

# CRITICAL SUCCESS FACTORS INFLUENCING PROJECT MANAGEMENT SUCCESS: PERSPECTIVE OF SRI LANKA

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## ABSTRACT

*This study investigates the factors influencing project management success in the context of Sri Lankan construction projects. Five key project components and their associated critical success factors are hypothesised to influence project management success. One of the project components (efficient project management) is posited to also act as a mediator. Self-administered questionnaires were distributed to the personnel working in the top 20 construction companies in Sri Lanka. The results suggest that all the key project components (project design document, project human resources management, stakeholder management, project budget and efficient project management) were significantly associated with project management success. Further, efficient project management was found to be a significant mediator. However, when analysed independently, some of the key project components did not show any significant mediation. The findings could spur further research, as well as enable the construction companies to determine which key project components should be prioritised to achieve project management success.*

**Keywords:** Key Project Components, Critical Success Factors, Project Management Success, Construction Companies, Sri Lanka

## INTRODUCTION

Research on project management, particularly on factors influencing the success of projects and project management, has been in existence over the last several decades. Rockart (1979) has been acknowledged as the pioneer for introducing the critical success factors (CSFs) relating to project management success. Since then, a considerable number of studies have been carried out using a varying number of CSFs associated with key project components.

Whilst some researchers (Dvir, Lipovetsky, Shenhar & Tishler, 1998; Yong & Mustaffa, 2013) suggest that there is no universal set of CSFs and that care has to be taken to contextualise them based on size, complexity and the environment of projects, many of the available studies tend to propose common and broad CSFs influencing project management success in varying numbers (for example, see the studies of De Silva, Rajakaruna & Bandara, 2008; Gudienė, Banaitis & Banaitienė, 2013; Kerzner, 1987; Khan & Spang, 2011; Mitra & Tan, 2012; Saqib, Farooqui & Lodi, 2008; Yong & Mustaffa, 2013). A key observation is that there is yet a comprehensive set of CSFs where insofar, none of the available studies has attempted to investigate the CSFs of key project components influencing project management success in a single setting.

Since project management success is a multi-dimensional concept encompassing many attributes, a clear understanding of the CSFs is imperative as they serve to provide a sound guide to project organisations and the project management community on what are the important factors to be prioritised to meet the triple constraints of cost, time and quality (Demilliere, 2014; Dinsmore & Cabanis-Brew, 2006). However, due to the massive variations in CSFs, Alotaibi & Al Nufei (2014) opine that it would not be entirely wrong to assume that there are ambiguities in determining whether or not a project is successful. In fact, Prieto (2015) had questioned the adequacy of the current project management theories in which their applications have not led to project management success, one of which is the lack of a comprehensive set of CSFs examined in prior

studies which might have contributed to the reason of why many projects still fail to meet the triple constraints.

This study is based on the setting of the large construction companies in Sri Lanka, which are struggling with the issues of cost overrun, time overrun and poor quality. These are also the common issues reported in projects undertaken by developing countries (Ankomah, Ayarkwa & Agyekum, 2020; Durdyev & Hosseine, 2019) due to lack of understanding and implementation of the CSFs of the key project components. Specifically, the construction industry in Sri Lanka in general is grappling with the issue of low budget availability, lack of skilled resources, technical knowledge, quality control and poor management of projects (De Silva et al., 2008; Gunathilaka, Tuuli & Dainty, 2013). If large companies fail to handle very large and significant projects, the impact is certainly disastrous. Secondly, there will be no sources for the construction companies of similar or different sizes to learn from.

It is against this backdrop that Silva, Warnakulasuriya & Arachchige (2015) recommend the need to identify the CSFs of key project components influencing project management success in Sri Lanka, in which studies are lacking to date. Since the CSFs have been studied in isolation, the study considered CSFs of five key project components in one single setting, namely project design document, project human resources management, stakeholder management, project budget and efficient project management which have been found to influence project management success to answer the first research question on what are the CSFs of key project components influencing project management success?

In addition, the literature has identified efficient project management as a mediator. This is premised on the important role played by project managers as reported in many studies (Ballard & Koskela, 1998; Hamilton, 2007; Mohandas & Sankaranarayanan, 2008; Naqvi, Aziz & ur-Rehman, 2011). This serves to answer the second research question on *whether efficient project management significantly mediates the relationships between the CSFs of key project components and project management success*.

The rest of the paper is organised in the following manner. It proceeds to review the literature relating to project management success, the key project components and their associated CSFs, the role of the mediator and subsequently the posited relationships between them, leading to the development of a research model and a series of hypotheses to be tested. The methodology is described next, followed by the findings. The implications are discussed before the paper is concluded with future research directions.

## LITERATURE REVIEW

### Project Success and Project Management Success

De Wit (1988); Kerzner (1989) define project success by measuring it against the overall objectives of the project to meet the requirements of cost, time and quality. Accordingly, the project structure defines the way how tasks are decomposed and coordinated, which contributes to the success of projects (Caniels, Van loon & Chiochio, 2019).

Although project management also concentrates on timely delivery within budget, schedule and acceptable quality to the stakeholders, project management success is a multi-dimensional concept encompassing many attributes, including human, stakeholders and environmental factors, implying the importance of the identification, implementation and monitoring of the CSFs to achieve the desired project management outcomes. Hence, project management success is predicted by the projects achieving the targets of cost, time quality, environmental considerations and stakeholder satisfaction (De Wit, 1988; Kerzner, 1998; Mir & Pinnington, 2014).

## Critical Success Factors

Rockart (1979) defines the CSFs as the critical areas of project activities that should receive continuous and careful attention, which will have a significant impact on project management success if the factors are properly managed, maintained and controlled (Pinto & Slevin, 1987).

According to Cooke-Davies (2002), the CSFs can be categorised as common and unique CSFs. The common CSFs are considered factors that are necessary for any project such as top management leadership and commitment, culture, technology and environment, to name some. On the other hand, the unique CSFs are considered as the fundamentals or key project components in achieving project management success. Based on the literature, the researchers categorised the key project components into five: (1) project design document; (2) project human resources management; (3) stakeholder management; (4) project budget; and (5) efficient project management. The following sub-sections describe the CSFs associated with the five key project components.

### Project Design Document

A well-formulated design package has been acknowledged as a key requirement for project management success (Chan, Scott & Lam, 2002; Clarke, 1999; Echeverria-Valiente, Garcia-Alvarado, Celis-D'Amico & Saelzer-Fuica, 2019; Hamilton, 2007).

Accordingly, time spent on the development of the design document is critical (Chan & Kumarasamy, 1997; Hamilton, 2007) as it will enable technical considerations and different development options to be captured, along with the considerations on cost, time and quality. Specifically, Hamilton (2007) suggests that sufficient time spent on lessons learnt are critical as it will bring in additional experience and data required for the design package to mitigate unanticipated difficulties, leading to project success (Vasista, 2017).

During the initial stage of design formulation, proper communication is also vital to incorporate the requirements of clients and stakeholders (Naqvi et al., 2011) so that the detailed specifications and design complexities can be laid out. Management support is equally essential in the preparation of the project design package. This includes making available skilled staff (Chan & Kumarasamy, 1997), use of up-to-date design methods, taking into consideration the environment (Stasinopoulos, Smith, Hargroves & Desha, 2009), use of proper design standards, including the use of new technologies, as well as the use of sufficient quality control methods.

### Project Human Resources Management

Project resources management has been identified as one of the critical components leading to project management success (Belout, 1998). Sufficient management recognition and support, continuous monitoring of resource allocation, as well as the availability of training methods and sufficient training facilities have been reported as major requirements in managing resources (Somers & Nelson, 2001).

The importance of recognition by the senior management team on the availability and access to the skilled workforce has been widely documented (Bayiley & Teklu, 2016; De Silva et al., 2008; Gunathilaka et al., 2013; Mitra & Tan, 2012). Accordingly, staffing projects with the right skills at the right time, monitoring their performance and providing motivation and/or rewards along with providing opportunities to employees to develop their skills continuously are important responsibilities of management (Bingi, Sharma & Godla, 1999). Failure to recognise the skills and attitudes required will demoralise employees and inevitably contribute to poor quality work, backlogs and rework, which will impact on schedule and cost, leading to unsuccessful project completion (Somers & Nelson, 2001).

## Stakeholder Management

Amongst the major reasons reported for project failures in developing countries include poor decision making by stakeholders and not meeting their expectations (Davis, 2014; Eyiah-Botwe, 2015). Diverse occupational, professional backgrounds and interests, goals and expectations amongst the stakeholders create conflict with each other (Boutelle, 2004). It is therefore important for the management and project team to recognise the important roles the stakeholders play, their influence and power, as well as their attitudes toward risk and benefits over the project (Jepsen & Eskerod, 2009; Jergeas, Williamson, Skulmoski & Thomas, 2000; Liang, Yu & Guo, 2017; Ogwueleka, 2013; PWC, 2018).

Recognising the strengths of stakeholders will increase their commitment in terms of financial, quality and project success, leading to project management success (Nguyen, Chileshe, Rameezdeen & Wood, 2019). Management plays an important role in educating the stakeholders and get them to work together for common interests. Continuous discussions with stakeholders to understand their needs (Durdyev, in press) and updating them of the status of projects are critical for decisions to be made in a timely manner (Chan & Oppong, 2017). It is also important for management to understand the local environment where projects without political support will experience major barriers (Aapaaja, & Haapasalo, 2014; Gudiene et al., 2013; Mok, Shen & Yang, 2015).

## Project Budget

Project budget should be considered as an important, if not the most important, component of a project. The accuracy of project budget is related to the completeness of the design document, availability of skilled staff and sufficient data, as well as proper budget allocation and control, which are necessary for project management success (Chan & Kumarasamy, 1997; Kaming, Olomolaiye, Holt & Harris, 1997; Toor & Ogunlana, 2008).

Specifically, the availability of a complete design package prior to the preparation of budget is very important to the overall project execution in terms of ensuring there is no cost overrun, schedule delays and sub-standard output (Flyvbjerg, 2004). In addition, the availability of historical base information and skilled staff, particularly skilled estimators who know the cost estimating methods and experienced in estimating project costs and breakdowns are necessary to arrive at a confident budget (Dandan, Sweis, Sukkari & Sweis, 2019; Vasista, 2017).

Developing, continuous monitoring and controlling of a project budget for project management success is therefore a critical management skill. Management needs to manage external interference and constantly revisit the project budget, in addition to making sufficient contingencies available to cover unforeseen expenditures (Flyvbjerg, 2004).

## Efficient Project Management

Project management leadership qualities, experience in infrastructure projects and ability to carry out project planning and effective management have been recognised as the key requirements for project management success (Elhag, Eapen & Ballal, 2020; Hamilton, 2007; Mohandas & Sankaranarayanan, 2008; Sirisomboonsuk, Gu, Cao & Burns, 2018). Accordingly, the managerial skills and commitment of project managers and their technical backgrounds are critical factors leading to efficient project management (Adebisi, Alao & Ojo, 2020; Leung, Chan & Yu, 2009) and subsequently project management success.

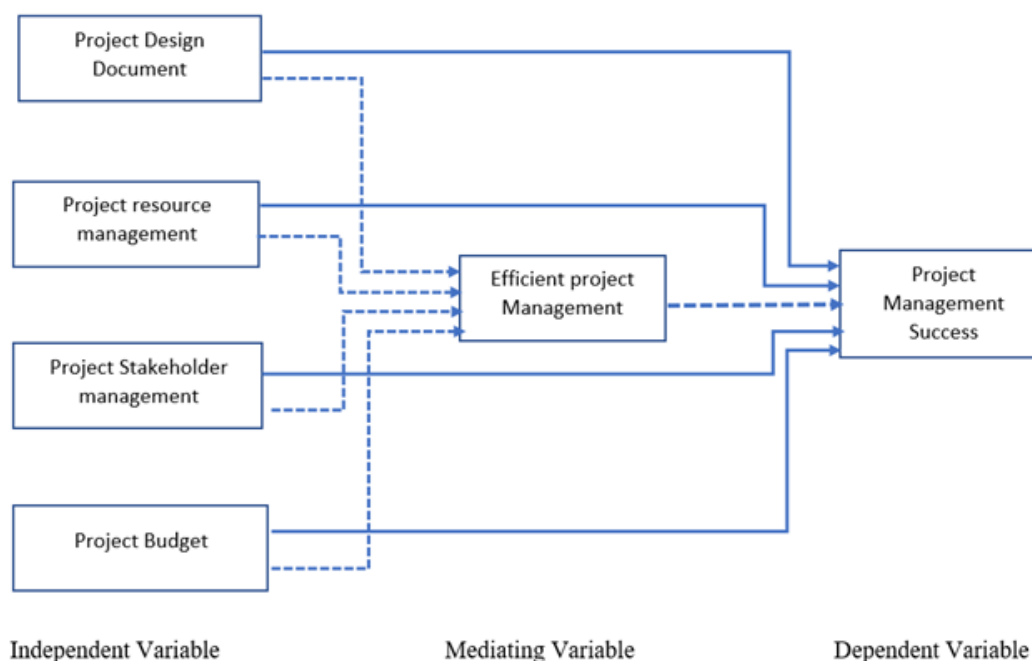
In addition, the ability of the project manager to plan, manage and coordinate projects, resources, finances and stakeholders, as well as to communicate, manage and motivate team members as important pre-requisites to efficient project management leading to project management success (Kezsbom, Schilling & Edward, 1989; Newton, 2009; Nicholas, 1989) has also suggested the mediating role of efficient project management as pointed out in several studies

(Ballard & Koskela, 1998; Bourne & Weaver, 2010; Collinge, 2012; Hamilton, 2007; Mohandas & Sankaranarayanan, 2008; Naqvi et al., 2011).

The literature has documented many challenging requirements that project managers need to meet to enable efficient project management, which include a commitment to organisational development, abilities to make financial and other decisions quickly, possession of technical capabilities, efficient communication, planning and coordination skills, good variation and quality controls, good safety applications, as well as developing and motivating team members and different stakeholders to meet project demands (Dye, 2011; Kezsbom et al., 1989; Nicholas, 1989).

## Framework and Hypotheses

Figure 1 shows the research model of the study. The four key project components (project design document, project human resources management, stakeholder management and project budget) act as the independent variables of the study, whilst project management success is the dependent variable. Efficient project management acts as a mediator in the study.



**FIGURE 1**  
RESEARCH FRAMEWORK

Based on Figure 1, the following hypotheses are formulated:

- H1: Project design document has a significant relationship with project management success.*
- H2: Project human resources management has a significant relationship with project management success.*
- H3: Stakeholder management has a significant relationship with project management success.*
- H4: Project budget has a significant relationship with project management success.*
- H5: Efficient project management has a significant relationship with project management success.*
- H6: Efficient project management mediates the relationship between project design document and project management success.*
- H7: Efficient project management mediates the relationship between project human resources management and project management success.*
- H8: Efficient project management mediates the relationship between stakeholder management and project management success.*
- H9: Efficient project management mediates the relationship between project budget and project management success.*

## METHODOLOGY

### Research Instrument

The study employs the quantitative method and data was collected using a self-administered survey questionnaire. The questionnaire is divided into two sections. The first section collects demographic data of the respondents. The second section comprises questions on the variables (see Appendix 1), measured by a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The instrument was piloted on 30 participants in the construction industry. The Cronbach's alpha values ranged from 0.69 to 0.84. Minor modifications were made to some of the questions based on the feedback received. Hence, reliability and face validity were achieved.

### Population and Sample Size

About 20 government agencies, leading private design and construction companies, as well as architectural and engineering consulting firms involved in infrastructure and large building construction projects in Sri Lanka were contacted for the study. The questionnaires were distributed to 600 personnel working as project directors, project managers, senior project engineers, senior engineers and some senior technical staff working on-site and in offices. About 233 responses were received, yielding a response rate of 38.8%.

Table 1 shows the demographic profile of the respondents. Consistent with the nature of this industry, most of them were males. More than 80% of them were married and between the ages of 30 and 49 (82.4%). The majority of them also possess a Bachelor's degree, followed by a Master's degree in engineering and were members of the institution of engineers. The number of years in service, as well as years with the organisation indicated the extent of experience of the respondents in project management. Most of them were project managers, followed by planning/scheduling and project engineers. The distribution of respondents showed a good indication of the representativeness of the sample size to the population of the key groups.

Demographic Variable		Total	%
Gender	Male	200	85.83
	Female	33	14.16
Age	30 - 39	98	42.06
	40 - 49	94	40.34
	50 - 59	38	16.3
	Above 60	3	1.28
Marital Status	Married	187	80.25
	Single	46	19.74
Education	Diploma	37	15.87
	Bachelors	136	58.36
	Masters	61	26.18
	MBA	11	4.72
Professional Qualifications	Fellow of Institution	13	5.57
	Member of Institution	169	72.53
No. of Years in Service	Graduate of Institution	51	21.88
	5-9	84	36.05
	10-14	59	25.32

	15-19	38	16.31
	Above 20	52	22.31
No. of Years with the Organisation	2-4	48	20.6
	13-15	33	14.16
	13-15	17	7.29
	above 16	51	21.88
Current Position	Project Director	15	6.43
	Project Manager	71	30.47
	Senior Project Engineer	31	13.3
	Project Engineer	27	11.58
	Senior Engineer	43	18.45
	Planning/Scheduling Engineers	46	19.74

## FINDINGS

Table 2 shows the results of Confirmatory Factor Analysis (CFA) using principal component analysis and varimax rotation. The minimum factor loadings and Average Variance Extracted (AVE) were in acceptable ranges, confirming the sufficiency of the validity of the model. Two key project components (project design document and stakeholder management) were further divided into three sub-components, whilst the other components remained intact.

<b>Summary CFA</b>			
<b>Final Measurement Items for Variables</b>	<b>Minimum Factor Loadings</b>	<b>AVE</b>	<b>Final Measurement Model Validity</b>
PDDf1	0.885*	0.817	Sufficient
PDDf2	0.696*	0.63	Sufficient
PDDf3	0.900*	0.857	Sufficient
PRM	0.874*	0.807	Sufficient
PBf1	0.886*	0.87	Sufficient
PME	0.904*	0.83	Sufficient
SMf1	0.796*	0.783	Sufficient
SMf2	0.767*	0.727	Sufficient
SMf3	0.851*	0.79	Sufficient
<b>Note:</b> PDD = Project Design Document; PRM = Project Human Resources Management; PB = Project Budget; PME = Efficient Project Management; SM = Stakeholder Management			

Table 3 describes each of the key project components which were segregated into factors, their associated concept measurement and the questions relating to each factor (see Appendix 1 for the questions). Based on the results of the CFA, three, one and four of the items under project resources management, stakeholder management and efficient project management, respectively, have been dropped from further analysis.

<b>Table 3</b>			
<b>FACTORS OF PROJECT COMPONENTS WITH CONCEPT AND QUESTIONS</b>			
<b>Project Components</b>	<b>Factor Identification</b>	<b>Concept Measurement</b>	<b>Questions Related to Factors</b>
Project Design Document (PDD)	PDDf1	<b>Concept: Design package, initial data collection methods and management support.</b> Design package initiation with different design data options and with management support.	Q2.2, 2.3, 2.4, 2.7 and 2.10
	PDDf2	<b>Concept: Economics and technical consideration during PDD preparation.</b> Detailed design specifications with applicable content with balance of cost and time with quality control (QC) procedures.	Q2.6, 2.8, 2.11 and 2.12
	PDDf3	<b>Concept: Design preparation methods and skills availability.</b> Time spent on design control, methods used and availability of skilled personnel.	Q2.1, 2.5 and 2.9
Project Human Resources Management (PRM)	PRM	<b>Motivation and monitoring.</b> Management support and recognition with sufficient training, monitoring and motivation.	Q4.1, 4.2, 4.3, 4.4 and 4.5
Project Budget (PB)	PB	<b>Concept: Efficient and reliable budget preparation.</b> Project budget done with sufficient management input using past experience and good cost estimation.	Q6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7 and 6.8
Stakeholder Management (SM)	SMf1	<b>Concept: Project financial, resource and organisation management.</b> Stake holder strength, financial commitment understanding the environmental needs and his attitude to risk.	Q8.6, 8.7, 8.8 and 8.11
	SMf2	<b>Concept: Commitment to Success of Project.</b> Commitment of stakeholders to the success of the project.	Q8.5, 8.9 and 8.10
	SMf3	<b>Concept: Recognition and benefit expectations.</b> Knowledge and expectation of stakeholders of benefits and recognition of the projects	Q8.1, 8.2 and 8.3
Efficient Project Management (EPM)	EPM	<b>Concept: Technical, planning, financial and quality management.</b> Technical, planning and QC ability, along with leadership qualities, people motivation, project coordination and financial responsibility.	Q10.1, 10.3, 10.4, 10.5, 10.6, 10.7, 10.11, 10.12, 10.13 and 10.14

Table 4 shows that the Kaiser-Mayer Olkin (KMO) values of all the factors were above 0.50, which assures the validity of the constructs in the study. The Bartlett's test results were also significant at 5% level. Internal consistency was measured through Cronbach's Alpha with values closer to 0.70 or above.



<b>Table 4</b> <b>RELIABILITY AND VALIDITY ANALYSIS</b>						
		<b>Validity</b>				<b>Reliability</b>
		<b>Number of items</b>	<b>KMO test</b>	<b>Bartlett's test</b>		<b>Cronbach's Alpha</b>
				<b>Chi-value</b>	<b>Sig.</b>	
Project Design Document	Factor 1	5	0.781	211.291	0	0.723
	Factor 2	4	0.745	166.221	0	0.717
	Factor 3	3	0.699	112.121	0	0.697
Project Human Resources Management	Factor 1	5	0.708	273.7	0	0.731
Project Budget	Factor 1	8	0.787	369.118	0	0.759
Stakeholder Management	Factor 1	4	0.717	190.018	0	0.731
	Factor 2	3	0.694	142.294	0	0.683
	Factor 3	3	0.664	139.342	0	0.681
Efficient Project Management	Factor 1	6	0.834	416.272	0	0.813

Due to the existence of sub-components for project design document and stakeholder management, H1 (project design document) and H3 (stakeholder management) were further divided into sub-hypotheses to address the different sub-components in the analysis.

Table 5 shows the mean and standard deviation scores for the CSFs. Except for the third sub-component of Project Design Document (PDDf3) and Stakeholder Management (SMf3), all the other factors scored above the average mean score. The average mean score was close to 3.90, implying that all these factors were perceived to be important to the construction industry, including efficient project management. The standard deviation scores for all factors were below one, indicating consistency in the responses obtained.

<b>Table 5</b> <b>MEANS AND STANDARD DEVIATION SCORES FOR CSFS OF KEY PROJECT COMPONENTS</b>		
<b>Factors</b>	<b>Mean</b>	<b>Std. Deviation</b>
Project Design Document		
PDDf2	4.3584	0.53184
PDDf3	3.1032	0.50123
Project Resources Management	4.1742	0.41442
Project Budget	4.3789	0.40035
Stakeholder Management		
SMf1	4.0762	0.50997
SMf2	4.0347	0.45084
SMf3	3.2435	0.44537
Average of Critical Success Factors	3.9313	0.45723
Efficient Project Management	4.3194	0.38229

Table 6 shows the results of the Pearson correlation coefficient analysis. All the key project components, including efficient project management are significantly correlated with project management success. Based on the correlation index, project budget showed the highest coefficient, followed by efficient project management and project human resources management. The lowest coefficient was recorded on stakeholder management.

	<b>Spearman Correlation Coefficient</b>	<b>P-value</b>
PDDf1 avg	0.414	0
PDDf3 avg	0.292	0
PRM avg	0.506	0
PB avg	0.619	0
SMf1 avg	0.465	0
SMf2 avg	0.391	0
SMf3 avg	0.229	0
EPMf1 avg	0.529	0
<b>Note:</b> Correlation is significant at the 0.01 levels (2-tailed)		

The same key project components were then subjected to multiple linear regression analysis. As shown in Table 7, except for the two factors from Project Design Document (PDDf1 and PDDf3) and two factors from Stakeholder Management (SMf1 and SMf3), the other factors were significantly associated with project management success. Project budget recorded the highest Beta value, followed by efficient project management, project resources management, economics and technical consideration of Project Design Document (PDDf2) and commitment to the success of project of Stakeholder Management (SMf2). The Variation Inflation Factor (VIF) for all the factors were less than 10, indicating that multicollinearity was not an issue. Based on the results, H2, H4 and H5 are accepted, whilst H1 and H3 are partially accepted. The adjusted R-squared value of 0.461 implied that 46% of the key project components influence project management success.

<b>Model</b>	<b>Unstandardised Coefficients</b>		<b>Standardised Coefficients</b>	<b>t</b>	<b>Sig.</b>	<b>Collinearity Statistics</b>	
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>			<b>Tolerance</b>	<b>VIF</b>
PDDf1	0.02	0.052	0.028	383	0.702	0.46	2.173
PDDf2	0.108	0.052	0.142	2.053	0.041	0.497	2.013
PDDf3	0.012	0.043	0.018	0.291	0.771	0.631	1.585
PRMf1	0.211	0.071	0.173	1.68	0.03	0.475	2.353
PB	0.458	0.07	0.491	6.547	0	0.423	2.362
SMf1	0.065	0.058	0.076	1.282	0.181	0.486	2.348
SMf2	0.105	0.053	0.12	1.985	0.048	0.549	1.541
SMf3	0.15	0.049	0.06	1.015	0.311	0.689	1.452
PME	0.24	0.077	0.238	3.117	0.002	0.394	2.537
Dependent Variable: Project Management Success; Adjusted R-Square = 0.461							

Table 8 shows the results of the mediating effects of efficient project management, using the regression analysis of individual key project components on project management success. Except for PDDf3 (design preparation methods and skills availability) and SMf3 (recognition and benefit expectations of stakeholders) which showed full mediation, efficient project management significantly mediated the relationships between the other CSFs of key project components and project management success. Therefore, H7 and H9 are accepted, whereas H6 and H8 are partially accepted.

<b>Model 1: Dependent Variable (PMS)</b>			<b>Model 2: Dependent Variable (PMS) with EPM as Mediating Variable</b>	
	<b>Sig.</b>	<b>R-squared value</b>	<b>Sig.</b>	<b>R-squared value</b>
PDDf1	0.537	0.134	0.04	0.349a
PDDf2	0.006	0.223	0	0.379a
PDDf3	0.743	0.055	0.328	Full mediation by EPM
PRM	0	0.253	0.002	0.363a
PB	0	0.425	0	0.467a
SMf1	0	0.237	0.019	0.352a
SMf2	0	0.167	0.032	0.350a
SMf3	0	0.093	0.153	Full mediation by EPM
Dependent variable: EPM = Efficient Project Management				

Taking a closer look, Table 9 shows the results of the mediating effects for the overall model. The results show that PDDf1 (design package, initial data collection methods and management support) and PDDf3 (design preparation methods and skills availability), SMf1 (project financial, resource and organisation management) and SMf3 (recognition and benefit expectations of stakeholders) were not significant and were fully mediated by efficient project management. The highest Beta value was recorded for project budget, followed by project resources management, Project Design Document (PDDf2) and Stakeholder Management (SMf2). The adjusted R-squared value was 0.484.

<b>Model</b>	<b>Unstandardised Coefficients</b>		<b>Standardised Coefficients</b>	<b>t</b>	<b>Sig.</b>	<b>Collinearity Statistics</b>		
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>			<b>Tolerance</b>	<b>VIF</b>	
1	(Constant)	1.446	0.228	-	6.352	0	-	-
	PB	0.488	0.058	0.523	8.357	0	0.606	1.649
	PRM	0.281	0.043	0.324	5.344	0.012	0.403	1.714
	SMf2	0.117	0.049	0.135	2.393	0.018	0.751	1.313
	PDDf2	0.104	0.044	0.138	2.362	0.019	0.698	1.432
Dependent variable: Project Management Success; Adjusted R-square = 0.484								

## DISCUSSION AND IMPLICATIONS

### Discussions on the Research Questions

To answer the first research question on the CSFs of key project components influencing project management success, the results of multiple regression analysis suggests that except for the two factors under project design document (design package, initial data collection methods and management support; and design preparation methods and skills availability) and the two factors under stakeholder management (financial resource and organisation management; and recognition and benefits expectations of stakeholders), all the other CSFs showed significant associations with project management success.

The findings of Pearson correlation coefficient in Table 6 shows that project budget showed the highest coefficient, followed by efficient project management and project human resources management. The same factors were found to be significantly associated with project management success using multiple regression analysis. The findings are supportive of the literature and reflect the context of Sri Lanka where the availability of finance and skilled resources are identified as the major barriers preventing project management success (De Silva et al., 2008; Gunathilaka et al., 2013).

Interestingly, out of the three sub-components of project design document, only detailed design specifications with economics and technical considerations (PDDf2) was found to be significantly associated with project management success although PDDf1 was perceived to be important (Table 5) and that PDDf1 and PDDf3 were significantly correlated with project management success (Table 6).

As for stakeholder management, only the commitment of stakeholders to the success of projects (SMf2) was significantly associated with project management success. Project financial, resource and organisational management (SMf1) and recognition and benefits expectations (SMf3), whilst significantly correlated with project management success (Table 6), were found not to be significant in the multiple regression analysis (Table 7). To some extent, SMf3 was found to score below the average mean (Table 5).

To answer the second research question on whether efficient project management significantly mediates the relationships between the CSFs of key project components and project management success, when the overall model was regressed with efficient project management as a dependent variable (Table 8), the results showed that, except for PDDf3 and SMf3, all the other CSFs of key project components were associated with efficient project management. However, when efficient project management is introduced as a mediator, only project budget, project resources management, detailed design specifications with economics and technical considerations (PDDf2) and commitment of stakeholders to the success of projects (SMf2) were significantly associated with project management success (Table 9).

Whilst PDDf1 and SMf1 were significantly mediated by efficient project management, they do not lead to project management success. Together with PDDf3 and SMf3, the findings suggest that attention should be given to project budget, project resources management and the two sub-components of project design document and stakeholder management and the effect of efficient project management on these CSFs in contributing to project management success.

The findings have the following theoretical and practical implications as described in the following sub-sections.

### Theoretical Implications

This study has attempted to look at project management success from the lens of a more comprehensive set of CSFs of key project components with efficient project management as a mediator. This study is perhaps one which has proposed the most comprehensive model to date,

one which is argued to be required to manage complex and large projects, and amongst the first to address the lack of studies in the Sri Lankan context. The demographic background of the respondents (Table 1), which reflects the representation of those in the construction industry in Sri Lanka, as well as the reliability and validity of the research model (Tables 2 and 4), has enabled significant practical implications to be derived at. The research also has the potential to spur future works in the same domain by using the model developed as an anchor.

### **Practical Implications**

From the practical point of view, this study has enhanced understanding and provided a guide to the construction organisations in recognising and prioritising the key project components in planning, implementation and monitoring of projects. To begin with, budget overruns manifested from poor project design, bad communication with stakeholders and external interferences during preparation of project budget, along with shortage of skilled estimators are common in Sri Lanka (Mohandas & Sankaranarayanan, 2008). Since project budget is the most influencing factor, management needs to take cognisance of the different factors influencing project budget and manage them appropriately through efficient project managers. This is especially critical to the large construction companies which manage projects requiring huge investments.

Equally important is the project human resources management. Praveen, Niththiyananthan, Kanarajan & Dissanayake (2013) has reported on how skills shortage has affected the construction projects in Sri Lanka. Strategic and a balanced allocation of human resources are critical (Sanchez, Terlizzi, de Oliveira & de Moraes, 2017). In addition, management needs to pay sufficient attention to the availability of and capacity building for skilled resources, including efficient project managers, acknowledging that a committed and skilled workforce makes a positive difference. At the same time, project managers should be given the autonomy to identify skilled project members whom they believe can contribute to project management success.

The findings also point to the importance of project design document where management support is required in the preparation of the design documents, taking into consideration technical content and the economical dimensions. In this case, the project managers have an important role to play to liaise with different stakeholders and coordinate their input (Yap, Abdul-Rahman & Wang, 2015). The construction companies and project managers ought to give priority to the preparation of lean and effective designs, which could reduce the final cost of implementation.

Likewise, stakeholder management, particularly in getting their full commitment, is important for project management success (Alvarenga, Branco, Guedes, Soares & Silva, 2019). The project managers should leverage their experiences to manage expectations, collaborate and obtain commitment from different key stakeholders (Bond-Barnard, Fletcher & Steyn, 2018; Boutelle, 2004; Jallow, Demian, Baldwin & Anumba, 2014). Since each project is unique in nature, the project managers must emphasise to the project team to build trust within and between the project stakeholders (Yang, Shen, Bourne, Ho & Xue, 2011).

The responses to the CSFs can be used as a checklist by management and project teams to effectively develop, manage and control projects. Whilst these key project components should be translated into organisational policies, standard operating procedures or even key performance indicators of all involved, the role and contributions of project managers ought to be recognised as central to the success of project management.

### **CONCLUSION AND FUTURE RESEARCH DIRECTIONS**

The research has provided valuable insights on the key project components influencing project management success and the important role of the mediator. Indeed, the findings reflect the behaviours and priorities of large construction companies. It is hoped that the insights and recommendations provided are useful to the construction organisations to focus on what is truly important for better project management outcomes. Implementation of the CSFs, if proven to be

successful, could lead to significant development to Sri Lanka or any developing country and enable construction companies of different sizes to emulate their bigger size counterparts, which could increase their odds of success.

Several limitations were identified in the study. Data was collected from only large construction companies in the Western province of the country. Data collected from construction organisations of different sizes and throughout the country may fetch different findings. Of equal interest would be a gap analysis to look at importance-performance gaps of the CSFs so that more specific recommendations can be derived.

Since this study focused only on five key project components, future research may extend it to cover, say environmental and/or other influences to address the United Nation's Sustainable Development Goals. The impact of information systems on project management success is another possible area to be investigated (Thi & Che Wan Muhammed Salleh, 2016). In addition, this study only considered one mediating variable, where future studies should identify other potential mediating-inducing factors. Equally important is the background of respondents. This study did not look at their influences, particularly the different roles played by the government agencies, contractors and clients. Identifying their specific roles would enable the construction companies to address them individually to increase the probability of project management success. To do so, more data would need to be collected.

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