

Analysis of the Causes and Minimize the Occurrence of Rework in Residential Project Due to Poor Communication

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Abstract: The importance of construction Rework in construction projects is referred to as the unnecessary effort of redoing a process or activity that was incorrectly implemented in the first instance. In construction projects, rework can result from an array of factors such as errors, omissions, failures, changes, poor communication and poor coordination. Rework could adversely affect the performance and productivity and ultimately the profit margins as well. For example, some previous studies identified that costs of rework could add around 10% to the total project costs. However, the literature also suggests that rework is mostly unnecessary and avoidable. A pilot study is being conducted in Solapur to explore the rework occurrences in the local construction industry. In this paper, some discussions regarding the significance of reducing rework and an overview of rework factors are presented. Also, a structured framework for rework management has been proposed so as to enhance the project performance levels.

Keywords: Rework causation, quality, supervision, questionnaire.

1. Introduction

The construction industry is mainly project-based and various complexities are inherent in the construction projects e.g. dealing with diverse interests of multiple stakeholders and resultant changes/ variations. Mainly, rework and wastages are considered as non-value adding endemic symptoms that seriously affecting the performance and productivity aspects in construction projects (Alwi et al. 2002, Josephson et al. 2002). The rework occurrences in construction projects are mostly from the unnecessary redoing/ rectifying efforts of incorrectly implemented processes or activities (Love, 2002). The critical tasks of project managers include balancing the competing demands of quality, scope, time and cost (PMI, 2004). Thus, project management roles can provide effective fulcrum for tracking of rework occurrences and thereby implementing suitable management measures for reducing the resultant impacts on productivity and project performance. Although changes may be deemed as inevitable in some perspectives, uncontrolled occurrences of rework and wastages should be effectively controlled to improve various targeted objectives of construction project management e.g. with respect to

timeliness, cost targets and product/ service quality. A pilot study is being conducted in Hong Kong that mainly aims at (a) identifying significant rework items and their root causes in the construction projects and (b) developing structured frameworks for effective rework control and management. This paper presents (a) a basic summary of significance of reducing rework, (b) an overview of rework factors, and (c) a proposed framework of rework management to enhance project performance levels. For brevity, the complete details of ongoing rework study are not covered in this paper.

A. Objectives

The general objectives of this research are improving the construction quality and optimizing the rework through the use of a case study and conducting a questionnaire survey and by focusing on rework as one of the major problems in construction industry. The specific objectives of this study are:

- To investigate and identify the rework problem in construction field work due to poor communication.
- To determine the impact of rework on project performance.
- To develop rework reduction strategies by questionnaire survey.

2. Literature survey

[1] Peter E. D. Love, ZahirIrani, and David J. Edwards; "A Rework Reduction Model for Construction Projects" *IEEE Transactions on Engineering Management*, Vol. 51, No. 4, November 2004.

Rework is endemic problems in building construction projects. To reduce the incidence of rework throughout the construction supply chain, data from 161 completed projects were gathered using a questionnaire survey. Stepwise multiple regression was used to determine the significant variables that contributed to rework in projects. In conjunction with previously reported research, these variables were used to develop an alternative procurement model for reducing rework in projects.

[2] L.O. Oyewobi1, D.R. Ogunsemi "Factors Influencing

Reworks Occurrence in Construction: A Study of selected building projects in Nigeria” Journal of Building Performance ISSN: 2180-2106 Volume 1 Issue 1 2010.

To improve the performance of projects the research work evaluated rework in some selected building projects in Niger State. The work identified some factors contributing to rework which was categorized under three main headings; technical, quality and human resources factors to actually dig down into the casual of rework. A structure questionnaire was self-administered on projects identified to have experienced rework amongst the selected projects and these were ranked according to their perceived degree of severity.

[3] Ekambaram Palaneeswaran and Muthukaruppan Ramanathan and Chi-ming Tam “Rework in Projects: Learning from Errors” *Surveying and Built Environment Vol 18 (2), 47-58 December 2007 ISSN 1816-9554*

Construction projects are mainly multidisciplinary and involve several consultants and contractors. Project success is mainly propelled by essential understanding of the design principles and construction methods by various team players. Effective coordination frameworks and efficient arrangements for information and communication are essential for project success. Reduction of rework and wastages is crucial for achieving good performance in project systems. Rework occurrences in construction projects are mostly avoidable as these are mainly unnecessary redoing/rectifying efforts of incorrectly implemented processes or activities.

[4] Bon-Gang Hwang, Stephen R. Thomas, Carl T. Haas, and Carlos H. Caldas, “Measuring the Impact of Rework on Construction Cost Performance” *Journal Of Construction Engineering And Management © ASCE / March 2009.*

Rework continues to affect both cost and schedule performance throughout the construction industry. In addition, it identifies the sources of this rework, permitting further analyses and the development of rework reduction initiatives. The impacts of rework differ according to project characteristics and that the sources of rework having the greatest impact are not significantly different among project categories. By recognizing the impacts of rework and its sources, the construction industry can reduce rework and ultimately improve project cost performance.

(5) Ekambaram Palaneeswaran; “Reducing rework to enhance project performance levels”. *Proceedings of one day seminar on “Recent development in project management in Hong-Kong” (12 May 2006)*

Rework in construction projects is referred to as unnecessary effort of doing a process or activity that was incorrectly implemented in the first instance. In construction projects the rework can be result from the array of factors such as errors, failure, changes, omissions, poor communication and poor coordination. Rework adversely affects on project performance and productivity.

Uncontrolled rework occurrences in construction projects have serious impacts on project performance. The endemic

rework occurrences as well as their impacting influences performance and productivity aspects should not be viewed as inevitable. The undesired outcomes related to rework can be substantially improved through developing of adequate awareness as well as structured systems for rework management.

[6] Di Zhang, Carl T.Haas, Paul M. Goodrum, H. Caldas, and Robin Granger; *Construction Small-Projects Rework Reduction for Capital Facilities Journal of Construction Engineering and Management ASCE / December 2012 / 1377.*

Rework is a persistent problem in construction. Reducing field rework is widely regarded as an effective way of improving construction performance in terms of productivity, cost, and schedule. This paper presents a generalized model for a rework reduction program (RRP), which is intended to reduce rework by managing a continuous improvement loop with four functional processes:

(1) rework tracking and cause classification, (2) evaluation of rework and its causes, (3) corrective action planning, and (4) integration of changes into the total management system. Analysis is conducted to examine and verify the functional mechanisms and effectiveness of the generalized model, by investigating a rework reduction program implemented in practice for a series of dozens of small projects executed by three contractors that represents the generalized model, and by analyzing the impact trends on rework in terms of frequency, cost, and labor hours over a considerable time period.

3. Project methodology

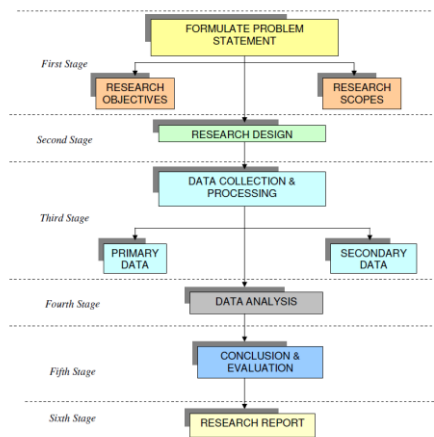


Fig. 1. Project methodology flow chart

A. First stage - Formulation Problem Statement

- In formulation of the problem statement for this study, extensive preliminary literature studies are required.
- The concepts of “Rework Construction” are required to be further explored and examined before forming the aims, objectives and scopes.
- Sources of references will include journals, technical reports, proceedings, publishing on the Internet and books.

- The aims, objectives and scopes will then be established together with the discussion in order to formulate the direction of the thesis.

B. Second stage –project design

- The site visits for observation and study of the construction activities and the non-value adding tasks performed.
- Proper collection and compilation of the data hence collected.

C. Third stage –Data Collection

- The method of data collection to be adopted includes:
- Observation from project site visits
- Interviews of people from the construction industry by means of questionnaire survey.

D. Fourth stage – Data Analysis

- Comprehensive analysis will be carried out on the data collected via descriptive and inferential statistics.

E. Fifth stage –Conclusion

- This phase will evaluate and conclude the results from the data analysis and conclude by answering the thesis objectives with the findings from the data collected and analyzed.
- Attach with constructive recommendations for further researches.

F. Sixth stage –Project theses Report

- This will involve substantial submission of write up, organizing the data format and outline.
- Constant discussion with the superiors throughout the write up processes, until the approval of draft, amendment draft and finally the Final Manuscript.

4. Data analysis

The statistical methods which were used in analyzing the data obtained from of respondents on the causes of construction reworks. Data collected through questionnaire survey from Pune and nearby area and analyzed. Work will be analyzed based on the data provided by Stake holders. Data for study is gathered through structured questionnaire. The other method of data attainment is through consultation with experts and people who work in involved organization by email contact: telephone interviews as well as face to face interviews.

Formulae used.

Mean score ranking =

$$\frac{\text{Sum of weight by respondent}}{\text{sum of no of respondent}}$$

1= Strongly agree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly agree

Sample calculation

For cause Lack of knowledge and experience of design and construction process the sample calculation is as follows

$$\begin{aligned} \text{Mean score ranking} &= \frac{\text{Sum of weight by respondent}}{\text{sum of no of respondent}} \\ &= \frac{1(0)+2(1)+3(5)+4(3)+5(4)}{13} \\ &= \frac{49}{13} \\ &= 3.77 \end{aligned}$$

Frequency Index

$$= \frac{3N1+2N2+N3}{3(N1+N2+N3)}$$

N1= no. of respondent who answered high
N2 = no. of respondent who answered medium
N3 = no. of respondent who answered low

A. Sample calculation

For cause Lack of knowledge and experience of design and construction process the sample calculation is as follows

$$\begin{aligned} \text{Frequency Index} &= \frac{3N1+2N2+N3}{3(N1+N2+N3)} \\ &= \frac{3*5+2*5+3}{3(5+5+3)} \\ &= \frac{28}{39} \\ &= 0.72 \end{aligned}$$

B. Case study

Detail Mean score rank and frequency index of cause according with respective cause - In this results detail description about all the factors are discussed. The factors which are considered as cause of rework are studied in detail and based on that the mean score rank and its frequency index is found out.

C. Poor communication

In poor communication rework arises due to ineffective communication. Effective communication between the parties involved in the project is key for avoiding rework. Communication keeps all parties aware of the status of important activities and issues. First ranked cause of rework in poor communication is non response to questions or resolutions of problems on the project according to mean score rank and according to frequency index is unclear lines of communication

Table 1
Causes, Mean score rank and frequency

Causes of reworks in poor communication	Mean Score Rank	Frequency
Late conformation of variations	3.31	0.72
Clients design vision not communicated effectively to the design team	3.61	0.74
Non-responses to questions or resolutions of problems	3.77	0.64
Incomplete or inaccurate responses to problems	3.46	0.74
Unclear lines of communication	3.46	0.79

that means the direction given by the designer or architect are taken in wrong way.

Non-responses to questions or resolutions of problems for frequency index Unclear lines of communication.

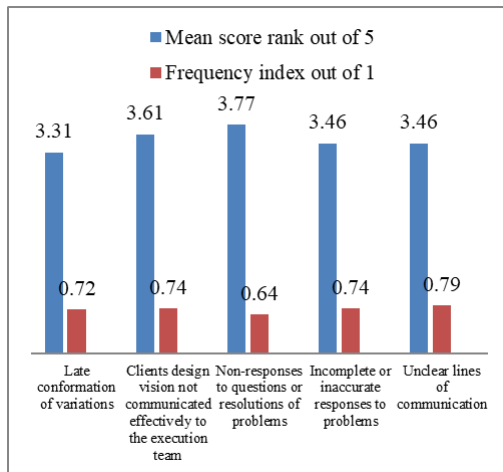


Fig. 2. Ranking of causes of rework in client related factors.

5. Result and conclusion

In this results detail description about all the factors are discussed. Cause of rework are studied in detail and based on that the mean score rank and its frequency index is found out.

A. Poor communication related factor

The first rank according to mean score rank in this area is

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