

Factors affecting contractor's risk on cost overburden in Sri Lankan Construction Industry

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Abstract— Cost overrun is one of the major issue faced by the construction industry at present. The contractor's cost overrun directly affects with the contractor's profit margin which has become a major burden within the contractor's scope of work. This study attempts to identify the severity of the factors affecting contractor's risk on cost overburden in Sri Lankan construction industry under the factors affecting cost estimate, factors affecting final cost and contract specific factors. Data collection was done by a questionnaire survey which a questionnaire was distributed among experienced quantity surveying professionals in Sri Lanka. Collected data was subjected to a quantitative analysis using the Relative Index technique and ranking of questionnaire was done. The findings elaborated that the factors affecting the final cost have the highest impact on contractor's cost overburden in Sri Lankan context. Proper consultation of clients on variations and on time payments and proper management of stability of the country's economy by the government will improve the contractor's cost performance and the project performance as a whole. Focusing on mitigation approaches to avoid the risk factors causing cost overburden will improve the efficiency of the construction industry in Sri Lanka.

Keywords: Contractor, Cost overburden, Sri Lankan Construction Industry

Introduction

The primary aim of an industry is to achieve the completion of the project within the given time and specified budget. This has become as same for the Construction Industry which the final expectation is to complete the project on time, within budget and with the expected

quality. But with the complexity and uncertainty, the Construction Industry frequently face by problems like reduction of efficiency, quality lapses, issues with completing within allocated time, overruns in cost, etc. (Memon et al., 2011). At present, construction cost overrun has become a major issue faced by the industry in all around the world and the impact is basically distributing in between Clients, Contractors and Project Managers (Creedy et al., 2010).

The burden of cost overrun in Construction is basically hold by the Client and the Contractor. The Contractor's cost overrun will directly influence the Contractor's profit margin which will cause a massive burden to the Contractor. This impact on profit margin becomes high because of the inadequate identification of the cost overruns and lack of a methodical approach in managing such situations by mitigating or avoiding such cost overruns.

The main intention of the research is to identify and analyse the factors affecting Contractor's risk on cost overburden in orderly with basis of the severity. The basic limitation of the research is limiting for the traditional procurement. In order to narrowing down the research the framework has been built focusing the traditional procurement which has become the most practical procurement method in use in the present construction industry in Sri Lanka.

The findings of this research will improve the standards of the construction industry and will help to develop the contractor's provision in an outstanding manner. Also, this will be a guidance for the development of the construction industry of other developing countries also.

Literature Review

It has been clearly identified that the cases on cost overruns within the Construction are higher than the time overruns (Subramani T. et al, 2014), which has become a major issue to be considered significantly (Kasimu, 2012). Moreover, it has become a significant challenge faced by the stakeholders in construction industry. Cost overrun in construction has emerged as a fact of increasing the cost in Construction and additional pressure in investments. This matter influences the investment decision making and moreover extend up to the wastage of national finance. Therefore, proper identification of cost overrun issues with a considerable burden in order to avoid or mitigate such issues as possible has emerged utmost important (Ali & Kamaruzzaman, 2010).

Abdulaziz M. et al, (2015) identified that the cost overburden problems faced by the contractors have become a major cause of Construction risk factor which affect for the overall Construction. Risk on cost have been directly influenced with the Contractor's profit obtained from the project (Akintoye and MacLeod, 1997) and are left low with the efficiency of decision-making actions within the Construction organizations (Zavadskas et al., 2010). Loosemore et al. revealed that there is a lack in maintaining a procedural system of risk management in Construction projects which enhances better interaction within the stakeholders specially with the Contractor which would help to avoid the possible risks by improving the project predictions and demands throughout a solid, straight and practical approach.

Akinci B. & Flsher M. (1998) has clearly elaborated that there is a major impact from the uncontrollable risk factors on the Contractor's cost which will massively impact for the Contractor's profit margin. Moreover their finding elaborated that the

implementation of a scientific approach by analyzing the risk factors properly will be more beneficial in reducing the critical situations that may occur within the project.

It has been significant that there is a lack of the studies and findings which identify risks related with the Contractors cost in developing countries (Iqbal et al., 2016). Further, findings of the studies related with such issues in construction projects in developed countries were identified as incompatible with the state of construction industry in developing countries (Hosseini et al., 2016). The main reason was because of such matters related with construction projects were directly linked with the state of political, economic, environmental, and sociocultural sectors of a particular country which could be observed as unique features differ from one country to another (Perera et al. 2014).

Through this research the main intention is to identify the factors affect the Contractor's risk on cost overburden by prioritizing them in order to identify the most severe risk factors which enables the construction professionals to undergo the management of the projects, specially the management of Contractor related factors in a successful manner. The findings will safeguard the Contractor's side as well as the project.

Methodology

The data collection was done under a questionnaire survey which was distributed in between Quantity Surveyors who are currently working in Sri Lankan Construction Industry. Under the above mentioned population, a randomly selected sample of 40 quantity surveyors with minimum 5 years of experience was selected.

30 questions were prepared for the questionnaire focusing the objective of the research by mainly considering the factors affecting cost estimate, factors affecting final cost and contract specific factors under the

base of the literature review of Akinci B. & Flsher M. (1998)

For the analysis of collected data, a five point scale method was used and the questions were prepared as scale type questions which were scaled under five weights as follows:

- Strongly Agree =05
- Agree =04
- Neutral =03
- Disagree =02
- Strongly disagree =01

Relative Index Analysis technique which would provide the ranking of the factors from the highest severity to the lowest was used for the analysis of the collected data.

The formula used under the Relative Index analysis is as follows:

$$\text{Relative index} = \frac{\sum 5R_1 + 4R_2 + 3R_3 + 2R_4 + R_5}{5 \sum R_1 + R_2 + R_3 + R_4 + R_5}$$

R₁ = number of response for Strongly Agree

R₂ = number of response for Agree

R₃ = number of response for Neutral

R₄ = number of response for Disagree

R₅ = number of response for Strongly Disagree.

Analysis and discussion

With the data collected through the questionnaire, a quantitative analysis was done under the relative index method. Out of 40 questionnaires distributed, 32 were responded and 08 were not responded. A category based rank was produced by taking the average of each sector to identify the most affecting sector for the contractor's cost overburden. The outcomes of the analysis are shown under the following table.

Table 1. Relative index and ranking of challenges

SN	Frequency	ND	L1	RE	CA
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	Problem Statement	SA	A	N C	D	S D		
FACTORS AFFECTING COST ESTIMATE								
Estimator specific								
1	Clerical errors	7	19	5		1	0.7938	0.8175 - 03
2	Wrong production rates	8	20	3	1		0.8188	
3	Improper identification and assessment of risk	11	18	2	1		0.8438	
4	Lower consideration on market, quantity and location	7	23	2			0.8313	
5	Less experience	7	21	2	1	1	0.8000	
Design and project specific								
6	Excluding risk beyond the project team	6	20	2	4		0.7750	0.7984 - 07
7	Initial stage material pricing	10	16	5		1	0.8125	
8	Improper scheduling of time for completion	9	19	3	1		0.8250	
9	Advanced technology	5	20	6	1		0.7813	
FACTORS AFFECTING FINAL COST								
Construction related								

10	Unforeseen geological conditions	8	21	3			0.8313	0.8125 - 04
11	Unexpected weather conditions	7	19	5		1	0.7938	
Client generated risk factors								
12	Changing needs	15	16	1			0.8875	0.8250 - 01
13	Claims record of client	6	21	5			0.8063	
14	Past experience with client	4	19	8		1	0.7625	
15	Payment delays	4	18	9	1		0.8438	
Subcontractor related risk factors								
16	Weak financial stability	6	19	6	1		0.7875	0.8063 - 06
17	Uncertainty in reliability and timeliness	9	18	5			0.8250	
Economic factors								
18	Price escalation	8	22	2			0.8375	0.8250 - 01
19	Inflation	10	16	6			0.8250	
20	Economic instability of country	8	20	3		1	0.8125	
Political factors								
21	Political instability	5	18	8	1		0.7688	0.8104 - 05
22	Change in regulations	6	22	4			0.8125	
23	Labour shortage	10	20	2			0.8500	
CONTRACT SPECIFIC FACTORS								
Type of contract								
24	Lump sum	8	15	3	6		0.7563	0.7763 - 09
25	Measure and pay	9	21		2		0.8313	
26	Cost plus fixed fee	8	16	5	2	1	0.7750	
27	Cost plus percentage	4	20	5	2	1	0.7500	0.7906 - 08
28	Cost plus fluctuation	7	18	3	3	1	0.7688	
Context of contract								
29	Improper risk allocation	8	19	4		1	0.8063	0.7906 - 08
30	Ambiguous contract clauses	6	21	2	1	2	0.7750	

Source: Questionnaire survey

The outcomes of the quantitative analysis are as follows:

With the obtained relative indexes, it was identified that the most severe factor which cause the highest risk on cost overburden of the contractor was the changing needs of the client which is affecting to the final cost of the project. The second priority was obtained by the labour shortage under the political factors which cause the exceed in final cost due to the inefficient execution of project. The third priority was obtained by the factor of payment delays which is caused by the client which will affect the effective continuity of the project.

Usage of cost plus percentage contract was identified as the least affective factor on contractor's risk on cost overburden. The burden to the contractor is low because of providing a percentage of profit with relation to the cost of the project.

Considering the major three sectors, the most severe factor which affect the cost estimate was identified as the factor of improper identification and assessment of the risk by the estimator. Negligence of the obligation as an estimator to have a proper assessment of risk in every aspect with the preparation of cost estimate has become a fact which generate a considerable cost overburden to the contractor.

The first priority among the facors affecting the final cost was obtained by the factor changing needs of client under the client

generated risk factors. It clearly depicts that the complexity and construction sophistication caused by the changing needs of client has been a severe burden with the contractor's cost performance.

Undergoing a measure and pay contract by the contractor was the highest factor of causing the cost overburden to the contractor under the contract specific factors. Receiving the amount after the completion of work segments will cause an improper cashflow of the contractor.

When considering the obtained category based rank, client generated risk factors and economic factors have obtained equally the highest priority of all categories. This clearly elaborates that the client and the state of country's economy are the major sources affecting the contractor's risk on cost overburden in Sri Lankan context. The minimum consideration was given to the type of contract which depicts that the state of contract agreement and conditions of contract are merely affecting the cost performance of the contractor.

By summarizing the analysis the final outcome can be obtained as contractor is having the highest risk of causing cost overburden due to the factors affecting final cost and the lowest threat on cost overburden generated by the contract specific factors. With the factors affecting the final cost, the contract amount will exceed the estimated budget which will cause a considerable impact on contractor's profit margin.

Conclusion and Recommendations

Construction industry manipulates in a complex environment which focusses on completion of the project fulfilling the achievement of main three constrains; time, cost and quality. The contractor is having the main responsibility on the project execution as agreed with the client party. Having cost overburden issues to the contractor will directly impact with the project performance

which will obstruct the completion of the work as expected. Among the factors affecting the contractor's risk on cost overburden, factors affecting final cost were taken the priority among other factors. Identification and proper management of the factors will avoid the exceeding of the final cost than the estimated cost. Proper consultation of client to move on with effective implementations with minimum variations and to provide continuous flow of payment as agreed without delaying will improve the efficiency of the contractor as well. The contractor is also bearing a considerable responsibility in managing the site works effectively even at a conflict situation such as a labour shortage where the contractor could improve the efficiency and fulfill the requirements avoiding cost overruns. The project management party should be well qualified enough in understanding the cost overrunning situations and act accordingly by advising the client and the contractor party appropriately which will be beneficial in safeguarding the contractor as well as the client by cost overburden issues. Further, the government should be well aware on maintaining the economic stability of the country which will safeguard the performance of not only the construction industry but also all other industries in country as well.

This research was undergone a quantitative analysis on identifying the factors affecting contractors risk on cost overburden by prioritizing them from highest severity to the lowest. With the outcomes of this research, further research can be continued on identifying the most appropriate mitigation approaches to mitigate the impacts of the affected factors. Also the research was limited to the traditional procurement system only. Future researches can be directed under other procurement systems such as design and build, management and partnering. Moreover, this research was limited under the views of quantity surveying professionals only.

Extending the research finding by considering the views of other stakeholders in construction industry, specially from the contractor and the client will improve the quality of the findings up to a considerable extend. With the finding reveled the objective was achieved and the aim was successfully completed.

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