The Impact of Cost Overrun Factors on the Project Performance in the Construction Industry of Sri Lanka

LADCN Wijesinghe[1][#] and SD Jayasooriya[1]

[1]*Department of Quantity Surveying, Faculty of Built Environment and Spatial Sciences, General Sir John Kotelawala Defence University, Sri Lanka*

[#]nimanthawijesinghe96@gmail.com

Abstract: *The construction sector is an extremely vital business for the sake of the economic growth of the nation. However, this sector has been suffering significant issues by the inability to finish projects within allowed cost and cost overrun effects on the total project performances. Hence, this study determines to identify the impact of cost overrun factors on the performance in the construction industry of Sri Lanka. As an outcome, the findings of this study give recommendations and solutions to cost overrun factors that affect the performance of a project in Sri Lanka's construction sector. The aims of this research were attained utilizing qualitative and quantitative data acquired through a comprehensive questionnaire survey and semi-structured interviews concurrently. The sum of circulated questionnaires was 50 and the number of responses was 90%. A detailed literature survey was carried out to establish the significant cost overrun factors that affect the project performance. Correlation & regression analysis done with the use of SPSS software to analyse the collected data. The interviewed questions were assessed through the content analysis. The findings of this study explain the cost overruns that have a major effect on project performance. Finally, solutions such as shifting to digitalization, selecting the best construction management team and employees, properly tracking and monitoring progress, developing employee skills and maintaining a sustainable supply chain were found to be effective in overcoming the cost overrun factors that have an impact on the performance of Sri Lankan construction industry.*

Keywords: *Cost overrun, Project performance, Construction cost, Construction industry*

1. Introduction

The construction industry forms a critical portion of a country's economic development. It included a highly complex process with broad connections to hundreds of upstream and downstream sectors (Oladinrin, Adeniyi and Udi, 2014). The rise of the construction sector contributes to the Gross Domestic Product (GDP) and the employment of all countries and the construction produces a multiplier impact on other industries such as manufacturing sector, professional services, and financial services. (Teknologi, Dingin and Modifikasi, 2015). Sri Lanka's construction industry is a vital part of the economy and has played a key role in the country's growth (Cooray et al., 2019). Sri Lankan construction industry has contributed approximately 6.8% to the GDP (Annual Report 2018, Central Bank of Sri Lanka). The success of a construction project is decided by its performance, which is measured in terms of on-time completion, cost control, quality assurance, and client satisfaction (Hanagodimath, Rajashekarswamy and Parate, 2016). When a building project is finished on time, on budget and according to plan and the satisfaction of all stakeholders, it is called proper achievement. In terms of functionality, the lack of claims and legal procedures for contractors, as well as "fitness for purpose" for occupants, have been castoff to assess project success (Takim and Akintoye, 2002).

All across the life cycle of a project, the cost is the most important considerations. The difference between the cost at completion and that initially anticipated, known as cost overrun, may be considered as one of the major significant criteria indicating the

accomplishment of projects. Even though it demonstrated its consequence, it is common to see building projects fail to complete within the budgeted timeframe. (Hiroshan and Hadiwattege, 2014). Cost overrun is a common occurrence connected with the majority of the building projects in Sri Lanka. This tendency is observed in the emerging nations, where these overruns often surpass 100 % of the initial project cost (Wijekoon and Attanayake, 2012).

This study is discussed about the impact of cost overrun factors on the project performance in the construction industry of Sri Lanka. The performance of construction projects in the worldwide construction sector is influenced by a variety of cost overrun elements. However, the scope of this study is confined to cost overrun factors in the Sri Lankan construction sector. Moreover, research data is collected based on only building constructions in Sri Lanka.

2. Literature Review

A. Construction Project Performance

The word project arises in the organization where the project completion is controlled by quality, cost, and time usually termed "triple constraint." Even though the project is regarded as necessary by the stakeholders, all the team members engaged in the project management should examine all the three triple constraints known as the "iron triangle" or "golden triangle" (Hassan and Adeleke, 2019).

Figure 1: Triple Constraints

Source: (Teknologi, Dingin and Modifikasi, 2015)

B. Construction Cost Overruns

Cost overrun is described as the variation between actual and budgeted costs. Cost overrun is also often called "cost escalation," "cost increase," or "budget overrun." A cost overrun is calculated by dividing the alteration in contract amount by the initial contract awarded value (Subramani et al., 2011). Appropriate cost management methods should be utilized to prevent cost overruns, which is not a simple operation. In identifying cost overrun factors that cause the project performance, it is not only adequate to discover them but also essential to determine what produces them and neutralize them before it impacts the relevant construction organizations (Senouci, Ismail and Eldin 2016).

D. Causes For Cost Overrun

Cost overruns in construction can occur for a variety of causes, depending on the project. Cost overruns may be divided into numerous categories to make them easier to analyse and provide better mitigation methods. Chan and Park (2005) investigated that it is clear that both internal and external factors of the company environment are significant drivers to cost overruns.

Slow decision making, poor timeline management, increases in material/machine prices, poor contract management, poor design/delay in providing design, rework due to incorrect work, land acquisition issues, incorrect estimation/estimation method, and the long time between design and time of bidding/tendering were all identified as significant causes of cost overruns (Subramani, 2014). According to the research (Hiroshan and Hadiwattege, 2014) Materials costs, project scale, project planning, and size of the project were regarded as the most relevant cost variables. Further, elements were classified into five major groups. Building parties associated variables, financial considerations, construction item-related issues, environmental considerations, and political factors. Abusafiya and Suliman (2017) The final findings revealed that numerous design

changes, construction faults, and timetable delays were the most common causes of cost overruns in Bahrain's construction sector. Inadequate planning and scheduling, fluctuating material prices, inadequate fund facility by the client, wrong cost projections, interruptions in payment by the client, financial issues by the client, extra works, poor financial control on site, interruptions in decision making, and recurrent design changes are among the leading reasons of project cost overrun (Akram et al., 2017).

Karunakaran et al., (2018) show that potential cost overrun causes were classified into seven categories: project-related, contract-related, client-related, contractor-related, consultant-related, labour-related, and external-related variables. Ramabhadran (2018) classified cost overruns into two types: internal and external. External factors are more challenging to regulate than internal ones, and it also has a low occurrence rate. He discovered that only internal factors were significantly affecting the cost overrun.

According to (Hiroshan and Hadiwattege, 2014; Teknologi, Dingin and Modifikasi, 2015) categorized cost overrun factors into five main categories. Such as financial factors, management factors, construction material related factors, governmental and environmental factors.

D. Mitigation measures for cost overruns

Throughout the implementation of a project, project management and record keeping processes become essential. Managers are required to be well prepared to implement the project, with appropriate attention to the quality of work, but within the specified cost and limitations. Cost management may be accomplished by choosing the appropriate personnel for the correct task, the right equipment and tools for the excellent work and the excellent quality of materials, in the correct amounts from the correct source, just at the correct price and delivered at the right time (Al-Jibouri, 2003). (Williams and Gong, 2014) state that the majority of the potential factors that

contribute to more enormous cost overruns can be identified during the bidding stage using the indicators provided in the bidding document. Premalal, Mudalige and Malkanthi (2016) state that experts in the building business are needed to have hypothetical knowledge on cost management approaches. The adoption of suitable project cost management apparatuses is a necessity in today's construction business.

Most past researches conduct to identify cost overrun factors in the industry. There were relatively few studies that explored the influence of cost overruns on overall project performance. In this study identifying the impact of cost overrun factors on the project performance in the construction industry through considering building projects in Sri Lanka and to give solutions to mitigate cost overrun factors that directly affect the project performance.

3. Research Methodology

The research study is targeted to identify the impact of cost overrun on project performance in the construction industry Sri Lanka. To assess the impact of cost reduction, a diverse group of professionals connected to the Sri Lankan construction sector will be surveyed. The study was thoroughly examined using a questionnaire survey and interviews with relevant authorities. Combining qualitative and quantitative methodologies is highly valued since it provides a holistic picture of the research field and enhances the study.

A. Data Collection Methods

A web based detailed questionnaire (Google forms) was circulated among professional groups in construction industry. Questionnaires were distributed among professionals in order to obtain suitable responses to the questionnaire & different viewpoints were ranked accordingly to the "Likert Scale". A total number of questionnaires distributed was 50 (selected by simple random sampling), & the response rate was 90% including from18 Quantity Surveyors, 13 Engineers, 08 Technical officers and 06

Project Managers. Semi-structured interviews with open ended questions are allow for a broad range of topics to be discussed. A purposive sample was selected for the semi-structured interviews since the objective is to select the participants who have better knowledge & industry experience in the area of research study. A total number of interviews conducted were 10 including 03 Quantity Surveyors, 03 Engineers, 02 Technical officers and 02 Project Managers.
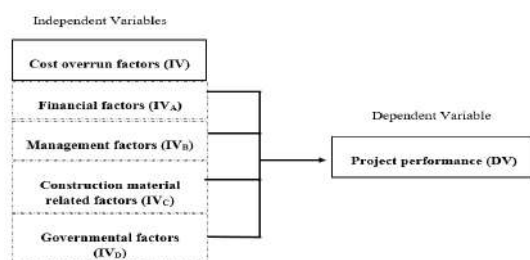
B. Conceptual Framework

Figure 2: Conceptual framework

D. Data Analysis Methods

Primary data has been evaluated using quantitative approaches and secondary data has been studied using a content analysis. Statistical study allowed to discover the correlations between the researched factors linked to cost overrun & their influence on project performance. This is an excellent approach for multivariable analysis. The relationship is hypothesized at the beginning & the statistical analyses were done appropriately. The study was done with the use of SPSS program which provides a comprehensive range of formulas, statistical methods.

Presentation was in the forms tables were auto created by the SPSS program itself. Most of the data transformed in to information. A cording scheme employed at the SPSS program is comparable to the codes given on variables.

4. Research Findings

The general information of respondents including their profession & experience in the industry were assessed because based on the perspective of different people the answers to the questions may vary due to their thinking capacity, knowledge & based on the industry experience. The degrees of responses are illustrated in Figure 3.
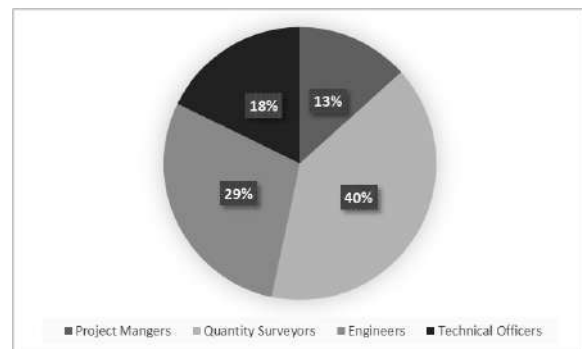

Figure 3: Respondents Details

A. Correlation Analysis

Correlation analysis done to identify the relationship between developed independent variables (IV) & the dependent variable (DV). Pearson correlation coefficient is used to check the relationship & analysed through SPSS software. Each independent variables were tested with the dependent variable. Positive correlation represents, when one variable increase the other variable also increase & the negative correlation represents decrease of both.

Table 1: Correlation Analysis (SPSS Software generated)

Correlations		AFFC	AMFC	ACFC	AGFC	ACFP
AFFC	Pearson Correlation	1	.868**	.867**	.745**	.827**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	45	45	45	45	45
AMFC	Pearson Correlation	.868**	1	.883**	.745**	.839**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	45	45	45	45	45
ACFC	Pearson Correlation	.867**	.883**	1	.717**	.867**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	45	45	45	45	45
AGFC	Pearson Correlation	.745**	.745**	.717**	1	.807**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	45	45	45	45	45
ACFP	Pearson Correlation	.827**	.839**	.867**	.807**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	45	45	45	45	45

**. Correlation is significant at the 0.01 level (2-tailed).

Financial factors (AFFC), Management factors (AMFC), Construction items related factors (ACFC) and Governmental factors (AGFC) has gained less than 0.001 significant value over the project performance and it is proven that there is a strong relationship between financial factors and project performance. The correlation values are 0.827, 0.839, 0.867 & 0.807 respectively. Which suggests there is a substantial and positive relationship between these factors.

B. Regression Analysis

Regression analysis done to identify the impact of developed 4 different variables on the dependent variable. This makes all the independent variables comparable & standardized.

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.100	.325		.309	.759
	AFFC	.077	.129	.090	.600	.552
	AMFC	.119	.152	.124	.783	.438
	ACFC	.483	.169	.442	2.855	.007
	AGFC	.320	.100	.330	3.208	.003

a. Dependent Variable: ACFP

Table 2: Regression Analysis (SPSS Software generated)

The beta value of 0.077 shows that project performance in the Sri Lankan construction sector is impacted by financial related cost overrun factors. There is a 7.7% variance of construction projects performance is affected by when regarding the financial related cost overrun factors. And according to the outcomes, this is the lowest impacted factor.

The highest impact is shown by the construction materials related cost overrun factors. The beta value of 0.483 shows that project performance in the Sri Lankan construction sector is impacted by construction materials related cost overrun factors. There is a 48.3% variance of construction projects performance is affected by when regarding construction materials related cost overrun factors.

The next highest impact is shown by government related cost overrun factors. The beta value of 0.320 shows that project performance in the Sri Lankan construction sector is impacted by government related cost overrun factors. There is a positive relation. This means there is a 32% variance of construction projects performance is affected by when regarding government related cost overrun factors.

Management related cost overrun factors have a beta value of 0.119. It shows that project performance in the Sri Lankan construction sector is impacted by management related cost overrun factors. There is a positive relation. This means there is an 11.9% variance of construction projects performance is affected by when regarding management related cost overrun factors.

C. Content Analysis

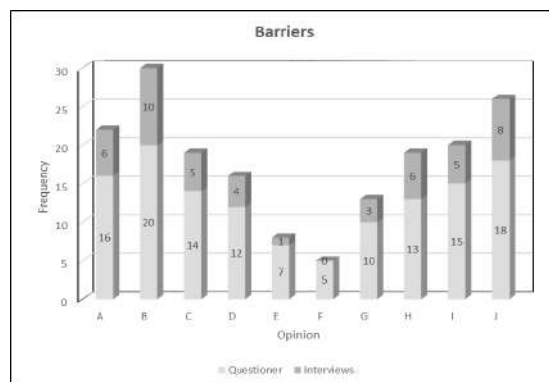### 1. Barriers Regarding Causes of Cost Overrun on the Project Performance

Figure 4: Identified Barriers

According to the comments of the professionals, approximately ten barriers were identified. As illustrated in the above bar chart highest frequency is obtained by 'Traditional practice' (opinion B), 83.3% frequency obtain out of total responses. The second most mentioned barrier is 'Lack of awareness in new technology' (opinion J), 72.2% frequency obtain out of total responses. The third highest frequency is obtained by opinion A; 'Limited resources availability', 61.1% frequency obtain out of total responses. 'Government rules and regulations', (opinion I) obtained 55.6% frequency, 'Unethical practice by management', (opinion C) and 'less competent staff members' (opinion H) obtained 52.89% frequency out of total responses. Fluctuation of economy (opinion D), In-efficiency of construction (opinion G), Climatic changes (opinion E) and Poor cost data bases (opinion F) obtained 44.4%, 36.1%, 22.2% and 13.6% respectively.

2. Solutions to Mitigate the Cost Overrun Factors that Directly Affect the Project Performance
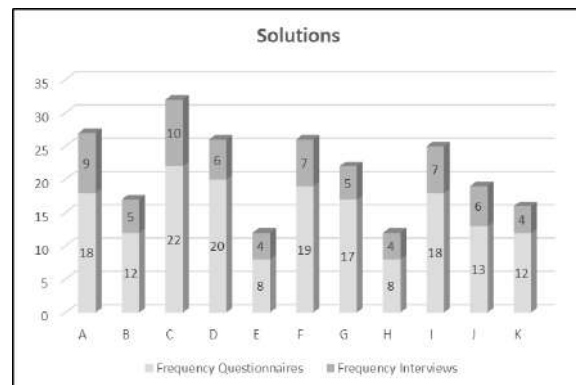

Figure 5: Identified Solutions

According to the replies of the specialists, generally eleven Solutions have been identified to mitigate the cost overrun problems that directly impact the project performance. As illustrated in the above bar chart highest frequency is obtained by 'Shifts to digitalization" (Opinion C), 88.9% frequency obtain out of total responses. Selecting the best construction management team and employees (opinion A) was the second most common mitigation method and it displays 75% of responses. The next highest frequency shows by Proper tracking and monitoring progress (opinion D) and Keep a sustainable supply chain (opinion F). These two factors show an equal frequency percentage of 72.2%. Development of skills of employees (opinion I) obtained 69.4% frequency. Establish material wastage management systems (opinion G) obtained 61.1% frequency out of total responses. Proper value engineering in the earliest stage of the project (opinion J), Implement proper communication plan (opinion B), Review and assess contractual terms and conditions (opinion K), Keep to the planned scope (opinion E) and Accurate future predictions on economy and industry (opinion H) obtained 52.8%, 47.2%, 44.4%, 33.3% and 33.3% respectively.

5. Conclusion And Recommendations

A. Conclusion

The major persistence of this study was to examine the influence of cost overrun elements on the project performance in the construction sector of Sri Lanka. Through the findings of the regression analysis, it was further demonstrated evident that there is an influence of cost overrun elements on the project performance in the construction sector of Sri Lanka. The second purpose of this exploration was to investigate the association between cost overrun variables and project performance in the construction sector as per the conceptual framework. Clear positive relationships were demonstrated between independent variables and dependent variable which satisfies the H1 (Alternative Factor). Through a comprehensive literature review, the purpose of this study was realized. The main cost overrun factors in the construction industry of Sri Lanka were identified.

Traditional practice in the modern building sector. Despite that, Lack of understanding of new technology, limited resources availability, government rules and regulations, unethical behaviour by management and less competent staff members; have been listed as the next highest frequent barriers regarding causes of cost overrun on the project performance. The most crucial solutions stated by the professionals moved to digitalization, pick best construction management team and staff, appropriate monitoring and monitor progress, retain sustainable supply chain, development of skills of employees and implement material waste control systems.

B. Recommendations

Nowadays traditional practice is one of the core problems that can be seen in the construction industry in Sri Lanka. For that, it is recommended to shift traditional practice to digitalization. Another important factor is lack of resources and wastage. So it is recommended to have proper resource management in construction. And also needed to reallocate resources if uncover a project costing more supplementary than planned. But it can formulate for that circumstance by analysing

resources ahead, and deploying them where they'll be greatest successful.

The employees' and professionals' knowledge about modern construction techniques and procedures is vital for the accomplishment of project performance. Therefore, suitable training, Continuous Process Development (CPD) programs and course work concerning the application of modern techniques and methods should be organized for professionals and employees. The greatest strategy to avoid cost overrun is to prepare a risk management strategy before implementing a project. The supplementary detailed and precise estimations, the more likely to remain within budget. There are dangers, but they may be accounted for with a comprehensive risk management strategy. When preparing for any project, must analyse completely conceivable possibilities, including past data, interviews and experience. The real-time monitoring method is appropriate for following the progress of a project as it occurs, not after the fact. Before difficulties become problems that lurk to send the project off-track and over-budget they may be handled. The real-time monitoring approaches examine not only the progress of the project, but also the workload of the team, anticipated and real completion deadlines, project slippage, and other factors. So this leads to overcoming cost overruns in the project and delivering the project to success.

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Acknowledgment

Author Biographies

 Mr. LADCN Wijesinghe, is a Student attached to the Department of Quantity Surveying the Faculty Built of Environment & Spatial Sciences, General Sir John Kotelawala Defence University (KDU). His research interests include Sustainable Construction, Cost Management and Building information modelling.

 Dr. Sanjaya Jayasooriya, is a Senior Lecturer attached to the Department of Quantity Surveying of the Faculty of Built Environment & Spatial Sciences. He holds a doctoral degree in Management the University from of Jayawardenapura. He has authored a number of research articles in his field of study and his research interests include Intellectual Capital, Human Capital, Financial and management Accounting, Finance management, Quantity Surveying, Taxation and Business Law.