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ASSESSMENT OF CRITICAL SUCCESS FACTORS (CSFs) FOR THE DEPLOYMENT OF CONSTRUCTION RISK MANAGEMENT PRACTICES IN SRI LANKA

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ABSTRACT

Risk is an uncertain occurrence that, if befalls, has direct and indirect effects on project objectives. In particular, construction projects in developing countries are likely to face a wide range of uncertainties. The evidence available for the effective implementation of risk management practices in developing countries is very little. The existing studies on risk management in developing countries like Sri Lanka, have generally concentrated on identifying and evaluating risks rather than applying risk management systems. This study is aimed to explore the Critical Success Factors (CSFs) for Implementing Risk Management Systems (IRMS) in the Sri Lankan construction industry. The study applied Delphi technique with fifteen industry experts through three rounds of the survey as the methodology to assess CSFs. Analytical Hierarchy Process (AHP) was used in the third round to analytically asses CSFs. The findings of the study disclose that 'Including the costs within projects' budgets for IRMS' and 'Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users' is considered as exceedingly imperative CSFs. In the meantime the meantime 'Attempting to deliver projects systematically on time and within the project's budget', 'Inclusion of risk management systems in engineering education and training modules of construction practitioners', and 'Awareness of risk management systems among stakeholders' is regarded as important factors for IRMS. The study also revealed that a substantial alignment is not found between the current findings of the research and the previous findings of similar studies in the developing world.

KEYWORDS: *Critical Success Factors, CSF, Risk, Construction, Construction Industry*

Article History

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INTRODUCTION

Risk management is a process which turns into a very important element across a number of businesses. Many companies often establish a risk management procedure in their projects for improving the performance and escalate the earnings. Projects carried out in the construction sector are widely multidimensional and have often significant budgets, and thus reducing risks in the project should be a main concern for each project manager (Gajewska & Ropel, 2011). According to the Project Management Body of Knowledge-PMBoK (PMI, 2013), project risk management is one of the ten most crucial parts of project commissioning. Project risk management embraces the processes of conducting risk management planning, identification, analysis, response planning, and monitoring and control of a project.

The objectives of project risk management are to increase the probability and effect of positive events, and decrease the probability and effect of negative events in the project.

The construction industry is every so often considered as a risky sector due to its complexity and tactical nature. It incurs a numerous project stakeholders, internal and external factors which will lead to enormous risks (Renuka, et al., 2014).Disappointingly, the construction industry has a poor status in risk analysis when compared to other industries (Lazzerini & Mkrtchyan, 2011).

According to Bowers & Khorakian, (2014), the evidence available for the effective implementation of risk management system in developing countries is less. The existing studies on risk management in developing countries have mostly focused on identifying and evaluating risks rather than applying risk management systems. Many issues faced by construction industry are preventable over the execution of effective risk management in projects. To evaluate the success of these systems, the first step is to identify the Critical Success Factors (CSF) for Implementation of Risk Management Systems in developing countries (Hosseini, et al., 2016). The existing literature on risk management in developing countries shows that CSF for implementing risk management is an area where researches are lacking. With this background, investigating of the CSF for Implementation of risk management system in construction projects, their interactions and subsequent impact on project success is an overlooked area of study in almost all developing countries (Perera, et al., 2014).

In essence, exploring the perceptions of construction practitioners with regard to the prerequisites of implementing risk management systems in developing countries has become an area in need of investigation (Iqbal, et al., 2015). As revealed by Chileshe & Kikwasi, (2014), there is a strong need to go for further studies of its kind in order to establish and generalize the previous findings in developing world.

LITERATURE REVIEW

The concept of Critical Success Factor (CSF) first came to the body of knowledge in 1979 introduced by Rochart. It was defined as 'the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. Pinto & Covin, (1989) defined CSF as certain rules, executive procedures and environmental conditions. Deros, et al., (2006) defined CSF as a range of enablers which, when put into practice will enhance the chance for successful benchmarking implementation and adoption in an organization. Considering all the definitions within the context of this study, CSFs could be said as the powers of successful implementation of risk management systems.

With the available evidences found in the literature, only a couple of researches have focused on the study area. Chileshe & Kikwasi, (2014) conducted a study titled CSFs for implementation of risk assessment and management practices within the Tanzanian construction industry. The study aimed to investigate the perceptions of construction professionals on CSFs relating to the deployment of risk assessment and management practices. The primary data were composed from 67 construction professionals working with clients (private and public), consultants, and contractor organizations (foreign and local) within the Tanzanian construction industry. A total of ten CSFs was used in the survey. The descriptive and empirical analysis confirmed a difference of the ranking of the ten CSFs among the groups; however, the differences were not significant. Based on the overall sample, the results of the mean score ranking illustrated that "awareness of risk management processes"; "team work and communications"; and "management style" were the three

highest ranked CSFs."Co-operative culture"; "customer requirement"; and "positive human dynamics" were established to be the tiniest most significant.

Hosseini, et al., (2016) carried out a study titled Critical success factors for implementing risk management systems in developing countries. This study was based in Iran based on developing world context. Also, this research was one of the first studies in its kind. The aim of the study was to explore the perceptions of construction professionals regarding the CSFs for execution of risk management systems. A total of 11 CSFs was used in the study and examined. This study has benchmarked the similar study conducted by Chileshe & Kikwasi, (2014)

Conclusion of the study was that four CSFs are as highly critical: 'support from managers', 'inclusion of risk management in construction education and training courses for construction practitioners', 'attempting to deliver projects systematically', and 'awareness and knowledge of the process for implementing risk management'. The researchers had finally concluded that studies ofa similar nature should be carried out in other developing countries in order to test the generalizability of these CSFs.

The following ten CSFs for IRMS were identified for the current study from the available past studies which were carried out by Chileshe & Kikwasi, (2014) and Hosseini, et al., (2016) in developing world context. .

***CSF1*:** Support from managers for implementing risk management systems.

***CSF2*:** Awareness of risk management systems among stakeholders.

***CSF3*:** Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users.

***CSF4*:** Incorporating IRMS among the strategic objectives of organizations involved in projects.

***CSF5*:** Taking into account the effects of the business environment surrounding projects.

CSF6:Attempting to deliver projects systematically on time and within project's budget.

***CSF7*:** Promoting teamwork and communication among the stakeholders.

***CSF8*:** Availability of specialist risk management consultants.

CSF9: Including the costs within projects' budgets for IRMS.

***CSF10*:** Inclusion of risk management systems in engineering education and training modules of construction practitioners.

METHODOLOGY

Survey Method

Considering the nature of the study area the Delphi technique was used to gather primary data for the research. Despite the most of the previous researchers had used questionnaire surveys and interviews to gather primary data, this research selected Delphi technique over other methods because the Construction Risk Management is not a well-matured knowledge area among most of the construction professionals working in Sri Lankan construction industry. Therefore the opinions of general construction practitioners, gathered through questionnaire survey or interview, will not be adequate enough to draw conclusions on the research objectives. Therefore, Delphi technique was considered as the best method suited to the current context for this method targets experts through many rounds of the survey.

The Delphi method is an extensively used and recognized technique used by scholars of various disciplines for gathering data from experts in the study area. The Delphi method was first introduced by Delkey & Helmer, (1963) in their work for the Rand Corporation. At the initial stage of its emergence, a four or five round Delphi method was in use. Later, Brooks, (1979) established that Delphi survey with only three rounds is adequate for consensus building. The basis of the questionnaire for this research was adapted from the validated instrument (questionnaire) used by Hosseini, et al., (2016) within the Iranian construction industry. According to Carless & Paola, (2000), customizing available instruments for a specific environment is acceptable in order to gather primary data for a research.

Selection of Delphi Expert Panel

Selecting a suitable panel of experts is the major aspect which ensures a successful Delphi survey. The key aspects of the selection process include selecting experts with the right qualifications, size of the panel, and participant commitment towards the research.

The number of participants of Delphi survey widely varies in previous studies. It is not fixed on what constitutes a suitable size of the Delphi panel. Clayton, (1997) indicated that having 15 to 30 participants is the widely accepted norm for a standardized group, comprising members from the same discipline. Ziglio, (1996) had also a similar view to Clayton, (1997) reporting that 10 to 15 Delphi participants yield better results in a homogeneous panel. In this background, initially, a total of 22experts was approached to participate in the survey. In round one, a total of 15 participants had successfully responded while the same number of participants was in the rejoinder list of the second round. The third round also had gottenthe same 15 successful replies. The panel had comprised of Senior Project Managers, Senior Engineers, Senior Quantity Surveyors, Senior Academics, representing private and public sectors of the Sri Lankan industry**.**

In the first round of surveys, the preliminary questionnaire, having included 10 CSFs identified from previous studies, was presented to the panel. The experts were also asked to introduce new CSFs, in addition, based on their knowledge and experience. Five point Likert scale, as follows, was used in round one and round two for the experts to rate the importance of the CSFs: 1= strongly disagree; 2= disagree; 3= neutral; 4= Agree; 5= strongly agree. In the second round questionnaire, the panel feedback from the first round was provided below as the number of responses in percentage of the total responses. In the third round questionnaire, top 5 CSFs were chosen for round three. The Analytical Hierarchy Process (AHP)with 9 relative rating score from 1 to 9, as follows, was used in third round to elicit the data; 9=Extreme Importance; 8=Very strong to Extreme; 7=Very Strong Importance; 6=Strongly to Very Strong; 5=Strong Importance; 4=Moderately to Strong; 3=Moderate Importance; 2=Equally to Moderate; 1=Equal Importance. AHP uses a pair wise comparison between parameters.

RESULTS AND ANALYSIS

Sample Demographic Features

Identified panel for the Delphi survey comprised of construction professionals from various disciplines of civil engineering such as road, building, irrigation and water supply with exposure to state and private sector construction projects.

All the panel members have bachelor degree in civil engineering and a total of 10 members have post graduate qualifications in construction project management whereas two other members have post graduate qualifications in civil engineering disciplines. Figure 1 illustrates the experience details of the expert panel.

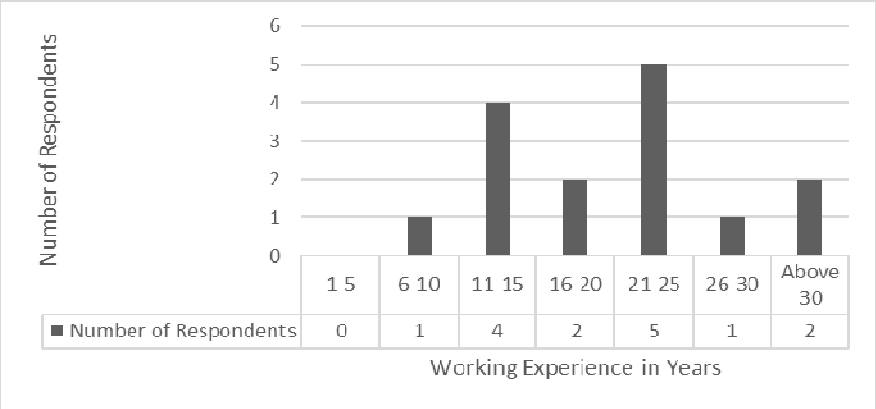

Figure 1: Experience Details of the Delphi Expert Panel

Delphi Round One

Based on the feedback given by the expert panel in round one, by means of five point Likert scale, the mean scores were calculated for every CSF using the Relative Importance Index (RII). The Relative Importance Index (RII) was computed as follows: RII = (W1 + W2 + …+ Wn) /A* N

Where W = weights given to each CSF by the respondents from 1 to 5, ('1' is strongly disagree and '5' is strongly agree),

A = highest weight (i.e. 5 in this case), and N = total number of respondents. No additional CSFs were proposed by the panel in addition to what were in the preliminary questionnaire. A total of 22 experts was approached to participate in the survey. A total of 15 participants had successfully responded to the survey. As illustrated in Table 1, the top three CSFs, respectively *CSF2, CSF3, and CSF10*are so domineering for successfully implementing risk management systems in Sri Lanka.

Table 1: Ratings of CSFs in Round one

Critical Success Factors (CSFs)	RII	Rank
CSF1: Support from managers for implementing risk management systems.	0.774	5
CSF2: Awareness of risk management systems among stakeholders.	0.840	1
CSF3: Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users.	0.826	2
CSF4: Incorporating IRMS among the strategic objectives of organizations involved in projects.	0.706	7
CSF5: Taking into account the effects of the business environment surrounding projects.	0.640	10
CSF6: Attempting to deliver projects systematically on time and within project's budget.	0.786	4
CSF7: Promoting team work and communication among the stakeholders.	0.694	8
CSF8: Availability of specialist risk management consultants.	0.654	9
CSF9: Including the costs within project's budgets for IRMS.	0.760	6
CSF10: Inclusion of risk management systems in engineering education and training modules of construction practitioners.	0.814	3

The first round study additionally reveals that all the other CSFs are also considered to be fairly significant in the process of implementing risk management systems in Sri Lanka as far as the corresponding RII values are concerned.

Delphi Round Two

In Delphi round two, the panel members were presented the summarized panel feedback from round one. The data were presented as the number of responses in percentage of the total responses. The objective of the Delphi round questionnaire two was to offer a chance for the panel experts to reassess their feedback, provided earlier, and to confirm or revise the feedback having reviewed the consensus of the experts. A total of 15 questionnaires was distributed to the experts who were responsive in round one and all the questionnaires were collected on time with a 100 % response rate. As illustrated in Table 2, ranks obtained in round one have been slightly changed by the experts reviewing the panel feedback from round one. The second round established that CSF3, CSF10, and CSF2, are so domineering for the successful implementation of risk management systems. Though the individual ranks of top three CSFs, as perceived in round one, are dissimilar in round two, the experts had come to a consensus that these three CSFs are so important for efficacious application of risk management systems in the Sri Lankan construction industry. Table 3depicts the comparison of ranks of CSFs obtained in round and round two.

Table 2: Ratings of CSFs in Round Two

Critical Success Factors (CSFs)	RII	Rank
CSF1: Support from managers for implementing risk management systems.	0.734	7
CSF2: Awareness of risk management systemsamong stakeholders.	0.880	3
CSF3: Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users.	0.906	1
CSF4: Incorporating IRMS among the strategic objectives of organizations involved in projects.	0.746	6
CSF5: Taking into account the effects of the business environment surrounding projects.	0.666	9
CSF6: Attempting to deliver projects systematically on time and within project's budget.	0.800	4
CSF7: Promoting teamwork and communication among the stakeholders.	0.734	7
CSF8: Availability of specialist risk management consultants.	0.626	10
CSF9: Including the costs within project's budgets for IRMS.	0.760	5
CSF10: Inclusion of risk management systems in engineering education and training modules of construction practitioners.	0.894	2

Table 3: Comparison in Ratings of CSFs in Round One and Round Two

CSFs	First Round		Second Round	
	RII	Rank	RII	Rank
CSF1	0.774	5	0.734	7
CSF2	0.840	1	0.880	3
CSF3	0.826	2	0.906	1
CSF4	0.706	7	0.746	6
CSF5	0.640	10	0.666	9
CSF6	0.786	4	0.800	4
CSF7	0.694	8	0.734	7
CSF8	0.654	9	0.626	10
CSF9	0.760	6	0.760	5
CSF10	0.814	3	0.894	2

Delphi Round Three

From the facts established in round two, the top five CSFs were chosen for the third round where it was tested by means of Analytical Hierarchical Process (AHP). The CSFS were tested with AHP under pair wise comparison. A freely available AHP software, version 04.05.2016, offered by Business Performance Management Singapore was used to analyze the data received by means of 1-9 rating scales between any two CSF.

This software was an AHP Excel template with maximum 20 inputs. The work consists of worksheets for pair-wise comparison, a sheet for the consolidation of all feedbacks, a summary sheet to display result, a sheet for solving the eigenvalue problem using eigenvector method (EVM), and a sheet with reference tables which include random index, limits for geometric consistency index GCI, and judgment scales.

For AHP analyses, a perfectly consistent decision maker should always obtain Consistency Index (CI) = 0, but small values of inconsistency may be tolerated. In particular, if Consistency Ratio (CR) < 0.1 (CR=CI/RI); whereas RI means Random Index. RI value for five criteria (small problems) is 1.12 [17]. Hence, Consistency Index (CR) obtained in every input of the study was figured out and found to be in acceptable limit except only two inputs with CI/RI values 0.11 and0.12; whereas CI/RI value below 0.1 is generally acceptable. Figure 2 and Figure 3 show the weighted geometric mean of participants and comparison matrix respectively as generated by the excel sheet.

	1	2	3	4	5	6	7	8	9	10
1		3.331	3.329	1.939	0.993	0	0	0	0	0
2	0.3		0.993	0.808	0.318	0	0	0	0	0
3	0.3	1.007		0.558	0.228	0	0	0	0	0
4	0.516	1.238	1.792		0.683	0	0	0	0	0
5	1.007	3.144	4.389	1.464		0	0	0	0	0
6	0	0	0	0	0		0	0	0	0
7	0	0	0	0	0	0		0	0	0
8	0	0	0	0	0	0	0		0	0
9	0	0	0	0	0	0	0	0		0
10	0	0	0	0	0	0	0	0	0	

Figure 2: Weighted Geometric Mean of Participants

Matrix		CSF3	CSF10	CSF2	CSF6	CSF9	0	0	0	0	0	normalized principal Eigenvector
		1	2	3	4	5	6	7	8	9	10	
CSF3	1	-	3 1/3	3 1/3	2	1	-	-	-	-	-	31.89%
CSF10	2	1/3	-	1	4/5	1/3	-	-	-	-	-	10.44%
CSF2	3	1/3	1	-	5/9	2/9	-	-	-	-	-	9.07%
CSF6	4	1/2	1 1/4	1 4/5	-	2/3	-	-	-	-	-	16.67%
CSF9	5	1	3 1/7	4 2/5	1 1/2	-	-	-	-	-	-	31.93%
0	6	-	-	-	-	-	-	-	-	-	-	0.00%
0	7	-	-	-	-	-	-	-	-	-	-	0.00%
0	8	-	-	-	-	-	-	-	-	-	-	0.00%
0	9	-	-	-	-	-	-	-	-	-	-	0.00%
0	10	-	-	-	-	-	-	-	-	-	-	0.00%

Figure 3: Comparison Matrix

As shown in the result Table 4 with calculated weights and rank using the EVM, the third round survey had concluded that CSF9 and CSF3 are almost equally important with a very minute margin in calculated weights whereas CSF9 was ranked to be the first and CSF3 came to be the second in ranking. The third, fourth, and fifth CSFs are CSF6, CSF10, and CSF2 respectively. The consensus indicator rangesfrom0% (noconsensus among decision makers) to 100%(full consensus among decision makers). The consensus indicator reached in the study was 67.6%.Principle Eigen Value Lambda of the analysis was 5.044. So the results show that a significant level of consensus has been achieved among the Delphi expert panel members.

Table 4: Ratings of CSFs in round three using AHP

Se.No	CSFs	Normalized Principle Eigenvector (%)	Rank
1	CSF3	31.89	2
2	CSF10	10.44	4
3	CSF2	9.07	5
4	CSF6	16.67	3
5	CSF9	31.93	1

DISCUSSIONS

As one of the forerunner studies in Sri Lanka, the present study attempted to investigate the CSFs for implementing risk management systems in construction projects with a special reference to Sri Lanka as one of the developing nation in the world. The students started identifying lists of CSFs through an extensive literature survey and a total of 10 CSFs were initially presented to the Delphi expert panel members.

After three rounds of the survey, this research concluded that 'Including the costs within projects' budgets for IRMS' is the most important CSF, having obtained the AHP weight of 31.93%, to successfully deploy the risk management systems in Sri Lankan construction projects. It is a clear indication that the construction stakeholders in Sri Lanka are not much keen on allocating money room for IRMS within the budget. Therefore, the study sends a signal towards the construction stakeholders to be keener on allocating money resources for proper risk management systems since it is going to pay back through enhanced and fully accomplished project objectives. The investment in the compulsory implementation of risk management systems will certainly carry return on project performance in countries such as Sri Lanka where risk management is not significantly implemented.

The second most and almost equally important CSF to rank one CSF found through the study, having obtained the AHP weight of 31.83%, is 'Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users'. This CSF is regarded as much important as the ranked one CSF does when the weighted values are concerned. The initiation of risk management systems within projects should originate from clients or end users of the projects so that the rest of the party would join hands in the process of implementing risk management systems. The inclusion of contract clauses on IRMS will make sure that risk management systems are respected and strictly followed by all the stakeholders of construction projects. The study further explores that 'Attempting to deliver projects systematically on time and within the project's budget', 'Inclusion of risk management systems in engineering education and training modules of construction practitioners', and 'Awareness of risk management systems among stakeholders' are regarded as important factors for IRMS.

Construction practitioners in Sri Lanka should attempt to deliver projects systematically respecting major project constraints such as time and budget. Systematic delivery of projects demands an in-depth exposure to knowledge, skills and tools and techniques of project management body of knowledge. The maturity level of project managers on systematic project management and its requirements is reportedly said to be low in Sri Lanka. Also, the engineers who enter the industry right after their studies lack knowledge in the project management body of knowledge. Therefore, it draws a line towards engineering education and training modules should include a detailed project management body of knowledge in teaching spectrum, in particular, risk management systems. The knowledge on systematic project management will certainly a driving factor for construction professionals to be more attentive on IRMS.

Generalizability of CSFs in Developing World

According to the study conducted by reference(Chile she & Kikwasi, (2014)'Awareness of risk management systems among stakeholders' was rated to very top as the foremost CSF in implementing risk management systems in Tanzania. The study steered by Hosseini, et al., (2016) had concluded that 'Support from managers for implementing risk management systems' is the most influencing CSF in implementing risk management systems in Iran. The both of the studies available in the literature, contextualized to developing countries, are not brought into line with the findings of this study, whereas 'Including the costs within projects' budgets for IRMS' is concluded to be the foremost prompting CSF for the successful implementation of risk management systems in Sri Lankan construction projects.

Table 5 shows that the further comparison between the findings of the current research and previous similar studies.

Table 5: Comparison of the Research Findings between Current Study and Previous Studies

Studies	Top 5 Rating of CSFs				
	Rank 1	**Rank 2**	**Rank 3**	**Rank 4**	**Rank 5**
Refernce [8]	Awareness of Risk management Processes	Teamwork and cooperation	Management style	Effective use of methods and tools	Goals and strategic objectives of the organization
Reference[5]	Support from managers	Inclusion of risk management systems in engineering education and training modules of construction practitioners.	Promoting team work and communication among the stakeholders	Attempting to deliver projects systematically on time and within project's budget.	Awareness of risk management systemsamong stakeholders
Present Study	Including the costs within project's budgets for IRMS.	Request for Implementation of Risk Management Systems (IRMS) on projects by clients and end users.	Attempting to deliver projects systematically on time and within project's budget.	Inclusion of risk management systems in engineering education and training modules of construction practitioners.	Awareness of risk management systems among stakeholders

Even though a precise alignment is not found among the findings of the studies, a slight unison has been observed with the finding of the studies conducted by Hosseini, et al., (2016) and the present study where 'Inclusionof risk management systems in engineering education and training modules of construction practitioners', 'Attempting to deliver projects systematically on time and within project's budget', and 'Awareness of risk management systems among stakeholders' are established within the top five CSFs to promote risk management systems in developing countries' construction projects.

CONCLUSIONS

This study brings some additions to the risk management body of knowledge as past studies were not attentive on exploring the major critical success factors for executing risk management systems in developing nations such as Sri Lanka. Thisstudy has endeavored to apply the existing theories, drawn from previous researches, to a different context and validated the CSFs for IRMS in Sri Lanka which is one of the developing countries in the world. Hence this has expanded

the body of knowledge of construction risk management in developing world. This extension of the body of knowledge has drawn a new perspective for addressing the difficulties related to the execution of risk management systems in the developing world. As it is cited by Chileshe & Kikwasi, (2014) investigation of CSFs for IRMS in construction projects and its impacts on project performance is an unnoticed area in almost all the developing countries. Therfore,the available literature is notsufficient enough inorder to reach common consensus on the knowledge of CSFs for IRMS in construction projectsof developing world. So this study has taken a step forwardto also assist in finding generalizabilty of CSFs for IRMS in developing world.

In real sense, the findings of this study will be more beneficial to nurture the construction professionals' consciousness towards CSFs prompting the IRMS in developing world like Sri Lanka.This research will set routes for top level managers to indorse training programmes and educational improvements towards construction risk management. It is also very factual that a solid conclusion towards CSFs in developing world context could be sensibly grasped only if these CSFs are verified and authenticated in some more similar countries.

REFERENCES

1. *E. Gajewska and M. Ropel, "Risk Management Practices in a Construction Project - case study," Division of Construction Management, Goterborg, 2011*
2. *S. Renuka, C. Umarani and S. Kamal, "A Review on Critical Risk Factors in the Life Cycle of Construction Projects," Journal of Civil Engineering Research, pp. 31-36, 2014.*
3. *B. Lazzerini and L. Mkrtchyan, "Analyzing risk impact factors using extended fuzzy cognitive maps," IEEE Systems Journal, vol. 5, pp. 288-297, 2011.*
4. *Anyanful, T. K., &Nartey, E. D. Critical Success Factors In Supply Chain Management In The Banking Sector In Ghana.*
5. *J. Bowers and A. Khorakian, "Integrating risk managemenet in the innovation project," European Journal of Innovation Management, vol. 17, no. 1, pp. 25-40, 2014.*
6. *M. Hosseini, N. Chileshe, J. Jepson and M. Arashpour, "Critical Success Factors for Implementing Risk management Systems in Developing Countries," Construction Economicsnand Building, vol. 16, no. 1, pp. 18-32, 2016.*
7. *B. Perera, R. Rameezdeen, N. Chileshe and M. Hosseini, "Enhancing the effectiveness of risk management practices in Sri Lankan road construction projects: A Delphi approach," International Journal of Construction Management, pp. 1-19, 2014.*
8. *S. Iqbal, R. Choudhry, K. Holschemacher and J. Tamosaitiene, "Risk management in construction projects," Technological and Economic Development of Economy,, vol. 21, no. 1, pp. 65-78, 2015*
9. *N. Chileshe and G. J. Kikwasi, "Critical success factors for implementation of risk assessment and management practices within the Tanzanian construction industry," Engineering, Construction and Architectural Management, pp. 291-319, 2014*
10. *J. Pinto and J. Covin, "Critical Factors in Project Implementation: A Comparison of Construction and R&D*

Projects," Technovation, vol. 9, no. 1, pp. 49-62, 1989

11. *B. Deros, S. Yusof and A. Salleh, "A survey on critical factors and problems in implementing benchmarking towards achieving business competitiveness in SMEs," Journal of Kejuruteraan, pp. 29-37, 2006*
12. *C.-C. Hsu and B. Sandford, "The Delphi Technique: Making Sense of Consensus," Practical Assessment Research & Evaluation, vol. 12, no. 10, 2007.*
13. *N. Delkey and O. Helmer, "An Experimental A pplication of the Delphi Method to the Use of Experts," Management Science, vol. 9, no. 3, pp. 458-467, 1963.*
14. *K. Brooks, "Delphi Technique: Expanding Applications," North Central Association Quarterly, vol. 53, no. 3, pp. 377-385, 1979.*
15. *Carless and C. D. Paola, "The Measurement of Cohesion in Work Teams," Small Group Research, vol. 31, no. 1, pp. 71-88, 2000.*
16. *M. J. Clayton, "Delphi: A Technique to Harness Expert Opinion for Critical Decision-Making Tasks in Education," An International Journal of Experimental Educational Psychology, vol. 17, no. 4, pp. 373-386, 1997.*
17. *E. Ziglio, The Delphi Method and Its Application to Social Policy and Public Health, Jessica Kingsley Publishers,, 1996.*
18. *T. Saaty, The Analytic Hierarchy Process, New York: McGraw-Hill, 1980.*