Root Causes & significant Cost of Rework due to owner & contractor related factors

Shinde Maheshkumar Ramesh

Maheshkumar Ramesh Shinde
PG Scholar
TSSM's Padmabhooshan Vasantdada Patil Institute of Technology, Bavdhan, Pune, India
Shindemaheshkumar007@gmail.com
Maharshtra ,India

ABSTRACT

Rework is a major provider to cost and schedule. In a large composite environment that involves numerous levels of trades, suppliers and installers, and where many activities take place simultaneously, the possibility for errors, omissions and poor administration practices often cause neglect to facilitate can lead to quality failures, which must then be reworked. Errors are defined as accidental deviation from correct and adequate practices and lead to project cost and schedule overruns, which are both unnecessary and avoidable.. In addition to activities and sources previously describe the analysis of sample experimental autonomous research data from a diversity of construction and engineering projects typically measures the cost of rework based on project type, project industry, project size and by procurement method. These data analysis are based on both direct and indirect costs that are attributable in the road and rail network and building industries. This paper evaluate the impact of rework on direct and indirect construction cost for project types, project industry, and project size and procurement methods in different categories. By recognize the impacts of rework and its sources, the construction industry can reduce amend and ultimately progress project plan and cost performance

Keyword : - *Impact of rework,Direct &indirect costs, and Rework reducing strategies.*

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1. Definition of Rework

Rework is define as work events that have to be completed more than once. Another definition which emphasizes the spirit of rework is "work that is made to be conventional to the original necessities by completion or alteration at least one extra time due to non conformance with requirements." Rework is not commonly describe to include mislaid scope of work change and change orders brought about by end user, which are not unavoidably considered non-conformance. somewhat changes such as these in its place stem beginning a desire to change due to financial statement constraint or other unrelated circumstances.

1.1 Examination of Design-Induced Rework

Rework ensuing from client design changes or design mentor error has been recognized as the chief factor causal to time and cost overruns. Design-induced rework has been reported to contribute as much as 70% of the total amount of rework experienced in construction and engineering projects (Peter E. D. Love et al 2008).In spite of instruction learned from project failures and design errors, deprived design and construction organization practices carry on to infection the construction industry. Errors completed during the early stages of a project are often detect during the anon stages of the

project, after what appear to be an "error free - unnoticed period." Design error from architectural and engineering professional that go unnoticed may lead to Structural, Geotechnical and Civil Engineering or Mechanical failures that can have disastrous consequences.

The major reason for these issues is due chiefly to industry timeline expectations, pressure and client anxiety. Design consultants are usually too quick to move onto the next bid or are prepare the next stage of the project to fully understand and reflect on these past design issues, design defects and the review of their processes. The procurement process for public bidding, in meticulous can increase the chances of rework. The handoff of incomplete design related documentation, which is then relied upon by contractors or design-build teams toward accumulate tender certification and budgets can create dependability problems as these errors in credentials are not detected until operations begin on site. In some cases this may directly affect the engineering and plant procedure, which will then impact security

If we bit down into the design blunder causes we can see more rudiments that drive consultants to make error, which affect their concert and further manipulate their decision-making practice.

2. The Effect of Rework on Construction Cost Performance

The CII Capital Program benchmarking and metrics program collected data for about 360 projects where direct rework costs were calculated as a section of actual construction costs. CII developed a procedure to calculate a metric known as Total Field Rework Factor (TFRF), which is articulated as Total Direct Cost of Field Rework over the Total manufacture Phase Cost as a leading gauge used for this group data analysis. The data samples were divide into two groups, one for Owners and one for Contractors, with the results being analyzed independently for each group**.**

Formula for Total Field Rework Factor:

$$TFRF = \frac{\text{Total direct cost of field rework}}{\text{Total construction phase cost}}$$

Two statistical hypothesis are established for this study:

(1) the significant difference in the impacts of rework on construction cost performance for different project groups, which are recognized throughout this section and (2) the statistically significant difference in rank order of rework sources.

Sources of rework that were classified in the study are as follows:

- Owner Change (OC)
- Constructor Error (CE)
- Design Error/Omission (DE)
- Design Change (DC)
- Vendor Error/Omission (VE)
- Vendor Change (VC)

- Constructor Change (CC)
- Transportation Error (TE)
- Other (OS)

Project Characteristics		Owner			Contractor		
		First	Second	Third	First	Second	Third
Industry Group	Buildings	DE	OC	OS	CE	CE	VE
	Heavy Industrial	DE	OS	OC	DE	OC	VE
Project character	Grass Roots	DE	OC	CC	DE	OC	DC
	Modernization	OC	DE	OS	DE	OC	DC
Project locality	Domestic	DE	OC	OS	DE	OC	DC
	International	DE	OC	CE	DC	DE	OS
Work Type	Construct Only	--	--	--	DE	DC	OC
	Design and Construct	--	--	--	DE	OC	VE

KEY: OC = owner change; DE= design error/omission; DC = design change; VE = vendor error/omission; VC = vendor change; CE = constructor error/omission; CC = constructor change; TE = transportation error; OS = other * Contractor-reported projects only

3.Rework Costs in Building production

- Changes made at the demand of the client or inhabitant when a product or process has been concluded Value running and its use to reduce rework
- unsuccessful use of information technology
- Design extent freezing

3.1Rework Costs in Civil Infrastructure Project

- Ineffective use of information technologies
- Working measures and communications lines not clearly definite
- extreme client contribution in the project
- Changes prepared at the demand of the client
- Insufficient change initiated by the client contractor to advance quality

4.Conclusion

For owner-reported projects, heavy industrial work had the buck reported TFRF. Conversely, heavy industrial projects were the mainly affected between contractors.circumstance where the TFRF consequences did match between owner and contractor were due to the result of rework cost increases for modernization. What is obvious from studies is that the rate of rework for owners is twice as elevated as for contractors, even though the owner is generally in control of the whole project as contrasting to a section of the project given to a contractor. Accordingly the owner bears a significantly larger proportion of financial responsibility. The most vulnerable projects exaggerated by rework are light industrial, heavy industrial, railway projects and transformation projects.

For owners, OC and DE were most normally ranked amongst all categories. CE was also found on owners category.

For contractors, OC, DE, DC and VE were most frequently ranked as the most prevalent sources of rework

5.Suggestions

It can be said that even though the cost impact of rework is unlike among groups, the greatest cost impact sources in groups were highly associated, for example **DE** and **OC** are the two most frequently ranked sources by cost impact and can be measured to be the most important core cause for both contractor and owner. It can also be illustrious that CE for owner report projects and DC for contractor reported projects are also great contributor to rework. To reduce rework, firms should execute quality operations such as pre-project planning, benchmarking processes, project change organization and constructability and design efficiency. Further more,firms should improve organization of design and documentation processes and communication between owner, designers and constructors to create a guiding combination, and a shared purpose and mutual conviction Overall change requires leadership and management; the larger the change the more leadership is required.

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