The Impact of Cost Reduction Methods on Cost Overruns in the Sri Lankan Construction Industry

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Abstract — Construction Industry plays a major role in the development of a country. Cost is a basic criterion which measures the success of a project. Though the cost reduction methods are available in the industry, cost overrun has severely affected the status of the Sri Lankan construction industry. Thus, this paper aims to identify the impact of cost reduction methods which are currently used over cost overrun, on the identified management approaches in the Sri Lankan construction industry. This research was assessed through a detailed questionnaire survey and interviews. The number of distributed questionnaires were 60 and the response rate was 88%. Correlation and regression analyses were done with the use of SPSS software to analyse the collected data. The interview questions were assessed through the content analysis. The findings highlighted that there is a positive relationship between cost reduction and those identified management approaches (pre-contract, post-contract, human resource, material & change management). It is recommended to change the cost mitigation measures from traditional methods to new methods such as sustainable construction and value management strategies. Moreover, the implementation issues of these methods were identified and suggestions were made as making proper project planning with the use of actual project data and software skills. While this research focused on finding the impact of cost reduction methods, future research could develop and categorize the modern techniques to reduce the cost and time overruns in construction projects.

Keywords: *cost control, management, cost overruns, Sri Lanka*

I. INTRODUCTION

Construction Industry plays a major part in the development of a country. Construction Industry is one of the prominent sectors in Sri Lankan context which has contributed approximately 6.8% to the GDP (Annual Report 2018, Central Bank of Sri Lanka). Due to various reasons the main problem which Sri Lankan construction industry currently is facing is "poor cost performance". The cost management is a challenging task to Project Managers. To complete the projects within given cost parameters & timeline, corrective actions are needed whenever it's required (Ejaz, et al., n.d.).

In most of the construction projects, the final completed cost is almost always higher than the pre-estimated cost which is calculated at the initial stage. Factors for cost overrun differ from country to country depending on economic, political, cultural as well as internal & external factors of the industry. Cost estimated at the initial stage is the most important factor (Devi & Ananthanarayanan, 2017). Real cost estimate is a crucial factor because it determines financial competence of the project & provides a basic idea for cost control of the project.

There is a necessity for increasing the work of construction & decrease the cost at the same time. Experts in the industry have to have theoretical as well as practical knowledge on cost control techniques. There are plenty of various techniques & project control softwares available regarding cost optimizing, but still not accomplish the basic target requirements of a construction project. Even with various cost control techniques, cost overrun is not uncommon all over the world (Azhar, et al., 2008).

There are many reasons for cost overrun in the construction industry. The large the amount of cost overrun, there the same amount of cost control & reduction techniques available at industry. Though they were plenty but sill we face the problem of cost overrun means there is a need of finding modern cost reduction methods. To achieve those targets, this paper aims to get the base knowledge by identifying the impact of this cost reduction methods which currently practiced at projects over cost overruns, on selected management approaches (pre contract, post contract, human resource, material & change management) in Sri Lankan context.

II. LITERATURE REVIEW

A, Construction Cost Overruns

There is a need for understanding the factors affecting cost overrun & identify the mitigation measures that can be taken to reduce the loss. It has been observed that delay and cost overrun are habitually occurring in developing countries (Ejaz, et al., n.d.). Further Azhar, et al. (2013) confirmed the statement as the poor cost performance is a shared problem worldwide.

The cost overrun of a project will be depending on project size, type & location. The statement was emphasized by Baccarini (1996) as the requirement of proper management of projects is greater at large scale construction projects than the smaller. Cost & time are inseparable since the extension of time leads to the cost overrun (Dlakwa and Culpin, 1990). Malkanthi (2017) interpreted that the main problem is in reality not the techniques, but the familiarity regarding poor management of methods & moreover the inadequate control. "Without keeping an eye on the real costs while in progress, the successful completion will not be possible" (Memon et al., 2011). Cost overrun has been a topic discussed in numerous literatures, & there is a need to find cost reduction methods by identifying the impact of them on behalf of the industry.

B. Causes For Cost Overruns

There are different reasons for cost overruns in construction which depend on the type of the project. Cost overruns can be categorized into several groups for the easy of understanding & providing of better mitigation solutions. A study by Ramabhadran (2018) categorized cost overruns into two main as internal & external. External factors challenging to control than internal & also it has a low occurrence edge. He found out that only internal factors were extremely influencing the cost overrun. Karunakaran et al., (2018) categorized potential cost overrun factors in to 7 categories named project related, contract related, client related, contractor related, consultant related, labour related & external related factors. Memon et al., (2011) & Baccarini (1996) confirmed in general, causes for cost overruns can be recognized as political, economic, technical or psychological causes. Olawale and Sun (2010) separated causes into three main headings which in a more practicable way as mainly within the owner's control, within the consultant's control and beyond either parties control.

Consequent delays in construction, reworks and the practice of awarding the contract to the lowest bidder are the common causes for cost overruns which identified in non-infrastructural Indian projects (Devi & Ananthanarayanan, 2017). Malkanthi (2017) investigated that 25% of projects in Sri Lanka are over budgeted. Some of the reasons are lack of monitoring, price fluctuations of raw materials, cost of plant & machinery, improper planning & high interest rates. Hafez (2015) noted that the contractors in Egypt find difficulty in controlling project cost due to problems which include change orders, design errors, economic dropdowns. Communication barriers between parties also badly effect on cost Memon et al., (2011).

Kaming et al. (1997) expressed survey in Indonesia listed inflation, higher material cost & higher cost of labour supply while Karunakaran (2018) research on Malaysia revealed poor contract management as the most significant causes for delay & cost overrun.

It's confirmed from the above literature that the causes of cost overrun vary from country to country based on the subjective matters. The experts in the industry could focus more common cost overruns & make efficient mitigation measures for the betterment of the industry.

C. Traditional Cost Reduction Methods

For the identified cost overruns there were reduction techniques which proposed through

different studies. Management should make necessary steps on controlling human resource. Further emphasized that the important of training about "Cost Management" & make proper management among the project (Ramabhadran, 2018). He further stated a well-defined plan is necessary for the effective completion of a project with less disputes.

The total cost should be carefully assessed at the initial stage before signing on a contract (Hedaya & Saad, 2017). The tight control among project can limit variations which directly affects to the cost overrun. Aljohani (2017) was suggested to control cost at projects by applying effective resources & improve proper communication between internal & external stakeholders. According to Tam (2011), cost control can be easily attained through recruiting the right person for the right job function which is a responsibility of project manager by delegating the responsibilities with proper understanding.

There were plenty of literature available on the causes of cost overruns & on the cost reduction methods (Ejaz, et al., n.d.). It's essential to access the impact of the current cost control practices on cost reduction. This paper aims to fill the gap by identifying the impact of cost reduction methods on cost overruns in the Sri Lankan construction industry by approaching identified management approaches.

III. RESEARCH METHODOLOGY

The research study is targeted to identify the impact of cost reduction on management approaches which practices in the construction industry Sri Lanka. To evaluate the impact of cost reduction, a large range of community which attached to the construction industry in Sri Lanka will be targeted covering with the professionals & stakeholders in the Sri Lankan construction industry. The research was completely evaluated through questionnaire survey & interviews with the concerned authorities. The combinations of qualitative & quantitative methods are highly appreciated because it gives a comprehensive picture & enhance the study about the research area (Ramabhadran, 2018).

A.   Data Collection Methods

A web based detailed questionnaire (Google forms) was circulated among professional

groups in construction industry, Sri Lanka sent through e-mails to the construction firms. Questionnaires were distributed among professionals in order to obtain suitable responses to the questionnaire & different viewpoints were ranked accordingly to the "Likert Scale". The total number of questionnaires distributed was 60 (selected by stratified random sampling), & the response rate was 88.33% including from 13 Contractors (C), 18 Quantity Surveyors (QS), 10 Engineers (Eng), 07 Consultants (CR) and 05 Project Managers (PM).

Semi-structured interviews provide the freedom to discuss about numerous areas widely (Le-Hoai, et al., 2008). A purposive sample was selected for the semi-structured interviews since the objective is to select the partakers who have better knowledge & industry experience in the area of research study. A total number of interviews conducted were 08 including 01 Contractor, 03 Quantity Surveyors, 02 Engineers, 01 Consultant and 01 Project Manager.

B.   Conceptual Framework

According to the conceptual framework, there are five relationships can be identified.
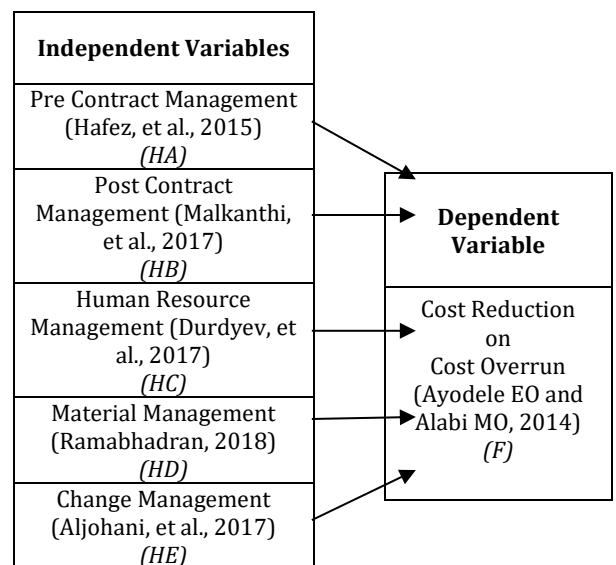

Figure 1: Conceptual framework

Independent variables are identified to find the effect of them against the main core of the study. Based on the framework, assumptions have been developed. In order to exam the agreement

among respondents on construction cost performances the hypotheses were developed as following.

HA1 –There is a relationship between Pre Contract Management & Cost reduction.

HB1 –There is a relationship between Post Contract Management & Cost reduction.

HC1 – There is a relationship between Human Resource Management & Cost reduction.

HD1 – There is a relationship between Material Management & Cost reduction.

HE1 – There is a relationship between Change Management & Cost reduction.

C.   Data Analysis Methods

Primary data has been analyzed using quantitative techniques and secondary data has been analyzed using a content analysis. Statistical analysis helped to determine the relationships between the developed variables related to cost control & and their effect on projects (Devi & Ananthanarayanan, 2017). This is a best method for multivariable analysis. The relationship is hypothesized at the beginning & the statistical analysis were done accordingly. The analysis was done with the use of SPSS software which has a broad coverage of formulas, statistical procedures. Presentation was in the forms tables which were auto generated by the SPSS software itself. Most of the data converted in to information. A cording system used at the SPSS software is similar to the codes mentioned on variables (Refer Figure 1).

1. Correlation analysis: This helps to analyze the relationship between different variables in a multivariable analysis study. The correlation is used to validate the agreement or disagreement among parties (contractors, quantity surveyors, client representatives, engineers, project managers) on a common factor (Le-Hoai, et al., 2008). This aim to find the relationship between developed key factors effects on cost control (independent variables) & cost reduction (dependent variable).

In this study, correlation coefficient is measured by the "Pearson Correlation Analysis" which is analyzed with the use of SPSS software. The output value of analysis is always been -1 and +1. Correlation coefficient equals to -1 shows there is negative relation between selected two variables, correlation coefficient +1 shows there is positive relation between selected two variables & correlation coefficient 0 shows there is no relation between selected two variables. For this research the coefficient value is determined as "P" & the significance level is 0.05.

2. Regression analysis: Regression analysis was done for the same statistical data collected & analyzed through the use of SPSS software. This focused to find out which variable has the most impact on the cost reduction in the construction industry in Sri Lanka. For this study the linear regression is computed.

IV. DATA ANALYSIS

The Construction activity is a complex work item which needs the hand of different parties who specialized in different areas of profession. In the same way "Construction Cost", is a main item which affects through the life cycle of a project & every party must know the cost items in different degrees according to their job specification. So, it is important to get the idea of different parties who are involved in a construction project regarding "Cost" factor. 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 showed in Figure 2.
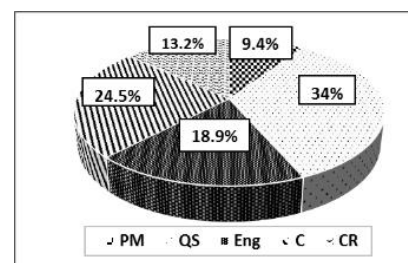

Figure 2: Respondent based on profession

Then targeted to find out whether these professionals, experienced project cost overruns. More than 90% of respondents have experienced cost overruns at construction projects which is highlighted as a serious problem in the construction industry and the need of actions to mitigate the cost overrun in projects.
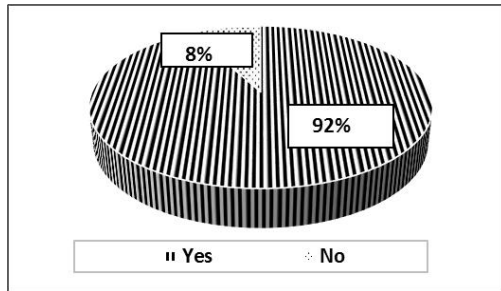

Figure 3: Experience in cost overruns

The dependent & independent variables were figured out according to the base literature survey. The main indicators which questioned from the respondents were tabulated below.

Table 1: Main indicators of variables

Variable	Indicator	Reference
Pre Contract Management (A)	Risk assessment	(Ramabhadran, 2018)
	Proper detailed estimation	(Sooriyaarachchi, 2007)
	Adequate contingency plan	(Ejaz, et al., n.d.)
	Pre-qualification assessment	(Ramabhadran, 2018)
	Most suitable bidder	(Hafez, et al., 2015)
	Tender documentation	(Aljohani, et al., 2017)

Variable	Indicator	Reference
	Time allocation	(Durdyev, et al., 2017)
	Feasibility study	(Le-Hoai, et al., 2008)
Post Contract Management (B)	Contractors' financial status	(Aljohani, et al., 2017)
	Clients' financial status	(Le-Hoai, et al., 2008)
	Government intervene	(Hafez, et al., 2015)
	ICTAD guidelines	(Malkanthi, et al., 2017)
	Project monitoring	(Sooriyaarachchi, 2007)
	Decision making	(Karunakaran, et al., 2018)
	Update cost data	(Ramabhadran, 2018)
Human Resource Management (C)	Labor turnover	(Durdyev, et al., 2017)
	Project management methods	(Ramabhadran, 2018)
	Experienced professionals	(Sooriyaarachchi, 2007)
	Effective resources	(Aljohani, et al., 2017)
	Training & development	(Karunakaran, et al., 2018)
	Better communication	(Aljohani, et al., 2017)
Material Management (D)	Inventory control	(Ramabhadran, 2018)
	Minimize material wastage	(Tam, 2011)

Variable	Indicator	Reference
	Resource management	(Aljohani, et al., 2017)
	Supply agreement	(Devi & Ananthanarayanaan, 2017)
	Local materials	(Durdyev, et al., 2017)
Change Management (E)	Client requirement	(Ramabhadran, 2018)
	Design team	(Hedaya & Saad, 2017)
	Design analysis	(Ramabhadran, 2018)
	Better visualization	(Aljohani, et al., 2017)
Cost Reduction (F)	Pre Contract Management	(Hafez, et al., 2015)
	Post Contract Management	(Malkanthi, et al., 2017)
	Human Resource Management	(Durdyev, et al., 2017)
	Material Management	(Ramabhadran, 2018)
	Change Management	(Aljohani, et al., 2017)

Key factors were developed (A, B, C, D & E) which the cost reduction (F) depends on. The professional idea is that cost control techniques can be used effectively at the post-contract stage & then in the pre-contract stage. The percentages are 23% & 21% accordingly which doesn't have a major difference between rates & confirmed that both these 2 stages are most critical for project cost control. The parties on the project are not much focused at the pre-contract stage regarding cost due to the limited time allocation. Most team members of the project are going for easy & short-term plans without predicting its risk when it comes to long term. The post contract stage is the lengthy period in a construction project where series of different complex activities happened. Controlling cost at that stage with appropriate strategies lead to reduction of cost overruns.
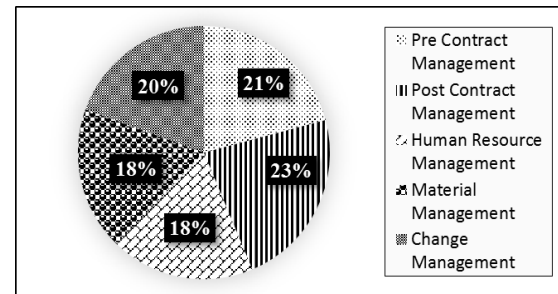

Figure 4: Effectiveness analysis of cost reduction

A. Correlation Analysis

Correlation analysis was 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 variable was tested with the dependent variable. Positive correlation represents, when one variable increases the other variable also increases & the negative correlation represents decrease of both. The correlation coefficient will be satisfied based on significance value (P) which,

$P < 0.05$ – The DV has a relationship with particular IV

$P > 0.05$ – The DV doesn't have a relationship with particular IV

Where:

N = No of respondents (53)

AVGA = Average of Pre-Contract Management *(IV)*

AVGB = Average of Post-Contract Management *(IV)*

AVGC = Average of Human Resource Management *(IV)*

AVGD = Average of Material Management *(IV)*

AVGE = Average of Change Management *(IV)*

AVGF = Average of Cost Reduction *(DV)*

The table 2 demonstrates the correlation between pre-contract management, post contract management, human resource management, material management & change management towards the cost reduction. The results of hypothesis testing were discussed below.

Table 2: Correlation coefficient analysis of variables (SPSS software generated)

Correlations		AVGA	AVGB	AVGC	AVGD	AVGE	AVGF
AVGA	Pearson Correlation	1	.591**	.588**	.507**	.601**	.720**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	53	53	53	53	53	53
AVGB	Pearson Correlation	.591**	1	.566**	.523**	.608**	.550**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	53	53	53	53	53	53
AVGC	Pearson Correlation	.588**	.566**	1	.474**	.633**	.630**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	53	53	53	53	53	53
AVGD	Pearson Correlation	.507**	.523**	.474**	1	.480**	.646**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	53	53	53	53	53	53
AVGE	Pearson Correlation	.601**	.608**	.633**	.480**	1	.731**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	53	53	53	53	53	53
AVGF	Pearson Correlation	.720**	.550**	.630**	.646**	.731**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	53	53	53	53	53	53
**. Correlation is significant at the 0.01 level (2-tailed).							

First variable is pre-contract management (A) & based on the aforesaid table, it has a positive & very strong relationship with a value of 72% & a significance level of 0.000 (P<0.05). That means can't reject the alternative hypothesis *(HA1)*, which there is a relationship between pre-contract management & cost reduction.

Second variable is post-contract management (B) & based on the aforesaid table, it has a positive & considerably strong relationship with a value of 55% & a significance level of 0.000 (P<0.05). That means can't reject the alternative hypothesis *(HB1)*, which there is a relationship between post-contract management & cost reduction.

Third variable is human resource management (C) & based on the aforesaid table, it has a positive & strong relationship with a value of 63% & a significance level of 0.000 (P<0.05). That means can't reject the alternative hypothesis *(HC1)*, which there is a relationship between human resource management & cost reduction.

Fourth variable is material management (D) & based on the aforesaid table, it has a positive & strong relationship with a value of 65% & a significance level of 0.000 (P<0.05). That means

can't reject the alternative hypothesis *(HD1)*, which there is a relationship between material management & cost reduction.

Fifth variable is change management (E) & based on the aforesaid table, it has a positive & very strong relationship with a value of 73% & a significance level of 0.000 (P<0.05). That means can't reject the alternative hypothesis *(HE1)*, which there is a relationship between change management & cost reduction.

B. Regression Analysis

Regression analysis was done to identify the impact of developed 5 different variables on the dependent variable. This makes all the independent variables comparable & standardized.

Table 3: Regression analysis (SPSS software generated)

Coefficients^a		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.071	.366		.195	.846
	AVGA	.397	.127	.338	3.125	.003
	AVGB	-.106	.124	-.092	-.852	.398
	AVGC	.121	.122	.108	.997	.324
	AVGD	.242	.079	.292	3.048	.004
	AVGE	.369	.110	.376	3.361	.002
a. Dependent Variable: AVGF						

From the aforesaid table 3 explained the regression model is as follows,

$$Y = \alpha + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + \beta 4 X4 + \beta 5 X5 + Std.E$$

Equation 1: Linear regression

Y = 0.071 + {[0.397*AVGA] − [0.106*AVGB] + [0.121*AVGC] + [0.242*AVGD] + [0.369*AVGE]} + Std.E

Equation 2: Linear regression (Based on SPSS generated data)

It shows the beta value 0.397 & a significance value of 0.003 shows a positive relationship with 40% variance of cost reduction is affected by the pre-contract management. More elaborately, it states that cost reduction increase 40% with the increase of pre-contract management strategies.

It shows the beta value (-0.106) & a significance value of 0.398 shows a negative relationship with (-11%) variance of cost reduction is affected by

the post-contract management. More elaborately, it states that cost reduction decrease 11% with the increase of post-contract management strategies. The correlation for this particular variable was positive & had a considerably strong relationship. The currently practicing cost reduction techniques were questioned by this variable. With the negative value, it indicates that there is significant lack among those traditional techniques & need of modern new techniques were identified because the post contract stage was ranked as the top when considering the causes of cost overruns (refere Figure 4) mostly happened & have the most of need to control the cost.

It shows the beta value 0.121 & a significance value of 0.324 shows a positive relationship with 12% variance of cost reduction is affected by the human resource management. More elaborately, it states that cost reduction increase 12% with the increase of human resource management strategies. Here the productivity is discussed with the minimum cost overruns.

It shows the beta value 0.242 & a significance value of 0.004 shows a positive relationship with 24% variance of cost reduction is affected by the material management. More elaborately, it states that cost reduction increase 24% with the increase of material management strategies.

It shows the beta value 0.369 & a significance value of 0.002 shows a positive relationship with 37% variance of cost reduction is affected by the change management. More elaborately, it states that cost reduction increase 37% with the increase of change management strategies.

V. CONCLUSION

The main objective of the research was to identify the impact between cost reduction & pre-contract, post-contract, human resource, material and change management approaches. This was achieved through a detailed questionnaire survey. The collected data were analysed with the use of SPSS software. Independent variables & dependent variable were developed & the relationship between variables were analysed through correlation analysis. For this the hypothesis were defined initially. The positive relationship was existing only if the significance value is less than 0.05 as

shown in table 2. The study revealed that the all independent variables have a positive relationship with dependent variable.

Then the regression analysis was done to identify the impact of the relationships based on above computed results which is shown in the table 3. If the variance value is positive, it determined that when the IV increases (decrease) the DV also increases (decrease) & if the variance value is negative it determined that when the IV increases (decrease) the DV decreases (increase).

From the interviews, the interviewees specifically comment on the implementation issues of cost reduction methods in the construction industry. There are plenty of new concepts in the industry regarding cost control but still experienced cost overruns due to implementing issues. Main issue is that the parties are not willing to changes due to the afraid of risk factor. Most of the time in construction projects the top level management are the old experienced professionals who are not interested on new method & go along with the traditional methods. So, the newcomers who have innovative ideas also proceed with the traditional methods which currently practicing because no one is there to get their modern ideas & persuade them. Normally people are lazy to adhere or to adopt new trends from conventional methods (Foster, 1989). No place for new generation ideas because old people run & tightly control the whole industry. An interviewee stated that,

"With the advanced development of the construction industry, it should go with new knowledge. The traditional methods which have being practiced a long period of time in the industry to control cost overruns must be the basic foundation, but modern cost reduction techniques need to implement for the development of the industry".

Poor planning strategies also an issue when implementing modern cost reduction methods (Ramabadran, 2018). Most of the planned schedules & programmes are not practical due to not having proper idea about the construction projects. Industry stakeholders don't have proper knowledge & don't know the importance of having cost reduction strategies on projects.

Simply they don't have any idea about cost controlling & also lack of innovative thinking. Even the industry professionals understanding and the ability to implement these modern cost reduction methods are questionable in the Sri Lankan construction market. Lack of expertise people on the industry & high cost for training people on among subjects are the main drawbacks for implementing cost reduction methods in the industry.

VI. RECOMMENDATIONS

The cost reduction strategies which questioned in the survey (refer table 1), are the traditional practices in the Sri Lankan context. Though these practices available in the industry, still cost overrun happens in every construction project. It is highlighted that the identification of modern, advanced, practical construction methods are needed to implement in the industry & interviewees recommended methods are listed below.

The main objective of the research analyzed & the impact of cost reduction methods over cost reduction. The impact is positive & the developed independent variables (management stratergies) have a relationship with the identified dependent variable.

Pre Contract management - *Selection of appropriate procurement strategy*; There are different types of procurement strategies for projects. Main procurement methods are Traditional, Design and build & Management. This selection must be done carefully because this step decide the success of the project (Otim, et al., n.d.). An interviewee said that, "Engaging for lump sum projects will somewhat keep the project on budget margins, because at the initial the contract sum is fixed amount & the construction works done up to the limited costs". *Risk management;* having a proper risk management at the initial is essential (Forster, 1989), by identifying all future unforeseen events & update the system up to the completion of the construction project. *Research & development (R & D) method*; Research & development is a new strategy to control the cost of a project. In this method, it's identified one activity of work & research on it to get the best option out of it with minimum cost by accessing the all-risk events.

Post Contract management - *Value management (VM);* Value management is a new approach of increasing the value of project by minimizing the additional unnecessary cost & reduce time for completion. *Sustainable construction*; with sustainable it can use more of natural energy resources which minimize cost to increase the use of renewable energy systems (Lowe & Zhou, 2003). The construction now-a-days go towards this concept by detecting the future advantages by analyzing the whole life cost of the project. *Modern construction technologies & software development*; with the advancement of technology there were modern techniques (Off-site construction, modular construction, precision manufactured construction, pre-manufactured construction & Digital/ Smart Construction), in building construction with complete project in lesser time. If the time of construction saved, the cost will be automatically mitigated. With the use of new softwares (Primavera, MS Project, ERP system & BIM), the project programme can update & can check the actual expenses of project along with the estimated project budget & can get the cost decisions along with. *Proper dispute resolution*; According to Baccarini (1996) disputes are a common phenomenon in construction due to its complexity & involvement of different parties. Dispute resolution is a process which consume a large amount of money & time. Better to mitigate arising of disputes by maintaining a better communication among members of the project.

Human Resource Management - *Proper labor control plans*; managing the human resource will be a challenging task at sites. Proper plans to be created to lower the labour turnover & have to make arrangements for settling the payments due monthly wise as they claimed. *Training & Development*; training programs must be conducted on behalf of lectures by giving the information of the importance of cost control with better communication processes.

Material Management – *Inventory control*; the material reconciliation must be done according to the payments requests & to be provided with the information of cost reports. *Supply Chain Management*; proper procedure have to be followed to the effective allocation of resources.

Change management – *Proper visualization*; the all stakeholders in the design team must co-operate when decision making is based on a situation to avoid arising of future disputes.

To overcome the implementation issues of cost reduction methods also discussed with the interviewees & some of their suggestions were discussed. Make proper project planning with the use of actual data & software (IT skill) facilities is an essential item. Establish a proper cost monitoring & cost controlling system during the construction period by using updated cost data will have positive impacts on project. The interviewee IP03 pointed out that,

"Involving the contractor at the design stage & optimize the project scope during project formulation make positive impacts on project cost. Conduct a proper waste management system & store management at site is required. Automated the project management system & should not over control the cost of essential items. On top of all this maintain update cost documents is very important to track cost overruns and idling".

Educate & make awareness of people about importance of cost control is a best strategy to implement modern cost reduction techniques in the construction industry (Hafez, et al., 2015). The interviewee stated that, *"Make proper training programmes & development states among people regarding those techniques including legal authorities related to construction like ICTAD & CIDA are essential"*. Educating people have to start from the academic level (relates to construction industry) itself. Improve knowledge of teenagers about value of money & important of cost control through academic programmes like in university course modules are a better option.

VII. RESEARCH LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While this research focused on the impact of cost overruns on management approaches in Sri Lankan construction industry (Limited to Sri Lankan Context), a study can be done to identify the modern techniques to reduce the cost overruns in construction projects. Further studies can be done to categorize the most vital causes for cost overruns in construction projects.

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