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Identification of Critical Factors in Building Construction Projects

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Abstract: *In India the building construction projects is increasing from time to time. However, it becomes difficult to complete projects in the allocated cost, time and quality. Taking this into consideration cost overrun time and quality and is one of the major problems in building construction projects. This research was carried out to get information on the factors that cause cost, time and quality during construction and their effects on building construction projects. A structured questionnaire surveys were used to solicit with desk study was used to collect data on quality, time and cost overrun. The critical factors have been analyzed to rank the causes of delays based on the Relative Importance Index (RII).*

Key words: *Construction Survey, Relative important index (RII), Causes of delay, Cost overrun, Time, Quality.*

I. INTRODUCTION

The construction industry is a very important role of the economy development for any developing country. In India, the construction industry plays a very important role for the economy. It provides the physical infrastructure, which is primary for the country's development.. While several studies that discuss about the critical factors affecting project delay in various countries, (Kumaraswamy and Chan, 1998, Lo et. al, 2006, Assaf and Al-Hejji, 2006, Sambasivan and Soon 2007, Ogunlana et. al, 1996). Time and cost overruns occur in most construction projects and the magnitude varies considerably from project to project. So it is essential to define the actual causes of time and cost overruns in order to minimize and avoid the delays and increasing cost in any construction project. This study makes an attempt to find the critical factor influencing on resource related delay in construction projects. This paper focuses on the construction stage of projects. The objectives of this study include:

- A. To evaluate to what extent the time delay and cost increases in building construction projects.
- B. To identify factors influencing time and cost overruns in building construction projects
- C. To discuss the effect of delay and time overrun in building construction projects
- D. To formulate recommendations based on the result obtained.

II. LITERATURE REVIEW

Time and cost are the two common concerns of construction management. Many factors relate to delay with types of project, locations, sizes, and scopes. Construction projects with their features of complexity and capital requirement have resulted interest to many researchers. Al-Momani (2000) conducted a quantitative analysis of construction delays by examining the records of one hundred and thirty public building projects constructed in Jordan. There were presented the regression models of the relationship between actual and planned project duration for different causes of delays. They concluded that the main causes of delays in construction projects relate to designers, user changes, weather, site conditions, late deliveries, economic conditions, and increase in quantities. Assaf et. al (1995) identified fifty six causes of delay under nine major groups and evaluated their relative importance index by them in Saudi Arabia. They were concluded that contractor owners and architects in general agree to the ranking of individual delay factors while contractors and architects substantially agree with the ranking of groups of delay factors while contractors and owners, and architects and owners don't agree. Assaf and Al-Hejji (1995) identified that the most common cause out of the listed 73 causes of delay identified by all parties of construction is change of orders using Frequency Index (FI), Severity Index (SI) and Important Index (II). Chan and Kumaraswamy (1997) examined the relative importance of delay factors in Hong Kong. There were identified five principal delay factors such as: poor risk management, poor supervision, unforeseen site conditions, slow decision making involving variation, and necessary variation works. El-Razek et. al (2008) examined the causes of delays in Egyptian construction projects. There concluded that different parties of construction don't agree on the relative

importance of various factors of delay, mostly blaming each other of delays using importance index and spearman rank correlation. Faridi and El- Sayegh (1995) identified that over 50% of construction projects experience delay due to factors such as delay in approval of construction drawings, poor pre-planning and slow decision making process. Comparing the key factors of construction delay across UAE, the Kingdom of Saudi Arabia (KSA) and Lebanon, the research asserted that delay in approval, owner's slow decision making and material shortages are common causes of construction delay across the region. However, the findings those other high ranked factors in UAE had no significant impact in KSA construction projects clearly highlight the fact that factors causing construction delay cannot be considered common across the countries. Iyer and Jha (2005) reported the success and failure attributes of the project and their latent property failure attributes being: conflict among project participants, ignorance and lack of knowledge, presence of poor project specific attributes and non-existence of cooperation, hostile socio economic and climatic condition, reluctance in timely decision, aggressive competition at tender stage, short bid preparation time. Kumaraswamy and Chan (1998) reviewed eight categories of delay factor as: project related factors, client related factors, design team related factors, contractor related factors, materials, labour, plant and equipment, and external factors. Lo et. al (2006) identified thirty causes of delay factors under seven categories namely client related, engineer related, contractor related, human behavior related, project related, external factors and resource related in Hong Kong construction projects. There were analyzed and ranked by using Rank Agreement Factor (RAF), Percentage Agreement (PA) and Percentage Disagreement (PD) difference in perceptions of various construction practitioners on causes of delay. Mansfield et. al (1994) reported the causes of delays and cost overrun in Nigerian construction projects. There were identified sixteen major factors that caused delays and cost overruns in Nigeria. The most important items agreed on by the contractor, consultants, and public clients surveyed were the financing and payment for completed works, poor contract management, change in site conditions, and shortages of materials inaccurate estimation, and overall price fluctuations. Sambasivan and Soon (1997) reported an integrated approach for causes and effects of construction delays in Malaysia construction projects, they were identified ten important factors Out of twenty eight listed factors and six main effects of delays using relative importance index and in order to test the degree of agreement between the three groups of respondents as to cause of delays. Odeyinka and Yusif (1997) examined the causes of delays in housing projects and identified main categories as: client, consultant, and contractor caused delays, and extraneous factors in inclement weather, acts of nature, labor disputes and strikes in Nigeria. The research asserted that client-caused delays predominately arise from design variation in projects.

A. *Timeoverruns*

Inability to complete a project either by the original planned time or budget, or both, ultimately results in project delay. The social and economic costs of delay can be amazingly high and to a certain extent cannot be absorbed by the industry. When a delay can no longer be absorbed by the client, it will result in the project being abandoned. Thus, it is important to predict and identify problems in the early stages of construction and diagnose the main causes and implement the most appropriate and economical solutions to prevent further negative impacts of delay.that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases. Completing projects on time is an indicator of effectiveness, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. Stumpf (2000) defined delay as an act or event that extends the time required to perform the tasks under a contract. It usually shows up as additional days of work or as a delayed start of an activity. He showed, in his article, that delay does matter, and that different methods for analyzing schedule delay lead to different results for the owner and contractor. Construction delays became an integral part of the project's construction life. Even with today's advanced technology, and management understanding of project management techniques, construction projects continue to suffer delays and project completion dates still get pushed back (Stumpf, 2000). Choudhry (2004) and Chan (2001) defined the time overruns as the difference between the actual completion time and the estimated and agreed completion time. It is measured in number of days. Project delays are those that cause the project completion date to be delayed (Al- Gahtani and Mohan 2007). From above, time overruns is defined as the time increased to complete the project after the planned date which is caused by internal and external factors surrounding the project.

B. *Cost Overruns*

Cost overrun is the amount by which actual costs exceed the baseline or approved costs. For the purpose of this research cost

overrun is defined as the positive difference between the final or actual cost of a construction project at completion and the contract amount agreed by the client and the contractor during signing of the contract.

III. RESEARCH METHODOLOGY

For this research, a questionnaire survey method has been adopted to find the impact of critical factors that leads to delay on resource related in the Indian construction sector drawing from various international researchers mentioned above in particular (Sambasivan and Soon 2007). A questionnaire survey was conducted of construction professionals representing various stakeholders involved in construction projects in India.

IV. QUESTIONNAIRE DESIGN

The questionnaire was designed based on critical factors were identified that contributed to the causes of delays. A questionnaire survey was developed to assess the perceptions of various construction professional of the relative importance of causes and the effects of construction delays. The questionnaire was designed into two sections: Section A; section B. Section A is to obtain the requested background information about the respondents. Section B is to obtain the information on factors that contribute to the causes of delays in construction projects from the perspective of construction professionals. The critical factors are listed in Table 1. A five point Likert scale (1 very low, 2 low, 3 moderate, 4 high, 5 very high) was adopted where respondents were asked to rank the importance and impact of a particular factors on delay in one of their selected projects. Descriptive statistics techniques namely Relative Importance Index (RII) has been used to highlight the relative importance of critical factors as perceived by the respondents (Assaf et. al, 1995; Faridi and El-Sayegh, 2006; Iyer and Jha, 2005; Kumaraswamy and Chan, 1998).

Table 1: List of Critical Factors

| Cost factors | |
|--------------|---|
| 1 | Market share of organization |
| 2 | Liquidity of organization |
| 3 | Cash flow of project |
| 4 | Profit rate of project |
| 5 | Overhead percentage of project |
| 6 | Project design cost |
| 7 | Material and equipment cost |
| 8 | Project labor cost |
| 9 | Project overtime cost |
| 10 | Cost of rework |
| Time factors | |
| 11 | Site preparation time |
| 12 | Planned time for project construction |
| 13 | Percentage of orders delivered late |
| 14 | Time needed to implement variation orders |
| | Time needed to rectify defects |
| 15 | Average delay in claim approval |
| 16 | Average delay in payment from owner to contractor |
| 17 | Availability of resources as planned through project duration |

| | |
|-----------------|--|
| 18 | Average delay because of closures and materials shortage |
| Quality factors | |
| 19 | Conformance to specification |
| 20 | Availability of personals with high experience and qualification |
| 21 | Quality of equipments and raw materials in project |
| 22 | Participation of managerial levels with decision making |
| 23 | Quality assessment system in organization |
| 24 | Quality training/meeting |

A. Data Analysis Method

Index(RII) method to determine the relative importance of Sum of weights

$$(W1 + W2 + W3 + \dots + Wn) / A \times N$$

Where;

W = The weight given to each factor by the respondents and range from 1 to 5;

A = The highest weight;

N = The total number of respondents

V. CONCLUSION

This study was identified the three categories of top ten most critical factors in Indian construction projects. A total eighty four construction professionals from Indian construction industry were participated and shared their expert opinion in the form of their response by completing the questionnaire survey. The three groups of top ten significant factors can be affected the project success. The project participants should be familiar with these significant causes of delays in resource related and plan to avoid or at least to mitigate their impact on project success. Some recommendations are as follows:

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