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## Critical Success Factors Influencing the Performance of Construction Industries

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**ABSTRACT:** Project managers would have a clear understanding of which aspects of projects might be critical for their successful completions. For a project to be successful, it is essential to understand the project requirements right from the start and go for project planning which provides the right direction to project managers and their teams and execute the project accordingly. A successful project is one that is delivered on time and managed within the budget, Time, cost and quality have been recognized as “triple constraint” or important elements of project success. The study of project success and critical success factors is often considered as one of the vital ways to improve the effectiveness of project delivery. Successful construction projects greatly depend on how the project has been managed and controlled. The critical success factors are more useful in decision-making support. The major objective of this study was to identify, categorize, and prioritize a general set of critical success factors for construction sectors of various backgrounds. This study relied mainly on analytical, descriptive and field study methodologies. A questionnaire was designed in the light of the literature review and tested by pilot study, and then it is applied on a sample of 100 contracting companies. Collected data is manipulated by SPSS software using many statistical tools as, frequencies, percentile values, Means, Pearson co-relation coefficient, regression analysis and One-Way ANOVA test.

**KEYWORDS:** critical success factors, construction industry

### I. INTRODUCTION

GENERAL Project is a complex, non-routine, one-time effort limited by time, budget and resource and performance specifications designed to meet customer needs. A construction project is completed through a combination of many events and interactions, planned or unplanned, over the life of a facility, with changing participants and processes in a constantly changing environment. Project managers would have a clear understanding of which aspects of projects might be critical for their successful completions. For a project to be successful, it is essential to understand the project requirements right from the start and go for project planning which provides the right direction to project managers and their teams and execute the project accordingly. A successful project is one that is delivered on time and managed within the budget, Time, cost and quality have been recognized as “triple constraint” or important elements of project success. The study of project success and critical success factors (CSFs) is often considered as one of the vital ways to improve the effectiveness of project delivery. Successful construction projects greatly depend on how the project has been managed and controlled. The critical success factors are (CSFs) are more useful in decision-making support. The study of project success and critical success factors (CSFs) is a means of understanding and thereby improving the effectiveness of construction projects.

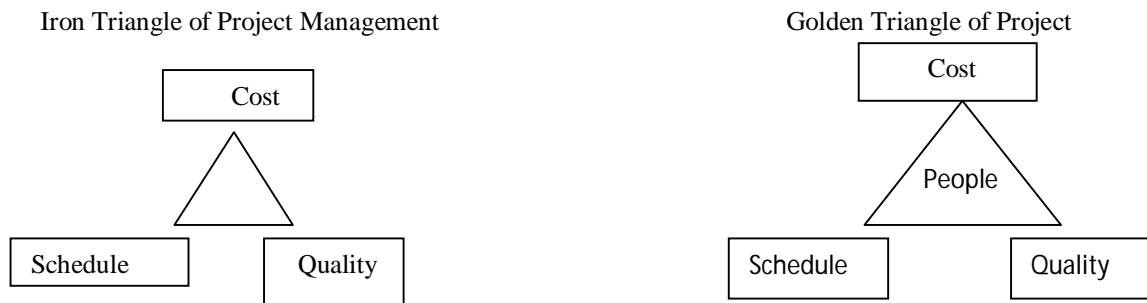
#### PROJECT MANAGEMENT AND SUCCESS CRITERIA

Projects can be considered as a set of activities that must be completed in accordance to specific objectives which involve the utilization of a company's resources. The project management is coordinating a process of interrelated functions such as planning, organizing and controlling construction activities for getting successful outcomes. Success criteria are “measures by which success of a project or business will be judged”.

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**Figure 1 Golden vs. iron triangle of project management**

The iron triangle of project management emphasizes the relationships among cost, schedule and quality. The golden triangle of project management emphasizes the relationships among cost, schedule, quality and people by placing people at the centre of the iron triangle (Figure 1). People are the one element that ties the other elements together. Mostly emphasis will be given to iron triangle. The emphasis on people in the golden triangle helps maintain a balance among cost, schedule and quality.

**CRITICAL SUCCESS FACTOR CRITERIA** Success criteria according to owners, designers and contractors are as follows:

- **Owner's criteria** Owner's criteria for measuring success are: on schedule; on budget; function for intended use; end result as envisioned ; quality; aesthetically pleasing and return on investment.
- **Designer's criteria** Designer's criteria for measuring success: satisfied client; quality architectural product; met design fee and profit goal; professional staff fulfilment; met project budget and schedule; minimal construction problems (easy to operate, constructible design); socially accepted (community response); client pays (reliability); and well defined scope of work.
- **Contractor's criteria** Contractor's criteria for measuring success: meet schedule (preconstruction, construction, design); profit; under budget; quality specification met or exceeded; no claims (owners, subcontractors); safety; client satisfaction.
- **Common Criteria** Priority item and one that appears in all three lists (designer, owner, and contractor) in some form is the financial reality of doing business. The owner wants the project completed on time and on budget, and the designer and contractor both expect to meet certain profit or fee goals. All three viewpoints also recognize the absence of any legal claims or proceedings on a project as a desirable outcome. In other words, this is a major criterion for measuring success. Another common thread among the three groups involves meeting an appropriate schedule as a way of measuring or determining if a project was successful.
- **Unique criteria** It is also evident that there are some unique factors associated with each of the three groups. The designer for instance is looking for a project that will increase the level of professional development and professional satisfaction among his employees. Safety is a high-priority issue for the contractor that would not normally be an issue with the other two groups, because their employees are at much less risk during the design or operation of a building than the contractor's workers is during the construction of a building.

**RESEARCH OBJECTIVES:** In view of the background of the research problem, the broad objective of this study is to develop a multi-dimensional performance evaluation framework encompassing, economic, social and environmental dimensions of public sector construction projects. Specific objectives of research are to:

- To Identify the KPI appropriate for measuring performance of construction projects.
- To Identify the CSF influencing the success of a construction industry.
- To study the Association between stakeholders' (client, consultant and contractor) on construction projects and occurrence of cost overrun, time overrun and quality defects.

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- To examine the extent of differences in the occurrence of cost overrun, time overrun and quality defects across different types of construction projects.
- To study the relationship between position of stakeholders (client, contractor, consultant) and type of project (industrial, domestic, hospital, agricultural) towards success factors of construction projects.
- To study the relationship between factors determining the success and the outcome of prediction factors based thesis (cost, time, quality & disputes) towards factors determining the success of construction projects.
- To study the impact between type of project and position of stakeholders towards factors determining the success of construction projects.
- To study the impact of the factors determining the success and the outcome of prediction factors based thesis (cost, time, quality & disputes) towards factors determining the success of construction projects

## II. LITERATURE REVIEW

Zarina Alias(2014) says that Critical success factors (CSFs) are inputs to project management practice which can lead directly or indirectly to project success. It encompasses many elements, which have to be synchronized to ensure the project delivery on time. The purpose of this study is to identify the extent of the relationship between CSFs and project performance. The research findings will be expected to assist the organization in evaluating the performance of project management. Finally, the conceptual framework was developed by identifying five variables for project success namely Project Management Action, Project Procedures, Human Factors, External Issues and Project Related Factors.

Adnan Enshassi et.al.(2009) studies briefly about the construction projects located in the Gaza Strip, Palestine suffer from many problems and complex issues. Consequently, the objective of this paper is to identify the factors affecting the performance of local construction projects; and to elicit perceptions of their relative importance. A comprehensive literature review was deployed to generate a set of factors believed to affect project performance. A total of 120 questionnaires were distributed to 3 key groups of project participants; namely owners, consultants and contractors. The survey findings indicate that all 3 groups agree that the most important factors affecting project performance are: delays because of borders/roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials. Based on these findings, the paper recommends that: 1) project owners must work collaboratively with contractors and facilitate regular payments in order to overcome delays, disputes and claims; 2) project participants should actively have their input in the process of decision-making; and 3) continuous coordination and relationship between project participants are required through the project life cycle in order to solve problems and develop project performance.

## III. RESEARCH METHODOLOGY

This chapter details the methodology and procedures which are used in the field study. This chapter deals with the research method, research population and sample, sample characteristics, research tools, Internal Consistent Validity, Questionnaire

Reliability, as well as list of statistical procedure used in the study.

### METHODOLOGY

This research used descriptive analytical method. Also primary and secondary data were used.

#### Secondary Data

This type of data is gathered from:

1. Books and references;
2. Periodicals, papers and master thesis;
3. Contractors unions such as builders association of India was considered ;
4. Internet and its electronic versions.

#### Primary Data

This type of data was collected in the following steps:

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1. Interviews with contracting firm's managers in and around Chennai to find out the crucial factors success.
2. Interviews with experts, academics and professionals to enrich the research results.
3. Questionnaire setting up through the following steps:
  - Primary design in the light of knowledge published in literature
  - Relevance test by research's supervisor.
  - Questionnaire adjustment as per supervisor's instruction.
  - External experts and specialists judgment.
  - Pilot study.
  - Modifications according to pilot study.

Questionnaire in a final format which was used in the field study (See appendix -2). The following are the basic dimensions of questionnaire:

1. Personal Characteristics of the contract and the position.
2. Organizational Characteristics of Companies;
3. Mission and Goals; (experience and the number of projects handled per year).
4. Managerial Skills for contractors;
5. Financial resources;
6. Cost Control;
7. Procurement approach employed;
8. Project start and finish time.
9. Type of project etc

## IV. DATA ANALYSIS AND INFERENCE

While inputting the data it was observed that a few sections of the questionnaire were not fully completed. Such sections were left blank for purposes of proper analysis. The SPSS Missing Data Analysis option was used to analyse the noted patterns in the data. The Replace Missing Values option was used to replace the missing values that were not significant with mean of all valid responses as is the norm with similar studies . Those respondents with a significant number of missing values were eliminated.

### DEMOGRAPHIC CHARACTERISTICS OF PROJECT PROFILE

Project type: The below table shows the frequency distribution of the project types from which the samples were collected and it was found that the respondents from the health care was 11%, Industrial estates were 51%, educational projects were 16%, domestic projects were 22% out of the total sample space of 100 respondents.

**TABLE 4.1 Project type**

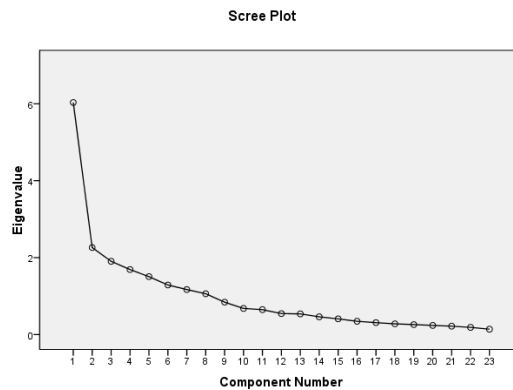
	Frequency	Percent	Valid Percent	Cumulative Percent
Health Care	11	11.0	11.0	11.0
Industrial Estates	51	51.0	51.0	62.0
Educational	16	16.0	16.0	78.0
Domestic market	22	22.0	22.0	100.0
Total	100	100.0	100.0	

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Factor Analysis following Varimax Rotation Having established that factor analysis could be applied on the 27 project success variables, principal component analysis (PCA) was employed with varimax rotation in order to identify the underlying structure of relationships. Due to lack of a priority basis on the number of factors to be extracted, initially all 27 variables were allowed to load freely on various factors so long as they had eigenvalue greater than one. Further a screen plot for different components was obtained (as shown in figure 4.2) in order to have an idea about the amount of variance explained by each factor



**Figure 4.2 Eigen Vs component number**

**To study the impact between type of project and position of stakeholders towards factors determining the success of construction projects.** In order to study the extent of the impact of between type of project and position of stakeholders towards factors determining the success of construction projects we use regression analysis.

**TABLE 4.10 Regression analysis 2**

DV	IV	R	R <sup>2</sup>	Adj R <sup>2</sup>	F	sig	Standard Error(coef )	Beta	T	Sig
<b>1.Time</b>	Type of project	.243	.059	.400	3.055	.052	.113	.237	2.386	.000
	Position of stakeholder						.147	.235	2.349	.000
<b>2.Cost</b>	Type of project	.172	.030	.800	1.484	.232	.009	.120	8.188	.000
	Position of stakeholder						.005	.110	8.093	.000
<b>3.Quality</b>	Type of project	.068	.005	.106	.225	.799 <sup>a</sup>	.095	.068	.670	.504
	Position of stakeholder						.122	.005	.046	.964
<b>4.Environmental impact</b>	Type of project	.135 <sup>a</sup>	.018	-.092	.900	.410 <sup>a</sup>	.109	.053	.524	.601
	Position of stakeholder						.140	-.118	1.162	.248
<b>5. Disputes</b>	Type of project	.050 <sup>a</sup>	.002	.018	.120	.887 <sup>a</sup>	.067	-.050	-.489	.626
	Position of stakeholder						.087	-.010	-.102	.919

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The impact of the factors determining the success to that of the type of project and the position of the stake holder was studied with the help of regression analysis. The significant values are time ( $F=3.055$ ) followed by cost ( $F=1.484$ ) and the least significant factor was environmental impact ( $F=-.092$ ). The percentage of the variability in the dependent variable explained by the independent variable is found to be the maximum at cost 40% and time 80% and it was found to be the least with disputes (9%).

## V. CONCLUSION

The purpose of the current study was to develop a performance evaluation framework for assessing performance amongst construction projects in developing countries. In order to realise this objective an extensive review of the relevant literature in order to identify the existing body of knowledge in the domain of performance measurement of construction projects. Based on the review, performance indicator variables and the variables that influence project success were identified and discussed with the experts in the area of construction management. The variables were refined and a survey instrument was designed. This was subsequently administered to clients, consultants and contractors who had been involved in the construction projects in Chennai. The demographic statistics regarding project characteristics and respondents' profile were analysed using Chi-square test of independence and one way Analysis of Variance (ANOVA) and their frequency distribution was also studied. The relevance of the performance indicator variables and success related variables amongst construction projects in Chennai was established through Factor analysis, correlation and regression analysis.

**FINDINGS** The purpose of the current study was to develop a performance evaluation framework for assessing performance amongst construction projects in developing countries. In order to realise this objective, an extensive review of the relevant literature in order to identify the existing body of knowledge in the domain of performance measurement of construction projects. Based on the review, performance indicator variables and the variables that influence project success were identified and discussed with the experts in the area of construction management. The variables were refined and a survey instrument was designed. This was subsequently administered to clients, consultants and contractors who had been involved in the construction projects in the Chennai. The demographic statistics regarding project characteristics and respondents' profile were analysed using Chi-square test of independence and one way Analysis of Variance (ANOVA). The relevance of the performance indicator variables and success related variables amongst construction projects in Chennai was established through Factor analysis, regression and the correlation.

- The occurrence of time overrun, cost overrun and quality defects does not vary on the basis of the type of CDF construction projects. All types of projects are prone to these problems pointing towards the need for other factors to be considered.
- Respondents' experience has no relationship with the occurrence of time overrun, cost overrun and quality of defects on CDF construction projects. Most of these projects are characterised by standard procedures which guide the construction process.
- The occurrence of time overrun and quality defects on CDF construction projects does not vary with the project procurement method. However, the occurrence of cost overrun varies across different procurement approaches. This is because different procurement approaches have implications on how project costs are computed and appropriated amongst different parties who are responsible for undertaking construction.
- Project performance of construction projects are evaluated on the basis of six KPIs namely *project time, cost, quality, safety, site disputes* and *environmental impact*. These KPIs address the economic, social and environmental dimensions of public sector construction projects.
- Whilst not all the KPIs are significant in terms of their relationship with project performance, there is significant evidence and support for measurement of project performance on the basis of time, cost, quality and site disputes.
- There are six CSFs that influence success of public sector construction projects: *project-related factor, client-related factor, consultant-related factor, contractor-related factor, supply chain related factor* and *external environment-related factor*.
- All these six CSFs assessed are significant, providing empirical support for considering them as factors that influence success of public sector construction projects.

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- The external environment related factor does not mediate the influence of the remaining *CSFs* on project success.

## RECOMMENDATIONS

- Understand the needs of the community through proper involvement of the representatives of the community and other stakeholders and accordingly select suitable projects which would cater to their needs.
- Understand the urgency of evaluating public sector construction projects on multi-dimensional performance measures incorporating economic, social and environmental aspects. Develop appropriate operational metrics to reflect the three broad dimensions of performance of public sector construction projects.
- Allocate considerable amount of resources into the issues relating to project time, cost, quality and site disputes of public construction projects. This is because *cost, time, quality* and *site disputes* were relatively more important.

## FUTURE RESEARCH

- Future studies can attempt to identify the direct relationship between the *CSFs* and *KPIs* through empirical studies. Also, future studies may examine moderating factors that may have an effect on the relationship between *CSFs* and project success.
- A study incorporating the effect of corruption in performance evaluation of public sector construction projects is of great importance. This is because the intended objectives of public sector construction projects can be properly realised in a corruption free environment. It is a well known fact that these kinds of projects are severely affected by the scams prevalent in many countries.

## REFERENCES

1. Adnan, E., Sherif, M., Saleh, A.2009.Factors affecting the performance of construction Projects in the gaza strip, JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT,15(3), 269–280
2. Albert, P. C.C, David, S. and Ada, P. L. C .2004. Factors Affecting the Success of a Construction Project,ASCE, 130(153), 0733-9364.
3. Arti, J.J. , Pankaj, P. B.2013.To Study Critical Factors Necessary for a Successful Construction Project ,International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2 (5), 2278-3075.
4. Hari, G., Jeevarathnam,G., Thulani, M.2008. Critical success factors influencing project success in the construction industry, ASCE, 116(11), 1329-1344.
5. Inuwa, I.,2013.Evaluation of critical success factors for construction projects(2013) International Journal of Strategic Property Management ,17 ( 1).