

Ranking the Project Management Success Factors for Construction Project in South India

K Aneesha and M K Haridharan*

School of Civil Engineering, SASTRA University, Thanjavur – 613 401. India.

*Email: haridharan@civil.sastra.edu.

Abstract. In Today's construction industry, to achieve a greater advantage over the firms, success of each project and efficiency is required. Effective Project Management overcomes these types of challenges. This study identifies the success factors which are important for project management in construction project success. From the literature review, 26 factors were found to be critical. Project managers, construction managers, civil engineers, contractors and site engineers were the respondents. After analyzing the data in SPSS software, the dominant factors from the regression analysis are top management support, competent project team, abilities to solve problems, realistic cost and time estimates, information/communication, competency of the project manager are the 6 factors out of 12 in 26 factors. Effective communication between stakeholders got highest priority and client involvement, good leadership, clarity of project goals got second priority. Informal communication gives better results compared to formal communications like written formats. To remove communication barrier with the stakeholders, informal communication like speaking face-to-face with the language this fits for the stakeholders.

1. Introduction

Construction industry of India is the indicator of the development. It is the second largest industry in India after agriculture. Quick development in the construction sector can boost up other industrial sectors like cement, paints, fitting and fixtures, chemicals and steel industries. Some of the major challenges in the industry are skilled and reliable workers, safety of workers as well as industry and limited time, resource and space constraints. To overcome these and for reducing cost, time and quality challenges in construction, effective project management should be required. Role of project management in construction is more now a day to meet specific constraints [1]. The empirical study about current practice in project management and found critical success factors and explained about the present level of project management in Indian construction industry [2-3]. Private sector using project management better compared to public sector. Defined the project management as use of knowledge, tools, skills and techniques to the project to meet specific project requirements and explained about the application of project management in construction industry [4].

In reality and in scientific view, project management practices are different [5]. Choosing of any work which is advanced in the project, project manager should have a lead role to choose that work [6]. [7-9] Found the difference between project success criteria and project success factors by



using definitions and categorized criteria's and success factors. Explained about the key success factors of project management and how to overcome problems of project management in practice using these factors were explained in [10]. [11] Described about the relationship between project performance and critical success factors and identified the critical success factors of project success. [12] Explained about the critical success factors of project and project management. In addition to this, Project Excellence Model which is related about linking the project critical success factors with project success criteria was explained.

[13] Enlightened that why projects continued to failing if factors and criteria for success are known. Author proposed a Square Route which eliminates the Type I and Type II errors in project management success criteria. Using critical factors, construction companies change their policies for their project success and these critical success factors differs with respect to project manager, team, organization etc. [14-15]. The variables for project success, combination of four independent subsystems gives project success [16]. Those are strategic, structural, technical and managerial. [17] Explained about the criteria and factors of project management success. What to be achieves describes about the criteria whereas how to achieve describes about factors in project management. [18] Discussed about the best practices in project management. Technical and people oriented themes came into picture for best practices in project management. [19] Explained about the success evaluation factors in construction project management in small and medium Portuguese companies. Factors which are important for project success is complete the project within budget, on schedule, complete according to requirements, customer acceptance. It was shown that superior technology and performance is the major difference between larger and smaller companies. Smaller companies should compete harder in the market and to satisfy customer with innovative ideas. [20] Explained about the complexity of project management in developing countries. Research found that project manager should have ability to understand the complexity of project and their effects of project success. [21] Discussed about the critical success factors needed for effective construction management in Malaysian industry.

2. Problem Statement

Construction industry in all world faces problems of quality, budget and time overrun. Recent technology development in the construction industry reduces the time but failed to expect the perfect estimated time because of onsite and unexpected challenges. Effective project management overcome all these challenges by using knowledge, skills, experience etc. from the conception to completion of project. Finding the critical success factors are important for effective project management. Critical success factors help to find out the areas that should be performed well. These factors act as indicators to measure the organization performance in project management. These factors are measured, monitored and tracked for performance. Improvements in the critical success factors will give better results in the project management success in construction projects.

3. Objective of the study

- Understand the importance of project management in the construction industry.
- To examine the success criteria of project management and find out the critical success factors of project management success in construction project success.
- To rank the critical success factors of project management success.
- To give recommendations for improvements in the practices of critical success factors.

4. Methodology

The methodology is the general research strategy that outlines the way in which research is to be undertaken and identifies the methods to be used in it. Procedure and methods in this research are:

4.1. Study population

The research study consists of respondents in the construction companies specifically in South India.

4.2. Sampling Technique

To select respondents, random sampling method was used. In order to ensure reliability of the data, mostly respondents chosen are the project managers, construction managers.

4.3. Data collection method

To collect the primary data from the respondents, a structured questionnaire was implemented. The primary data collected from the construction professionals in the South Indian construction companies.

4.4. Questionnaire Design

A questionnaire was developed by finding out the common critical success factors from the literature review. 25 factors were found important from literature review and those were used in the questionnaire. Construction industry employees (project manager, construction manager, site engineer, contractor and civil engineer) have more knowledge on project management are the targeted group of respondents. In primary data, two sections which deals about the respondents' demographic profile and critical success factors of project management. This primary data was collected from the respondents through the mail and face-to-face interviews. Out of 150, 116 respondents gave their opinion. Five-point Likert scale was used to take the opinion of the respondents on factors in the questionnaire. This scale ranges from 1=strongly disagree to 5=strongly agree. Refer Appendix for detailed questionnaire.

4.5. Data analysis tool

Analysis of the data was done by using Statistical Package for the Social Sciences (SPSS). For finding out the internal consistency of the data Reliability analysis was used. Frequency Analysis was done for the demographic profile data to know the frequency of occurrence of a variable. Regression Analysis was used to find the significant variables in the factors. Critical success factors are ranked according to the highest mean of the given variables.

5. Results and Discussions

To analyse the data, first step is to check the reliability. It refers the degree to which it is error-free. It gives the consistency of a measuring test and tells that confidence of a researcher placed on the questionnaire to give same numeric value when the measurement is repeated on the same question. Cronbach's Alpha is used to find the reliability. Normally Cronbach's Alpha reliability coefficient ranges from 0 to 1. Lower limit is not there to the coefficient. Closer the coefficient value to 1, greater is the internal consistency of the data. In below table 1. Cronbach's Alpha coefficient is 0.815. Found Cronbach's Alpha coefficient >0.8 is a reasonable goal[22]. So, all items are approved for the subsequent data analysis.

Table 1. Reliability Analysis

Cronbach's	
Alpha	N of Items
0.815	26

To transfer the raw data into grouped data, frequency distribution is used. Frequency distribution tells about the frequency of values or ranges of values for a variable. Here variable related to the respondents demographic profile. From the below table 2, it was shown that highest range of age of the respondents in this survey are 26-35 with percentage 41.4 followed by 18-25 with percentage

28.4. In this survey, most of the respondents are male with percentage 75.9 followed by female with percentage 24.1. 61.2% of the respondents completed graduate and 13.3% of respondents completed post graduate. Mostly 36.2% of the respondents are having 2-6 years of experience in their field. 20.7% of respondents having less than 1 year experience. Most of the survey was taken in urban construction companies. 62.9% from urban, 27.6% from semi-urban and 9.5% from rural. 40.5% of projects having budget of 26-50 and 25% of projects having budget of 51-75.

Table 2. Demographic profile of the respondents

S.No	Variables	Description	Majority wise first	Majority wise second	Majority wise third	Majority wise fourth
1	Age	Category	26-35	18-25	36-45	Above 55
		Percentage value	41.4	28.4	21.6	6
2	Gender	Category	Male	Female		
		Percentage value	75.9	24.1		
3	Education Qualification	Category	Graduate	Post Graduate	Diploma	
		Percentage value	61.2	26.7	12.1	
4	Number of projects handled	Category	Less than 5	6-10	7-11	12-16
		Percentage value	43.1	26.7	22.4	7.8
5	Experience in years	Category	2-6	Less than 1	Above 16	7-11
		Percentage value	36.2	20.7	19.0	17.2
6	Location	Category	Urban	Semi Urban	Rural	
		Percentage value	62.9	27.6	9.5	
7	Average budget of the project	Category	26-50	51-75	Less than 25	76-100
		Percentage value	40.5	25	13.8	11.2

Relationship between dependent and independent variable comes by using regression analysis. In below table 3 shows the significant value of the independent variables with respect to dependent variable. This significant value tells about how much relationship exist with dependent variable. In this table, T comes from coefficient (B) divided by the standard error (Std. Error). B is called unstandardized coefficient and Beta is called standardized coefficient. Unstandardized coefficient tells about amount which dependent variable changes by changing one unit of independent variable keeping other independent variable constant. Standardized coefficient calculated using standard deviation.

Table 3. Regression Analysis

S.NO	Model	Coefficients			T	Sig.
		Unstandardized Coefficients		Standard Coefficients		
		B	Std. Error	Beta		
	(Constant)	.024	0.705		0.034	0.973
1	Top management support	-0.238	0.082	-0.235	-2.892	0.005
2	Monitor performance and feedback	-0.052	0.086	-0.059	-0.611	0.543
3	Competent project team	0.219	0.091	0.191	2.416	0.018
4	Problem solving abilities	0.309	0.106	0.221	2.925	0.004
5	Realistic cost and time estimate	0.211	0.091	0.238	2.336	0.022
6	Management of risk	0.050	0.106	0.041	0.469	0.640
7	Information/Communication	0.274	0.082	0.258	3.328	0.001
8	Detail plan in design and construction	0.002	0.099	0.021	0.225	0.822
9	Participation/involvement of the client	-0.051	0.093	-0.049	-0.542	0.589
10	Understanding of the project	0.028	0.084	0.027	0.329	0.743
11	Project Manager competency	0.389	0.098	0.343	3.977	0.000
12	Clarity of project goals	0.069	0.135	0.049	0.513	0.610
13	Effective communication between stakeholders	0.075	0.091	0.065	0.825	0.412
14	Schedule performance	0.263	0.100	0.229	2.642	0.010
15	Sufficient financial budget	-0.070	0.095	-0.064	-0.735	0.464
16	Technical capability of the project manager	-.0185	0.082	-0.178	-2.241	0.028
17	Commitment of all project participants	0.282	0.094	0.248	3.009	0.003
18	Well-laid out specifications	0.061	0.089	0.059	0.692	0.491
19	Good Leadership	-0.239	0.106	-0.188	-2.247	0.027
20	Clear and realistic goals	-0.133	0.100	-0.118	-1.335	0.185
21	Past experience of project management technology and tools	-0.269	0.095	-0.243	-2.837	0.006
22	Complete the project according to	0.056	0.088	0.053	.635	.527

	requirements					
23	Use of superior and appropriate technology	-0.167	0.080	0.053	-2.095	.039

Dependent Variable: Overall employee acceptance for usage of project management in project success.

$$Y = .024 + (.235)x_1 + (.059)x_2 + (.191)x_3 + (.221)x_4 + (.238)x_5 + (.041)x_6 + (.258)x_7 + (.021)x_8 + (-.049)x_9 + (.027)x_{10} + (.343)x_{11} + (.049)x_{12} + (.065)x_{13} + (.0229)x_{14} + (-0.064)x_{15} + (.178)x_{16} + (.248)x_{17} + (.059)x_{18} + (.188)x_{19} + (.118)x_{20} + (.243)x_{21} + (.053)x_{22} + (-.053)x_{23} \quad (1)$$

Y is the overall usage of project management in project success. Above equation states that impact of project management variables on overall employee acceptance for usage of project management in project success. The result of t test disclose about the calculated significance of the regression coefficient (-0.235, 0.191, 0.221, 0.238, 0.258, 0.343, 0.229, -0.178, 0.248, -0.188, -0.243, 0.053) are having 0 and 5 percent respectively. From the above coefficient table it is concluded that variables of project management success in construction project success are top management support, competent project team, problem solving abilities, realistic cost and time estimates, communication, project manager competency, schedule performance, project manager technical capabilities, commitment of all project participants, good leadership, past experience of project management technology and tools, use of superior and appropriate technology. The top management support, project team, information/communication have direct impact on project success[23]. The top management involvement shows major differences of project management in the construction industry and software sectors [24-25]. Time and quality is important but not considered as a critical success criteria for project success.

Factor analysis is used to group the factors which explain same information. It is useful to summarize the data into a small number of factors by considering a large number of factors. Below Table 4 reduced the 26 factors into 9 factors.

Eigen value which is shown in the above table 4 explains about measure of variance of the observed variables a factor explains. An Eigen value ≥ 1 having more variance than a single observed variable. In this table, total 9 factors got Eigen value ≥ 1 . So, 26 factors are reduced to 9 factors.

1. Planning, estimation and monitoring
2. Time and cost management,
3. Client participation with definite objectives
4. Capability of project manager towards particular project
5. Competent team work with satisfaction
6. Communication towards reaching objectives
7. Management support and participants commitment
8. Updated technology and
9. Deliver directions with specification are the reduced number of factors from the 26 factors.

Ranking the factors is important to know which factors influence the project management success most. Below table 5 shows the ranking of factors using mean.

Table 4. Factor Analysis

Factor	Item	Rotated Factor Loadings	Eigen Value	% of Variation	Factor Name
I	Monitor performance and feedback	0.805	5.007	19.26	Planning, estimation and monitoring
	Realistic cost and time estimate	0.737			
	Detailed plans in design and construction	0.515			
II	Schedule Performance	0.812	2.148	8.263	Time and cost management
	Adequate budget	0.623			
III	Client involvement	0.682	1.895	7.288	Client participation with definite objectives
	Clarity of project goals	0.76			
IV	Project understanding	0.639	1.566	6.024	Capability of project manager towards particular project
	Project manager technical capabilities	0.774			
V	Competent project team	0.725	1.431	5.504	Competent team work with satisfaction
	Overall Employee satisfaction	0.735			
VI	Communication	0.633	1.307	5.025	Communication towards reaching objectives
	Clear and realistic objectives	0.71			
VII	Top management support	0.736	1.257	4.836	Management support and participants commitment
	project participants commitment towards goals	0.747			
VIII	Use of superior and appropriate technology	0.87	1.162	4.471	Updated Technology
IX	Well laid out specifications	0.581	1.019	3.919	Deliver directions with specification
	Good Leadership	0.804			

Table 5. Ranking Factors using mean

S.No		Mean	Std. Deviation	Rank
1.	Top management support	3.4310	1.23868	17
2.	Monitor performance and feedback	3.0862	1.40539	25
3.	Competent project team	3.5948	1.09527	7
4.	Problem solving abilities	3.4914	0.89923	16
5.	Realistic cost and time estimate	3.2069	1.41124	24
6.	Management of risk	3.2845	1.03677	23
7.	Communication	3.5000	1.18322	15
8.	Detailed plans in design and construction	3.5862	1.18739	9
9.	Systematic control over project execution	3.4310	1.12848	17
10.	Client involvement	3.6724	1.20705	2
11.	Project understanding	3.3276	1.23553	22
12.	Project manager competence	3.6466	1.10536	5
13.	Clarity of project goals	3.6724	0.88245	2
14.	Effective communication between stakeholders	3.7328	1.09034	1
15.	Schedule performance	3.5345	1.09092	12
16.	Adequate budget	3.5862	1.15019	9
17.	Project manager technical capabilities	3.5172	1.21213	14
18.	Project manager commitment towards goals	3.5690	1.12075	11
19.	Project participants commitment towards goals	3.6121	1.10155	6
20.	Well-laid out specifications	3.3966	1.20057	20
21.	Good Leadership	3.6724	0.98489	2
22.	Clear and realistic objectives	3.5259	1.11481	13
23.	Project management methods and tools	3.5948	1.13428	7
24.	Complete the project according to requirements	3.3707	1.18344	21
25.	Use of superior and appropriate technology	3.4224	1.37145	19

In the above table 5 shows highest mean having highest ranking. Here the top 5 success factors of project management success in construction project success are effective communication between

stakeholders, good leadership, and clarity of project goals, client involvement and competency of project manager. [26] research found that communication among stakeholders, competency and commitment are more important in construction project management. The success factors having schedule performance and budgeted performance have 7th and 8th factor in project management for project success[27]. In this survey, schedule performance and adequate budget have 12th and 9th factor because of increasing of other important factors in this study. Monitoring of the project, effective coordination, effective decision making, feedback capabilities, plan and schedule, team work and control mechanisms are the critical success factors of project management[28]. The study about critical success factors of project management in sustainable housing development. Project manager authority, communication/information, effective planning, monitoring and performance and feedback are the success factors for sustainable housing development[29]. [16] Explained about the factors of project management and project success. According to project management, cost, time, quality and client satisfaction are the success factors. [14] Adequate fund for execution have highest ranking in the success factors followed by professional and technical skills, relationship with stakeholders, companies financial strength, client decision making process. In this survey, adequate budget have 9th factor for project success. The success factors of sustainable housing in Nigeria. In his research [30] competent project team, support from the top management, adequate fund and resources, realistic cost and time estimates have 1, 5, 6, and 10. In this survey these factors have ranking of 7, 17, 9, and 24. [31]. The user involvement, good planning and estimation, good leadership and team members technical skills have top 4 success factors for project success. Top 4 critical factors in project management are project mission, top management support, project plan and schedule, client consultation. Classified critical factors into strategic and tactical[32]. Project mission, top management support and project scheduling have highest ranking in strategic factors. Client consultation, personnel selection and training have highest ranking in tactical factors.

6. Conclusion

The significant factors found by using regression analysis are support from top management support, competent project team, abilities to solve problems, realistic cost and time estimates, information/communication, competency of the project manager, schedule performance, technical capability of the project manager, commitment of all project managers, good leadership, past experience of project management tools and technology and use of superior and appropriate technology. Using factor analysis, 25 factors were reduced to 9 factors. These are

1. Planning, estimation and monitoring,
2. Time and cost management
3. Client participation with definite objectives
4. Capability of project manager towards project
5. Team work
6. Communication towards reaching objectives
7. Management support and participants commitment
8. Updated Technology
9. Deliver directions with specification.

From ranking of the factors using mean, effective communication between stakeholders got highest ranking. Clarity of project goals, good leadership and client involvement has second priority. Project manager competence, project participants' commitments towards goals have third and fourth priority.

7. Recommendations

- Bringing talented pool of employees within organization give better results. They have the ability to solve complex situations within less time. Good HRM should be developed. This play a major role in the construction industry.
- In small scale industries also project management training should be required. Most of the small industries face cost and time overrun because of inexperience in the initial stage.

- Proper training in the conception stage in the project management gives fruitful results in the upcoming future.
- Planning, scheduling and estimation are the main area to be focused by the project manager.
- The communication between stakeholders is most important in project management success. To improve this communication between stakeholders, maintain the long term relationship with stakeholders.

References

- [1] Munns A K and Bjeirmi B F 1996 The role of project management in achieving project success. *Int. J. Proj. Manag.* **14** 81-7.
- [2] White D and Fortune J 2002 Current practice in project management- an empirical study *Int. J. Proj. Manag.* **20**(1) 1-11.
- [3] Auti A and Skitmore M 2008 Construction project management in India. *Int. J. Constr. Manag.* **8**(2) 65-77.
- [4] Matos S and Lopes E 2013 Prince2 or PMBOK—a question of choice. *Procedia Technol.* **9** 787-94.
- [5] Prakash M and Udayashankar D Project Management Practices and Risk Perception in Construction Companies. *IOSR J. Mech. Civ. Eng. (IOSR-JMCE)* 37-42.
- [6] Serbanoiu I, Verdes M, Serbanoiu A A, Serbanoiu B V and Munteanu M 2016 Actual Trends in Construction Project Management in Romania. *Adv. Eng. Forum* **21** 587-95.
- [7] Muller R and Turner R 2010 Leadership Competency profiles of successful managers *Int. J. Proj. Manag.* **28** 437-48.
- [8] Ika L A 2009 Project success as a topic in project management journals. *Proj. Manag. J.* **40**(4) 7-19.
- [9] Basu R 2014 Managing quality in projects: An empirical study. *Int. J. Proj. Manag.* **32**(1) 178-87.
- [10] Clarke A 1999 A practical use of key success factors to improve the effectiveness of project management. *Int. J. Proj. Manag.* **1** 7139-45.
- [11] Alia Z, Zawawi E M A, Yusof K and Aris N M 2014 Determining critical success factors of project management practice: A conceptual framework. *Procedia-Social and Behavioral Sci.* **153** 61-9.
- [12] Shahin A and Jamshidian M 2006 Critical success factors in project management: A comprehensive review. *Proc. 1st Int. Proj. Manag. Conf.* 1-14.
- [13] Atkinson R 1999 Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *Int. J. Proj. Manag.* **17** 337-42.
- [14] Mohmood S and Sajid A D 2012 Exploring the Critical Success Factors of construction companies of developing countries. *Res. J. Soc. Sci. Manag.* **1** 8-16.
- [15] Naoum S, Fong D, Walker G (2004). Critical Success Factors in project management. *Globalisation Constr.* 817-27.
- [16] Abdulrahman B A and Abdallah F A N 2014 Critical Success Factors in project management: critical review of secondary data. *Int. J. Sci. Eng. Res.* **5**(6) 325-31.
- [17] Els M, der Merwe M F V and Hauptfleisch 2012 Critical success criteria and success factors in project management: A quest to enhance generic professional practices. 1-15.
- [18] Loo R 2002 Working towards best practices in project management: a Canadian case study. *Int. J. Proj. Manag.* 93-8.
- [19] Ribeiro P, Paiva A, Varajao J and Dominguez C 2013 Success evaluation factors in construction project management- some evidence from medium and large Portuguese companies. *KSCE J. Civ. Eng.* **17**(4) 603-9.
- [20] Yanwen W 2012 The study of complex project management in developing countries 2012 *Proc. Int. Conf. Solid State Devices and Mater. Sci.* 1547-52.
- [21] Norizam A and M A Malek 2013 Developing Critical Success Factors(CSF) for effective

- construction management in Malaysia Industry *Canadian Center Sci. Educ.* **9** 212-8.
- [22] Gliem J A and Gliem R R 2003 Calculating, interpreting and reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales. *Proc. Conf. Adult, Continuing, and Continuity Educ.* 82-8.
 - [23] Gemuenden H G and Lechler T 2009 Success factors of project management: The Critical Few-an Empirical investigation. *Proc. Portland Int. Conf. Manage. Technol.* 375-7.
 - [24] Varajao J, Dominguez C, Ribeiro P and Paiva A 2014 Critical success aspects in project management: similarities and dissimilarities between the construction and the software industry *Tehnicki vjesnik* **21**(3) 583-9.
 - [25] Shokri-Ghasabeh M and Kavooosi-Chabok K 2009 Generic project success and project management success criteria and factors: Literature review and survey. *World Sci. Eng. Academy S.* 456-68.
 - [26] Micheal J, Deepak T J and Tong I S Y 2014 Ranking the Factors that Influence the Construction Project Management Success: Malaysian Perspective. *Civ. Environ. Res.* **6**(1) 80-8.
 - [27] Gar KK 2014 Critical Success Factors of Project Management for Dam Construction Projects in Myanmar Doctoral *Dissertation. BRAC University.*
 - [28] Omran A, Abdulbagei M A and Gebril A O 2012 An Evaluation of the Critical Success Factors for Construction Projects in Libya. *Int. J. Econ. Behav* **2**(1)17-25.
 - [29] Ihuah, Paulinus W, Iyenemi I K, and David Eaton 2014 A review of Critical Project Management Success Factors (CPMSF) for sustainable social housing in Nigeria. *Int. J. Sust. Built Environ.* **3**(1) 62-71.
 - [30] Attarzadeh I and Siew H O 2008 Project management practices: the criteria for success or failure. *Communications of the IBIMA* **1**(28) 234-41.
 - [31] Pinto JK and Slevin D P 1987 Critical factors in successful project implementation. *IEEE T. Eng. Manage.* **1** 22-7.
 - [32] Schultz R L, Slevin D P and Pinto J K 1987 Strategy and tactics in a process model of project implementation. *Interfaces* **17**(3) 34-46.