

CLIENT'S IMPACT TO THE SCHEDULE DELAYS IN ROAD PROJECTS: CONTRACTOR'S PERSPECTIVE

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ABSTRACT

The problem of schedule delay is a frequent and regular phenomenon in the construction projects. Road construction of Sri Lanka is no exception. Client as a key project participant has a control on duration of construction phases. This makes client a casual cause for schedule delay. However, contractor also is a major suffering party due to unprecedented delays. Therefore, this research is aimed at investigating the contractor's perspective of client's impact to the schedule delay in rehabilitation and widening road projects (RWRP) in Sri Lanka. Initially, a comprehensive literature review aided to identify types and effects of delay in road construction projects. Further, identified literature was refined in the sense of Sri Lankan context through three number of preliminary interviews. Next, six cases were selected considering RWRPs in Sri Lanka and steered a document review to investigate the influence of the involvement of the client for delays. Then, a questionnaire survey was carried out to examine the significance of client's causes for delay on contractor's perspective and to identify the client's best practices including suggestions to minimize the delays in RWRPs in Sri Lanka. The analysed data confirmed that delayed interim payments to the contractors due to monetary difficulties of the client, change orders by the client throughout the construction period, delay in land acquisition and delay in handing over the site for construction work as key client causative factors. This study request client to adhere with the identified best practices to mitigate schedule delays in RWRP in Sri Lanka.

Keywords: *Client Initiated Delays; Rehabilitation and Widening Road Projects; Schedule Delays.*

1. INTRODUCTION

In an economy, the construction industry can be recognized as one of the key sectors which majorly impacts on the economic development (Divya and Ramya, 2015). Similarly, Tolera (2013) declared the construction industry as a vital subsector of a country's economy. This close relationship with the economy has led many countries to emphasis on ascertaining the strategies to improve the performance of the construction industry (Toor and Ofori, 2010) and to develop large-scale infrastructure projects including roadways, power plants, bridges, seaports, dams, airports, and telecommunications networks (Chen, 2004).

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However, the construction industry has to deal with cost, time and quality factors to develop and to become successful (Kesavan *et al.*, 2015; Mahamid, 2017). Further, Ngacho and Das (2014) stated that time is the most significant measure among other key performance indicators of the construction projects. Importantly, Tafazzoli and Shrestha (2017) highlighted that completion of the construction projects within the scheduled time as a cause for efficiency.

Therefore, time is a noticeable element that needs a proper research effort in the construction industry. Numerous researches had been carried out to find the causes for delays in the construction projects in the Sri Lankan and global context. However, only a few researches have been carried out to identify the delay factors in terms of rehabilitation and widening road projects in Sri Lanka. Even though the delays are unavoidable in road construction projects, minimizing delays has become a primary responsibility of project participants (Ekanayake and Perera, 2016). However, influence of the client as a project participant has gained a minimal research attention. Hence, considering the link of the clients to the time factor in a project this research focuses on client initiated delays, in road rehabilitation projects in Sri Lanka considering the perspective of the contractor.

2. LITERATURE REVIEW

Involvement of many parties including clients, contractors, consultants, regulators, and other stakeholders in the construction sector has created a complexity (Gajare and Attarde, 2014). Moreover, the numerous activities and their interrelationships that require different specialized knowledge complicate construction project (Acikara *et al.*, 2017). Beyond this complex nature, construction projects accomplish their main goals through managing the works within planned time, cost and quality (Kesavan *et al.*, 2015; Malkanthi *et al.*, 2017). Therefore, all the project participants are in the objective of effective time management (Idiaka *et al.*, 2015).

2.1 DELAYS IN CONSTRUCTION PROJECTS

Delay is a very frequent and non-prearranged phenomenon almost associated with ongoing construction projects (Daba and Pitroda, 2018). Assaf and Al-Hejji (2006), defined a delay in construction as an overrun of the completion time beyond the completion date specified in the contract document or the date which the parties agreed to deliver the project. According to Hamzah *et al.* (2011), ongoing progress of a project which is insufficient to complete the project within construction program is a situation of a delay.

2.2 CAUSATIVE FACTORS FOR DELAYS

Construction delays are caused by numerous factors (Fugar and Agyakwah-Baah, 2010). Identifying and understanding the delay factors enable clients and contractors to mitigate the effect of the delays on their projects (Hussain *et al.*, 2018). In the view of Ahmed *et al.* (2003), possible causative factors for delay can be categorized as contractor's responsibility, consultant's responsibility, client's responsibility and external factors. Meanwhile, Kesavan *et al.* (2015) increased number of categories up to seven categories as client related factors, contractor related, consultant related, labour related, material related, equipment related and external factors. In the study carried out by Assaf and Al-Hejji (2006), external factors category was replaced by project related and design related factors. Moreover, Sambasivan and Soon (2007) added contract relationship related and

contract related categories to the category list. Table 1 shows the categories and causative factors for delays identified through literature.

Table 1: Categories and causative factors for delays

Category	Factor	
Client related	1. Delayed interim payments to the contractors due to monetary difficulties of the client	14. Project scope modification (Change specification and replace or add new works to the scope)
	2. Client's interference to the work	15. Inadequate clients' supervisors
	3. Unreasonable time consuming for the decision making process by the client	16. Contract modifications
	4. Inadequate project feasibility study	17. Errors and mistakes in drawings
	5. Poor arrangements of project co-ordination and communication by the client with other project participants	18. Delay project due to delaying of land acquisition
	6. Irrational project duration	19. Delaying of providing work permits (Should be obtained and provide by the Client)
	7. Project postpone by the client	20. Suspension of the project by the client
	8. Delaying in approving sample materials	21. Delaying of hand over the site for construction work (Giving possession of site to the contractor)
	9. Indefinite scope of work	22. Conflicts between joint-ownership of the project by different state authorities'
	10. Change orders (Variations) by the client throughout the construction period	23. Clients' site clearance infirmities
	11. Delaying in approving documents by the client	24. Additional work
	12. Frequent design changes	
	13. Award the project to lowest bid	
Contractor related	1. Insufficient contractors' experience	9. Conflicts between contractor and other construction parties
	2. Contractors' financial and cash flow difficulties	10. Poor resource management
	3. Incorrect construction methods	11. Poor qualifications of the contractors' site supervisors
	4. Defective works and reworks	12. Delay in commencement
	5. Poor site management and performance	13. Construction mistakes
	6. Unproductive project planning and scheduling	14. Lack of high-technology equipment
	7. Rework for correcting of errors and unacceptable work	15. Delay in the sub-contractor's
	8. Poor communication and coordination of contractor with other parties	16. Delays in site mobilization

Consultant related	1. Changes in specifications;	10. Changes in specifications of materials
	2. Poor experience of consultant	11. Slow response to the contractor inquiries
	3. Late in approving of completed work	12. Delay in approving changes in the work scope
	4. Poor supervision and late testing	13. Discrepancies in design documents
	5. Poor communication and coordination of consultant with other parties	14. Un-use of advanced engineering design software
	6. Inflexibility of consultant	15. Absence of engineer's site staff
	7. Incapable inspectors	
	8. Insufficient inspectors	
	9. Delay in preparation of drawings	
Design related	1. Late design works	4. Insufficient data collection before design
	2. Inappropriate design	5. Designers' poor experience and capability
	3. Mistakes in design	
Material related	1. Late delivery of materials	3. Changes in types of material during construction
	2. Shortage of construction materials	4. Low quality raw materials
Labor related	1. Low productivity	5. Low level of operator's skill
	2. Less motivation	6. Insufficient laborers
	3. Unqualified workers	7. Personal conflicts among laborers and management team
	4. Discipline problem, labor accidents and injuries	
External	1. Adverse weather condition	11. Delay in obtaining permits from authorities
	2. Force majeure	12. Traffic control and restriction at job site
	3. Corruption	13. Accidents at construction
	4. Effect of social, cultural and political factors	14. Project size and location
	5. Policy of government	15. Delay in providing services from utilities
	6. Unavailability of utilities at site	16. Changes in laws and regulations
	7. Exchange rate fluctuation	17. External work due to utilities and public services
	8. Monopoly	
	9. Natural disaster	
	10. Unforeseen ground condition	

Sources: Al-Hazim and Salem (2015); Assaf and Al-Hejji (2006); Alinaitwe *et al.*, (2013); Divya and Ramya (2015); Gebrehiwet and Luo (2017); Hussain *et al.*, (2018); Kaliba *et al.*, (2009); Kesavan *et al.*, (2015); Luu *et al.*, (2009); Mahamid (2017); Ravisankar *et al.*, (2014)

3. RESEARCH METHODOLOGY

A comprehensive literature survey was carried out in order to explore the existing theories and researches on influence of parties causing delays in road constructions project and on causative factors for delays. Further, for the purpose of investigating the applicability of

literature findings to Sri Lankan context, preliminary interviews were carried out with three experts (Interviewee A (I-A), Interviewee B (I-B) and Interviewee C (I-C)) with 20 or more than 20 years of working experience in road sector. The research approach was based on the research problem. This research was focused to find out client's causes for delays and identify the suggestions along with the client's best practices to minimize delay. Accordingly, this research was based on both quantitative and qualitative aspects. Therefore, for this research a mixed approach was adopted.

According to Zainal (2007) an ability to examine the data in a close proximity is given to the researcher when using case study as a data collection technique. Therefore, after preliminary interviews this study used 6 in-depth case studies to investigate the influence of the involvement of the client for delays. Then, to achieve a generalised opinion from different respondents within a shorter period the study selected questionnaire survey to examine the significance of client's causes for delay and to identify the suggestions and client's best practices to minimize delay. For the Questionnaire survey 20 respondents were selected within cases and another 24 respondents were selected from outside the cases and was analysed through Relative Importance Index (RII) ranking method.

4. RESEARCH FINDINGS AND DISCUSSION

In the preliminary interviews, two of the three interviewees agreed that the four types of delay specified in the literature are applicable to the road rehabilitation and widening projects in Sri Lanka. However, I-A in his comment he argued "for excusable compensable delays contractor is entitled to both EOT and additional money as the compensation, but in Sri Lanka the government being the client only allow contractor the EOT". Interviewee further added, "therefore, it is better to use the delay type as 'excusable-compensable but not complied' instead of 'excusable-compensable' type". Confirming the literature findings all the interviewees identified non-excusable delays as contractor initiated delays. Further, almost all the respondents emphasized that in non-excusable delays the contractor does not have any right to claim EOT or additional money since there was no fault with the client or client's representatives. Besides, I-C and I-B argued that the contractor does not cause most of the delay events in RWRP in Sri Lanka and that they are caused mainly by the client or due to events beyond the control of both parties.

4.1 FINDINGS OF THE CASE STUDY

Under the case study, primarily data were collected through the documents and where there is no clear information project staff were asked for clarifications. So, three ongoing RWRPs and three completed projects (within five years) were selected for the in-depth study. A brief description about selected cases are given in Table 2.

Table 2: Profile of the cases

	Case A	Case B	Case C	Case D	Case E	Case F
Contract Sum (Rs.)	6.9 Bn	721 Mn	885 Mn	1020 Mn	2976 Mn	924 Mn
Form of Contract	SBD/02	SBD/02	SBD/02	SBD/02	SBD/02	SBD/02
Current status of the project	Ongoing	Completed on 02/10/2015	Completed on 15/09/2015	Completed on 05/10/2015	Ongoing	Ongoing

	Case A	Case B	Case C	Case D	Case E	Case F
Road Length	23 km	12.8 km	15.5 km	15.845 km	29 km	13.598 km
Road Grade	A	B	B	B	B	B
Contractor's CIDA Grade	CS2	CS2	CS2	CS2	CS2	CS2
Original Commencement Date	6-Sep-13	28-Aug-13	28-Aug-13	28-Aug-13	3-Jan-17	3-Jan-17
Original Completion Date	6-Mar-15	25-Apr-15	25-Apr-15	25-Apr-15	3-Jan-19	3-Jul-18
Original Duration of The Project	546 Days	605 Days	605 Days	605 Days	730 Days	546 Days
Revised Completion Date	31-Mar-18	24-Nov-15	16-Sep-15	05-Oct-15	17-Mar-19	19-Sep-18
No of Days Delay	1122 Days	213 Days	144 Days	163 Days	73 Days	78 Days

Eight factor categories were identified as the delay causes under six cases. Summary of identified delay causes through the case studies are summarised in Table 3.

Table 3: Summary of identified delay causes

Factor \ Case	Case A	Case B	Case C	Case D	Case E	Case F
1. Delay project due to delaying of land acquisition	✓		✓	✓		✓
2. Delaying of hand over the site for construction work (Giving possession of site to the contractor)	✓		✓	✓		✓
3. Utility relocation delay (Electricity posts, water lines, Telecom posts and underground services)	✓	✓	✓		✓	✓
4. Change orders (Variations) by the client throughout the construction period		✓	✓		✓	
5. Delaying of issue drawing (Delay of obtaining approvals for drawings)			✓	✓		✓
6. Unavailability of borrowed soil					✓	✓
7. Adverse weather condition	✓		✓	✓		
8. Increase in measured quantity		✓		✓		

According to Table 3, utility relocation delay (electricity posts, water lines, telecom posts and underground services) has occurred significantly in almost all the cases except for case D. Four projects out of six have identified ‘delay in project due to delay in land acquisition and ‘delay in handing over of the site for construction work (giving possession of site to the contractor)’ as delay events faced by the projects. Moreover, change orders (Variations), delay in issuance of drawing (delay in obtaining approvals for drawings) and adverse weather condition were the delay events in three projects out of six. Moreover, five out of eight identified factors from the case studies have originated from the client. Further, there were at least two or more than two delay events which were

caused by the client in each case. As a summary, client's contribution for delay in the selected projects in terms of percentages is portrayed in Table 4.

Table 4: Involvement of the client for delays in Sri Lankan RWRP

	Total project delay (Days, K)	Client driven delay (Days, L)	Percentage of client- initiated delays
Case A	1162	1118	96%
Case B	213	121	57%
Case C	144	134	93%
Case D	163	86	53%
Case E	73	43	59%
Case F	78	48	62%

According to Table 4, in all projects more than 50% of the total delay were caused due to the involvement of the client. Therefore, in all the six RWRPs, half of the reasons to delay the projects were originated and caused from the client. Among the cases, case A is dominant as it was affected by client caused delays by 96% of the total project delay followed by the case C with a 93% accruing from client. As a conclusion, the mean value of client-initiated/caused delay is 70%. However, a significant level of dispersion can be observed.

4.2 FINDINGS OF THE QUESTIONNAIRE SURVEY

Thirty-four professionals responded out of forty-four distributed questionnaires, which yield 77% rate of response. Respondents included 44% of quantity surveyors, 21% of assistant quantity surveyors, 26% of site engineers and 9% of project managers.

Twenty-five client initiated delay factors identified through the literature were confirmed to Sri Lankan RWRP through the preliminary interviews. Then, later part of the questionnaire was structured to rank the client-initiated delay factors. Therefore, the respondents were requested to mark the significance of client delay factors in the Sri Lankan RWRP using a likert scale of 1-5 (1= Very Low (VL), 2= Low(L), 3= Medium(M), 4= High(H), and 5= Very High(VH)) RII was calculated separately for each factor based on the significance marked by the respondents. Accordingly, the factors were ranked considering the RII values. Summarized findings are illustrated in Table 5.

As per the calculated RII values and the ranks given to the client initiated delay factors, top four most significant (equal or more than 80% of RII) client initiated delay factors in the Sri Lankan RWRPs are delayed interim payments to the contractors due to monetary difficulties of the client, change orders (variations) by the client throughout the construction period, utility relocation delay (electricity posts, water lines, telecom posts and underground services), delay in of land acquisition followed by changes made to the drawings (issuance of revised drawings while construction is going on) delay in handing over the site for construction work and delay in issuance of drawing with having more than RII value of 75%.

Table 5: RII values of Client initiated delay factors

Client initiated delay factors	Responses (%)					RII Value as %	Rank	
	VH	H	M	L	VL			
	5	4	3	2	1			
Delayed interim payments to the contractors due to monetary difficulties of the client	76	12	9	3	0	0.924	92%	1
Change orders (Variations) by the client throughout the construction period	65	24	6	6	0	0.894	89%	2
Utility relocation delay	41	35	9	15	0	0.806	81%	3
Delay project due to delaying of land acquisition	32	41	24	0	3	0.800	80%	4
Changes made to the drawings	29	44	18	3	6	0.776	78%	5
Delaying of hand over the site for construction work	32	32	24	12	0	0.771	77%	6
Delaying of issuing drawing	32	32	24	9	3	0.765	77%	7
Irrational project duration	32	29	26	9	3	0.759	76%	8
Government changes and Government policy changes	38	24	21	12	6	0.753	75%	9
Attitudes of the Client and Clients' staff	29	24	41	3	3	0.747	75%	10

Accordingly, to avoid and minimize the aforementioned implications client needs to adhere with best practices. Therefore, last section of the questionnaire was structured as an open-ended question with the aim of identifying the client's best practices and suggestions to minimize the delay in projects. However, seven suggestions frequently proposed by the respondents were proper planning from feasibility stage to final stage, timely payments to facilitate contractor's cash flow, client should finalize the design prior to begin construction client should assist the utility relocation process, handing over the site for construction work as per the program, client should assist the land acquisition process in accordance with the land acquisition schedule, provide necessary drawings, instructions, permits on time.

5. CONCLUSIONS

Client related factors, material related factors and external factors are the highly significant factor categories cause for delay in RWRP in Sri Lanka. Client related factors with a RII value of 0.924 has become the most significant delay category in RWRP in Sri Lanka over other factor categories. More than 50% of the total delay in Sri Lankan RWRPs were resulted due to the client driven factors with the mean value of client initiated/caused delay of 70% and a standard deviation of 17.54. In Sri Lankan context, twenty-five Client-initiated delay factors could be identified related to RWRP. Moreover, top four most significant client-initiated delay factors in the Sri Lankan RWRPs are delayed interim payments to the contractors due to monetary difficulties of the client,

variations by the client, utility relocation delay, and delay in of land acquisition followed by changes made to the drawings.

As an outcome of the data analysis of three different forms; preliminary interviews, case studies and questionnaire survey, it is clearly remarked that planning, timely payments, land acquisitions, utility relocation, compliance with programme and timely provision of drawings as significant practices with high impact to reduce client-initiated delays.

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