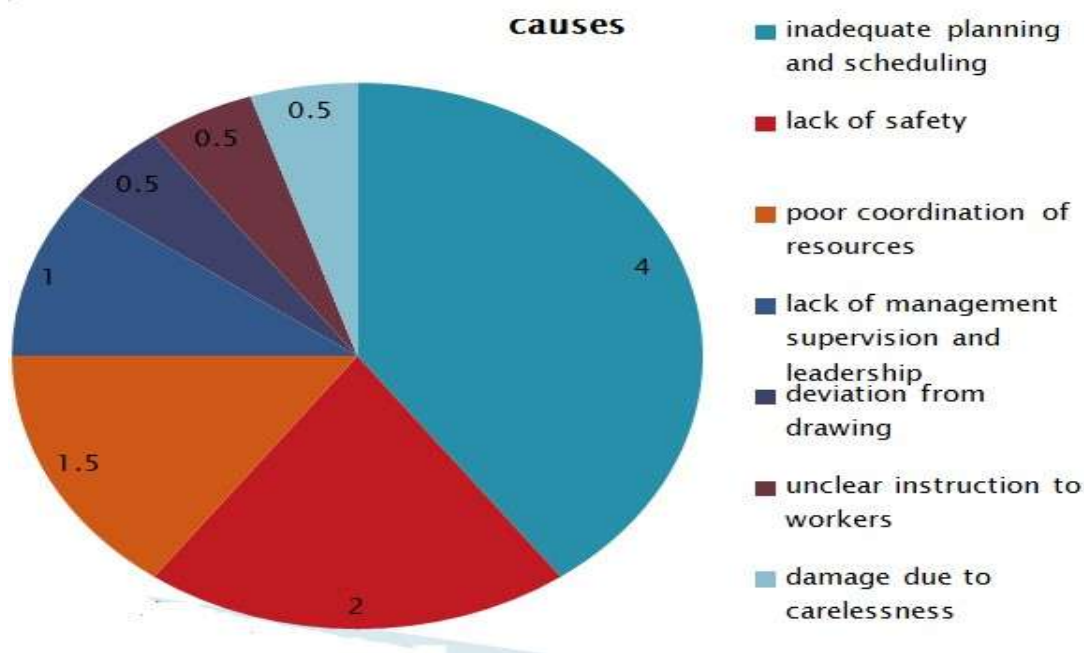
B. PILOT QUESTIONNAIRE AND ITS RESPONSE

The questionnaire comprises of two sections. First section is designed to gather the personal information of the respondent which includes gender, educational qualification, occupation, years of experience and the type of project that the company takes. The second section involves the objective questions. From the literature scan, the four major causes of rework were selected and used to design the questionnaire. In order to achieve the crucial factors, the respondents were asked to rank each factors using Liker scale of maximum four. The Liker scale was provided for each set of questions. The questionnaire survey was conducted among the various construction companies and got 20 respondents. Respondents included contractors, owners, consultants, design engineers, quality engineers and project managers.

PROFILE OF RESPONDENTS

As per the the analysis up to date the main causes of rework in the construction site are due to:

- In adequate planning and scheduling
- Lack of safety
- Poor coordination of resources
- Lack of management supervision and leadership
- Deviation from the drawing
- Unclear instruction to workers



III. CAUSES OF REWORK

CAUSES OF REWORK

The root causes of rework can be categorized into three different groups: 1) client-related, 2) design-related and 3) contractor-related factors 4) site management and 5) subcontractor factors.

Client-related Factors

This section explores the knowledge of respondents about the causes of rework. The causes of rework were identified using a scale where 1= least important, 2= slightly important, 3= important and 4= most important. Respondents were asked to

indicate the extent to which the following client-related factors might be the cause of rework. Regarding other factors not mentioned, one of the respondents suggested monitor time and cost implications as one of the client-related factors that caused rework while the other one agreed that using different architects for various areas of work led to rework. Clients and their project team members must communicate and work together harmoniously if projects are to be delivered on or ahead of time.

Table.1. Client-related Factors

CLIENT RELATED FACTORS	NO	AVERAGE RANK
Lack of experience and knowledge of the design process	5	1
Lack of experience and knowledge of the construction process	5	1
Lack of funding allocated for site investigation	5	1.8
Lack of client involvement in project	5	1.6
Insufficient time and money spent on the briefing process	5	1.6
Poor communication with design consultants(architect/engineers)	5	2.8
Payment of low fees for preparing contract documentation	5	2.2
Poor selection of Suppliers ,vendors and subcontractors by client	5	2.6
Poor communication with design consultant by the client	5	2.6
Inadequate managerial skills	5	3

Design Related Factor

The causes of rework attributed to design-related factors were identified. The results in above Table indicate the perception of respondents relative to design-related factors that led to rework. However, the other factors recorded a mean score less than 3 implying that respondents disagreed that those factors didn't contribute much to rework during the design stage.

IMPACT OF REWORK

The occurrence of rework clearly has an adverse impact on project performance. Palaneeswaran (2006) maintained that rework has both direct and indirect impact on project performance. For instance, in poorly managed projects, the gross impacts of rework (that is, both direct and indirect) could be equal to or even exceed the anticipated mark up or profit margin levels. Also,

in some cases there will be some carry forward ripple effects on different aspects such as stress, motivation, relationships and relationships and reputation.

IV. CONCLUSION OF STUDY

The aim of this thesis was to determine the underlying causes of rework during construction, and its impact on the overall project performance in order to develop effective prevention strategies. The study suggests that rework is a problem faced in most of the construction industry and better understanding of the causes will assist the project managers to identify the methods to improve or eliminate rework. A literature review was performed in order to analyze the major factors that leads to rework in construction .After having analyzed the data, a questionnaire was designed and sent to construction professionals, both with engineering firms and contractors firms. The questionnaire mainly concentrated on identifying the

main causes of rework and how it had impact on the construction projects as well as the organisation. The outcome reveals the top rework causes occurring in the construction industries, the impacts and its effects on the organisation.

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