

Analyze the Causes and Minimize the Occurrence of Rework in Construction Project

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ABSTRACT: Rework, are activities in the field, which have been completed, but were required to be repeated or undertaken again as a result of some impeding correction that was necessary to be carried out during the project. This is regardless of source, or effecting a change, not due to change of scope by the owner. Fundamentally, rework becomes necessary either when an element of building works fails to meet customer requirements, or when the completed work does not conform to the contract documents. In either scenario, the product is altered so as to ensure conformity. At a certain moment during construction, for example due to an error, rework is necessary. But the rework might not be discovered until some form of quality control check is done, after which it can be concluded as to what kind of rework needs to be done. Rework can also have internal or external origins. Changes in clients' expectations are an example of an external factor that might lead to rework. Rework can cause many costs to be higher than calculated at the start of the project. Rework can result from various sources such as errors, omissions and change.

I. INTRODUCTION

Over the decades, construction work across the globe has been a means for countries upgrading their national economies. The construction industry is faced with the significant problems of high cost of project delivery, bad financial performance and inability to deliver value to customers on time. As a result, the industry has been criticised extensively for poor performance and inefficient productivity. A major factor contributing to this setback is rework. Rework is defined as the unnecessary effort of redoing an activity that was inaccurately done the first time or the process by which an item is made to conform to the original requirement by completion or correction. Rework and wastages have become recognised as non-value adding endemic symptoms that seriously affect the performance and productivity aspects of construction projects and the problem of rework has been largely ignored by the construction industry. The construction industry is mainly project-based and various complexities are inherent in the construction projects such as dealing with diverse interests of multiple stakeholders and resultant changes. Due to these characteristic complexities of construction, amendments may be deemed inevitable in some instances; however, uncontrolled occurrences of rework and wastages should actually be more effectively controlled. This will essentially improve various targeted objectives of construction project management with respect to timelines, cost targets and product and service quality. Rework is a major contributor to time wastage and schedule overruns which eventually impact on cost, resources and quality. The adverse consequences of rework include reduced profit, loss of market share, worker injuries, damaged reputation, increased turnover of management and workforce, lower productivity, higher costs, and finally, costly litigation between participants over responsibility for overruns and delays. In the long term, rework can also affect a construction company's reputation and its ability to attract new business. However, little is known about the background and consequently, rework remains an innate problem. The lack of attention to the root causes of rework seems to be a global phenomenon. With this in mind, the aim of this research is to determine the underlying causes of rework during construction as well as the impact of rework on overall project performance so that effective prevention strategies can be developed. Most construction projects have got an assortment of causes that leads to rework, this include; omissions, alteration, failures, proper communication, and inadequate coordination and collaboration between stakeholders. Invariably, the impact of rework has badly impacted on the productivity, performance, and finance of a project.

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II. LITERATURE SURVEY

Sugiharto Alwi et al (1999): The quality of site supervision has a major influence on the overall performance and efficiency of construction projects. Inadequate supervision is believed to be one of the major causes of rework. This paper argues that the quality of site supervision is directly related to the supervisor's level of experience gained through formal training. Hence, the paper attempts to explore the relationship between the quality of site supervision, expressed as training cost, and the rework cost borne by contractors in high-rise building construction. P.E.D Love et al (2000) : This paper focuses on modelling and analyzing those factors that influence the occurrence of rework during the design process. In this thesis, factors that contribute to design errors are identified and used to design and develop a systems dynamics model, which is used to stimulate a number of practical scenarios that can be used to reduce design errors and rework. A Design and Construction Rework Minimization (DECOREM) management model is presented in this paper which can enable design and project managers to better understand the process of design documentation and how design errors occur in construction projects. John M. Kakitahi et al (2014): The realisation of the expected minimum client quality requirements in both the products and processes in the construction industry remains challenging. The effects have been increased wastage and value loss through rework in both public and private sector initiatives providing social services in developing countries. The purpose of the research was to compare the impact of construction related rework on project budgets and schedule in public building construction in both Uganda and Mozambique, being examples of developing countries. The objective of such comparison is to document where focus should probably be placed in ensuring that quality requirements in construction are achieved. Case study approach was adopted and separate case study protocols prepared.

III. 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 fore 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 Likert scale of maximum four. The Likert 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.

QUESTIONNAIRE SURVEY

A questionnaire is a research method consisting of series of questions that are used for the purpose of gathering information from respondents. The main approach in this thesis is to conduct a questionnaire survey which will help to understand the rework and its causes happening in the construction process. The questions for the survey were formulated according to the research objectives and a model

established during the literature study. The questionnaire is comprised of four sections, namely: information of organisation and project characteristics, details of project, causes of rework, impact of rework.

The first section (section A) of the questionnaire requested information about the profile of respondents. The information gathered includes the role of the organisation and the current position of the respondents. Section B obtained information concerning the project and facility type, the contract value and duration, procurement method and the size of the project. Section C solicited information regarding the causes of rework. The causes of rework were categorised into factors such as client-related, design-related, site management and subcontractors related and gathering of data was carried out using a four Likert-scaled type questions. Section D obtained data pertaining to the impact of rework. Likert-scaled type questions were designed to ascertain the level of impact of rework on cost, time and organisational and project performance. The questionnaire for the main study can be found in Appendix. Respondents and participants to be used in this survey will include the following: contractors, architects, clients, structural and quantity surveyors and project managers.

1. Questionnaire Survey

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2. Data Collection

IV.CAUSE 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.

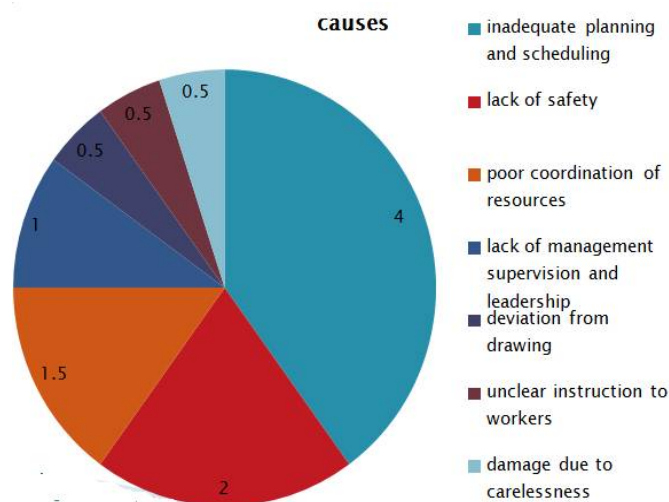
The findings of the study revealed that poor communication between design consultants and clients was the major factor contributing to client-related rework. This may imply that there is not much interaction between clients and the design

team consultants to ensure that clients' ideas are communicated properly; as a result, rework emanates right from the initiation stage, proceeding through an incubation system, and manifesting itself during the implementation stage. Moreover, in the case of design-related factors, the predominant factor suggested by respondents was changes made at the request of the client. This may imply that most clients lack experience with regard to the design process and because of this their ideas might not be feasible during the design. Relative to site management-related factors, respondents identified deviation from drawings, poor coordination of resources and setting out errors as the major factor contributing to rework which is due to inexperience and the inability to communicate effectively with subcontractors. It was reported by respondents that low-skilled labour employed by subcontractors resulted in rework. Implicitly, the human resource support systems such as education, training, motivation, and improved skill level provided by employees' organisations so that they can perform their jobs more effectively and productively is lacking.

MAIN EFFECTES

The main factors that have been effected the performance of the projects due to rework are:

- ▶ Cost overrun
- ▶ Time overrun
- ▶ Client dissatisfaction
- ▶ Quality degradation



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V. CONCLUSION

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 organization construction industries, the impacts and its effects on the organization.

IMPACT OF REWORK

The analysis of the comparative study revealed that reworks caused inter-organisational conflict that led to decrease in supervision and resulted in the de-motivation of workers. The study also revealed that the incidence of rework increased project cost. This was due to additional materials for rework, subsequent wastage handling, costs for covering rework occurrences and additional labour to rectify activities. Besides, additional time to rework and related extensions of supervising manpower were also identified, ultimately leading to customer dissatisfaction and reduced profit for contractors.

The analysis of the response of the questionnaire revealed that respondents tended neither to agree, nor disagree, that the cost overrun, time overrun and design team dissatisfaction as a result of rework impacted on project performance. Similarly, respondents expressed sentiments of disagreement and neutrality that reduced profit, de-motivation of workers and inter-organisational conflict all impacted on organisational performance.

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