CONSTRUCTION PROJECT DELAYS IN EASTERN PROVINCE OF SRI LANKA: PERSPECTIVES OF CONTRACTORS AND CONSULTANTS

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ABSTRACT: The delay is considered as a major misfortune in construction industry. It has been discovered that Sri Lankan construction industry faces a significant degree of delays in project delivery. The purpose of the research was to identify the most significant causes of delays in construction projects and propose apposite measures to diminish delays. Following a thorough review of literature from various angles, the causes of delays were first identified. These identified causes were presented to the key players in the construction industry consisting senior project managers, senior engineers, senior quantity surveyors and senior architects through a conduit of structured questionnaire. They were requested to put across their view on the level of significance on each cause and the results were statistically summarized. It was found that there are ten most significant causes of delays such as poor planning and scheduling, delay in obtaining permits and permissions, poor site management, design efficiencies, suspension of work by client, contractor's financial difficulties, variations, poor procurement methods of the contractor, slow decision making by client and lack of familiarity of local construction industry. Out of these ten major causes, poor planning and scheduling found as extremely significant and all other nine causes as very significant. The findings of this research were slightly different from previous studies of similar nature.

Keywords: Construction, Construction Delays, Risk.

1. INTRODUCTION

Delay, as referred in construction, is a prolonged construction period and disruptions of events that disturb the construction programme (B. Indhu & P. Ajai, 2014). Time performance of a project is usually an important attention for the construction parties. Often, the most troublesome construction disputes involve delay and failure to complete the work in the specified time frame (Mahamid, et al., 2015). Construction delays are seen as one of the biggest complications faced in almost every project. Tumi, 2009 mentioned that delays are one of the biggest problems faced by construction firms. The occurrence of delay is common in most of the construction projects due to various reasons and causes before or during construction phase. The Sri Lankan construction industry also faces a severe problem when it comes to timely completion of construction projects. It has been witnessed in Eastern province of Sri Lanka that many construction projects were suffered from time and cost overruns. So there is a challenge to overcome these issues by practicing suitable measures to minimize such delays. To establish the actions to address the issue, a detailed study on the causes and the effects of construction delay was very essential. Different parties involved in construction see the delay issues in different perspectives. The consequences of construction delay are also different for different parties (Salunkhe & Patil, 2013). This paper's aim is to investigate the major causes of construction project delays in two different perspectives from contractors and consultants and to propose suitable measures to minimize the delays. The objectives of the study are; (1) to identify the main reasons of construction delay in Sri Lanka; (2) to identify the effects of construction delays on projects; (3) to propose suitable methods to minimize construction delays.

Many studies have been conducted by various researchers from different part of the world on construction project delays. According to Muhwezi, et al., 2014, causes of delay were categorized in to four main group such as consultant related, contractor related, client related and external realted. The most significant factors of construction delays were identified as: 1) delay in assesing changes in the scope of work by consultant; 2) financial indisipline by the contractor: 3) inadequate contractor's experience; 4) design errors made by designers: 5) inadequate site investigation by the consultant. Assaf & Al Hejji, 2006 identified 73 factors as the reasons for delay and categorized in to 9 groups. The most significant causes of delays were approval of shop drawings, delay in contractor's payment and design changes by owners. Haq, et al., 2014 studied the effects of delay in construction projects of Punjab-Pakistan. Data on the study variables has been collected through structured questionnaire from 37 construction firms in Punjab. It is found that delay in construction projects significantly lead to cost overrun, time overrun, litigation and project abandonment.

Frimpong, et al., 2003 studied the delay causes based on ground water construction projects in Ghana. 26 factors of construction delay were identified and their relative importance index were calculated. It was found that monthly payement difficulties from agencies, poor contractor management, planning and scheduling deficiencies, material procurement and poor technical performance are the major causes of construction delay.

Sambasivan & Soon, 2007 studied the causes of construction delay in to seven major groups such as client related factors, contractor related factors, consultant related factors, material related factors, labour and equipment related factors, contract related factors and external factors. The identified six effects of construction delay were used in the study. It was found that contractor's improper planning , contractor's poor site mangement and inadequate contractor's experience were the top three major causes of construction delay.

2. METHODOLGY

Litarture survey was conducted to study the delay factors and effects of delay. Based on the findings from the previouse studies, the study was conducted through a structured questionaire survey. Seventy sets of survey questionnaires were distributed in total in order to identify the most important factors that cause delays, the common effect of delays, and methods of minimizing construction delays. Thirty four professionals responded to the survey. The survey questionnaires were distributed to the contractors and consultants who engaged in construction projects in eastern province of Sri Lanka. The questionnaire was completed by experienced project directors, project managers, projects engineers, site manager and designers.

The questionnaires were all divided in to 4 sections.

Section A: Respondant backround

Section B: Causes of construction delay

52 delay factors were idntified in to 7 different categories namely owner related, contractor related, consultant related, material related, equipment related, labour related, and external factors.

Section C: This part consisted of six impacts of construction delays namely time overrun, cost overrun, dispute, arbitration, litigation, and total abondonment.

Section D: This part was based on 15 different methods of minimizing construction delays identified from previouse researches.

The questionarrie was based on Liker's scale of five ordinal measures from 1 to 5 according to contribution. The dat was statically analysed to calculate the relative important inde (RII) and rank the factors in each category. To determine the ranking of different factors from the viewpoint of contractors and consultants, the Relative Importance Index (RII) was computed as:

RII = Sum of weights (W1 + W2 + …+ Wn) / A x N

where W = weights given to each factor by the respondents from 1 to 5, ('1' is less significant and '5' is extremely significant), A = highest weight (i.e. 5 inthis case), and N = total number of respondents.

3. ANALYSIS AND RESULTS

3.1 Delay Factors

The identified delay factors, from seven different categories, were ranked individualy and overall in each category based on Relative Importance Index (RII) from the view point of contractor and consultant. The following is a brief description of these factors in each group.

Table 1. Factors of Client Related Delays

`	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Late in revising and approving design documents	3.56	1	3.38	1	3.47	1
Change orders by owner during construction	3.50	2	3.25	3	3.38	2
Delay in approving shop drawing and sample materials	3.44	3	3.00	9	3.22	3
Slowness indecision making process	3.11	5	3.31	2	3.21	4
Poor communication and coordination	3.28	4	3.13	5	3.20	5
Conflicts between joint-ownership of the project	2.94	6	3.25	3	3.10	6
Delay to furnish and deliver the site	2.89	7	3.13	5	3.01	7
Suspension of work by owner	2.72	8	3.06	8	2.89	8
Delay in progress payments	2.61	9	3.13	5	2.87	9

Table 2. Factors of Consultant Related Delays

Factors	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Delay in approving major changes in the scope of work	3.33	4	3.38	1	3.35	1
Mistakes and discrepancies in design documents	3.50	2	3.06	3	3.28	2
Un-use of advanced engineering design software	3.78	1	2.63	8	3.20	3
Un clear and in adequate details in drawings	3.39	3	2.94	4	3.16	4
Delays in producing design documents	3.28	5	2.94	4	3.11	5
Insufficient data collection and survey before design	2.94	7	3.13	2	3.03	6
Poor communication and coordination	3.06	6	2.94	4	3.00	7
Inadequate experience of consultant	2.83	8	2.81	7	2.82	8

Table 3. Factors of Contractor Related Delays

Factor	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Delays in sub-contractors work	3.06	3	3.81	2	3.43	1
Poor communication and coordination	2.83	9	3.94	1	3.39	2
Inadequate contractor's work	3.11	1	3.63	4	3.37	3
Ineffective planning and scheduling of project	2.94	6	3.75	3	3.35	4
Conflicts in sub-contractors schedule in execution of project	3.11	1	3.56	6	3.34	5
Improper construction methods implement	3.06	3	3.50	8	3.28	6
Frequent change of sub-contractors	2.89	8	3.63	4	3.26	7
Rework due to errors during construction	2.94	6	3.56	6	3.25	8
Conflicts between contractor and other parties	3.00	5	3.50	8	3.25	8
Difficulties in financing project	2.83	9	3.50	8	3.17	10
Delays in site mobilization	2.61	11	3.38	12	2.99	11

Poor qualification of the contractor's staff	2.39	12	3.50	8	2.94	12

Table 4. Factors of Material Related Delays

Factors	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Delay in material delivery	2.89	1	3.38	1	3.13	1
Shortage of construction materials in market	2.83	3	3.31	2	3.07	2
Changes in material types during construction	2.83	3	3.31	2	3.07	2
Delay in manufacturing special building materials	2.89	1	3.19	4	3.04	4
Late procurement of materials	2.78	5	3.19	4	2.98	5
Damage of sorted material while they are needed urgently	2.56	6	3.00	6	2.78	6

Table 5. Factors of Labour Related Delays

Factors	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Shortage of labors	3.33	1	3.38	1	3.35	1
Low productivity level of labors	2.89	3	3.19	2	3.04	2
Working permit of labors	3.00	2	3.00	3	3.00	3
Personal conflicts among labors	2.39	4	2.75	4	2.57	4

Table 6. Factors of Equipment Related Delays

Equipment Related	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Lack of high-technology mechanical equipment	2.61	2	3.25	1	2.93	1
Low productivity and efficiency of equipment	2.61	2	3.19	2	2.90	2
Low level of equipment-operator's skill	2.72	1	3.06	3	2.89	3

Shortage of equipment	2.61	2	3.06	3	2.84	4
Equipment break downs	2.50	5	2.88	5	2.69	5

Table 7. Factors of other Related Delays

Factors	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Effects of subsurface and ground conditions	3.11	1	2.88	2	2.99	1
Weather effect on construction activities	2.83	2	2.75	4	2.79	2
Delay in providing services from utilities	2.50	8	2.94	1	2.72	3
Delay in obtaining permits from municipality	2.61	6	2.81	3	2.71	4
Traffic control and restriction at job site	2.67	4	2.75	4	2.71	4
Changes in government regulations and laws	2.83	2	2.50	7	2.67	6
Delay in performing final inspection and certification	2.67	4	2.63	6	2.65	7
Accident during construction	2.56	7	2.25	8	2.40	8

3.2 Effects of Construction Delays

Table.8 shows time over run, cost overrun, and dispute are the top three common effects of delays in construction project from the view of point of contractor and consultant. According to the top ten factors that contributed to the causes of delays, there are at least five factors which are highly inducing time overrun in construction project, such as late in revising and approving design documents, delays in sub-contractors work, delay in approving major changes in the scope of work and conflicts in sub-contractors schedule in execution of project.

There are also at least five factors which are highly inducing cost overrun in construction project, such as poor communication and coordination, change orders by owner during construction, inadequate contractor's work, ineffective planning and scheduling of project, and mistakes and discrepancies in design documents.

Table 8. Effects of Construction Delays

Factors	Contractor		Consultant		Overall	
	Index	Rank	Index	Rank	Index	Rank
Time overrun	3.56	1	3.75	1	3.65	1

Cost overrun	3.17	2	3.63	2	3.40	2
Dispute	3.06	3	2.88	3	2.97	3
Litigation	2.94	5	2.88	3	2.91	4
Total abandonment	3.00	4	2.81	5	2.91	4
Arbitration	2.94	5	2.56	6	2.75	6

3.3 Methods of Minimizing Construction Delays

These methods, identified from previous studies, were ranked based on the mean value, calculating the average indexes of methods identified by the contractor and consultant.

The analysis revealed that the site management and supervision, effective strategic planning, clear information and communication channels, collaborative working in construction and proper project planning and scheduling are the top five effective methods of minimizing construction delays by contractors and consultants.

The site management and supervision is the most important factor among all the other. In construction, we need to ensure the effective coordination among the various professionals. Moreover, the strategic planning is very important for construction companies as it provides the right direction to be spirited in the industry. For the third ranked factor, the clear communication is indispensable when overseeing actions in construction projects. Communication conveys the ideas and information. Hence site managers must ensure that their workers are able to understand all the instructions and commands before they start any activities at site.

Table 4.11: Result of methods of minimizing construction delays

Factors	Contractors		Consultants		Overall	
	Index	Rank	Index	Rank	Index	Rank
Site management and supervision	3.44	3	4.13	1	3.78	1
Effective strategic planning	3.56	1	4.00	3	3.78	1
Clear information and communication channels	3.50	2	4.00	3	3.75	3
Collaborative working in construction	3.39	5	4.06	2	3.73	4
Proper project planning and scheduling	3.44	3	4.00	3	3.72	5
Frequent coordination between the parties involved	3.39	5	3.94	6	3.66	6
Complete and proper design at the right time	3.33	7	3.88	7	3.60	7
Use appropriate construction methods	3.33	7	3.63	13	3.48	8
Accurate initial cost estimates	3.11	10	3.81	8	3.46	9
Proper material procurement	3.06	11	3.81	8	3.43	10
Proper emphasis on past experience	3.06	11	3.81	8	3.43	10
Frequent progress meeting	2.94	13	3.75	11	3.35	12
Compressing construction durations	3.22	9	3.44	15	3.33	13
Use proper and modern construction equipment	2.89	15	3.75	11	3.32	14
Use up-to-date technology utilization	2.94	13	3.56	14	3.25	15

4. CONCLUSIONS

Project delay is the major area of anxiety in the construction industry. Delays have turned out to be a common occurrence and are almost always accompanied by cost and time overruns. Construction project delays cause unbearable effects on parties such as owner, contractor, and consultant. It disturbs the contract in terms of a growth in adversarial relationships, distrust, litigation, arbitration, cash-flow problems, and a general sense of uneasiness towards each other. Delays can be diminished only when their causes are identified. Knowing the cause of any particular delay in a construction project will help to stay away from the same.

Hence, this study was consequently aimed at identifying the major causes of delays in construction projects in the eastern region of Sri Lanka. It also quantifies the perceptions of different parties engaged in construction projects.

Contractor related factors are found to be more aggressive in causing delays. The top five most important factors are late in revising and approving design documents, delays in sub- contractors

work, poor communication and coordination, change orders by owner during construction, and inadequate contractor's work. For the effects caused by delays, time over run and cost overrun are the most common effects of delays in construction projects. To minimize delays in construction project, effective strategic planning, site management and Supervision and clear information and communication channels are recommended as top most three ways.

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