

ANALYSIS OF CRITICAL SUCCESS FACTORS FOR INFRASTRUCTURE PROJECTS.

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Abstract: *Critical success factors are useful information for project decision makers in practice. A construction project failure principally defined as dissatisfaction in either one or the grouping of cost, time, quality, and management. This study is an effort to analyse the critical success factors (CSFs) in the infrastructure projects. Initially wide-ranging literature study is carried out and based on that critical success factors is identified. For discovery of CSFs in Indian construction site interview also carried out to search the most effective factors which will be the guide factors to forecast the chance of a project success. A questionnaire survey was conducted to collect expert assessment from across the different stake holders involved in the construction work. The current research makes a methodology departure from the literature by attempting to build the causation of project success & the contribution of each critical success factor to the project success will be established. And at the end of the study, the successful factors can help to the project manager in their upcoming project so project can be completed within given resources.*

Keywords: *Critical success factor, Infrastructure.*

I. INTRODUCTION

The construction industry is active in nature due to the growing uncertainties in technology, budgets, and expansion processes. Nowadays, infrastructure projects are becoming much more difficult and problematic. The project squad is facing unparalleled changes. The study of project success and the critical success factors (CSFs) are measured to be a means to recover the efficiency of project. However the idea of project success has remained unclearly defined in the mind of the construction experts. Various attempts were made by different researchers to decide CSFs in construction. Some variables are common to more than one list, but there is no overall contract on the variables.

Construction activity is an essential part of a country's infrastructure and industrial development and must be taken care of for a healthy development of the economy. It is imperative to put an all-out strength into ensuring that projects are completed as per the specified objectives. An investigation of the recent literature indicates that construction projects are often completed with large cost overruns, extended schedules and quality concerns. Delay is defined as the time overruns either outside the completion date specified in the contract, or beyond the date that the parties decided upon delivery of the project. The determinations of delay may include time overrun, cost overrun, disputes, arbitration, litigation, and total rejection.

This can be reached by understanding what the end result would be, and then declaring the deliverables of the project. Success principles of a project's definition of success is scope of services, project size, sophistication of the owner connected to the design of facilities, technological implications, and a variety of other factors.

In this research critical factors responsible for failure of the infrastructure project were identified which will help organizations involved in the construction industry with the foundation on which such strategies can be developed in the future. This Study focuses on the infrastructure projects in Surat.

II. LITERATURE REVIEW

In this study, Author Xueqing Zhang developed CSFs package that contain five main CSFs. Data analysis is done by Significance index method. Data Accuracy is done by agreement analysis. Experts were invited to participate in questionnaire survey. Agreement analysis shows that there is a good agreement in the ranking of these CSFs and SSFs between respondents from the industrial sector and those from the academic sector.

Author Albert P. C. Chan, Daniel W. M. Chan, Y. H. Chiang presents a review of the development of the partnering concept in general and identifies critical success factors for partnering projects from the Hong Kong perspective in particular. Data was collected by postal questionnaire survey.

Author Yue Choong Kog, Ping Kit Loh distinguish different critical success factors for different components of construction projects. An Analytical Hierarchy Process (AHP) is adopted for analysis of Data. To identify top 10 CSFs from 67 success related factor self-completed questionnaire was carried out. Experts with less than 15 years of experience in the construction industry were invited to participate in the questionnaire survey.

Main aim of author Albert P. C. Chan, Patrick T. I. Lam, Daniel W. M. Chan is to explore the critical success factors CSFs necessary to conduct PPP projects. The views from Chinese experts were collected via an empirical questionnaire survey. The results of this survey were analyzed by the factor analysis technique & checked by Kaiser meyre oikin measure. a study reveals that CSFs should pave the way for enhanced decision making in the choice of suitable projects.

Author D. K. H. Chua, Y. C. Kog, P. K. Loh distinguish success related factors according to the project objectives of budget, schedule, and quality. The AHP is adopted to determine the relative importance of success related factors. 67 success related factors are considered for the study. Experts with less than 20 years of experience in the construction industry were invited to participate in the questionnaire survey. A study reveals that, project success is not only determined exclusively by the PM, monitoring, and control efforts.

III. NEED OF THE STUDY

Infrastructure projects faces many problems and well known for its failure in construction firm which leads to cost and time overrun. This problem can be solved by identifying critical success factor for construction project. These factors (CSFs) are success key for taking decision & preparing strategies in the choice of suitable project. Most of the related past work only identify CSFs for construction project in general. The present study generate various steps for fulfilling the requirements of Critical Success factors.

Objectives:

- To Identify and to decide priority of Critical Success Factor of building projects.
- To check the feasibility and accuracy of analysed factors.
- To suggest precaution steps for achieving the success through critical success factor.

LIST OF SUCCESS RELATED FACTOR:

Table -1 list of success related factors

No.		SUCCESS RELATED FACTOR
1	Project Characteristics	Good Governance
2		Political Support
3		Social support
4		Technical approval authorities
5		Adequacy of funding
6		Constructability
7		Project Size
8		Project Nature
9		Site Condition
10		Project planning
11		Project control
12		Multi benefit objective
13		Project technical feasibility
14	Contractual Arrangement	Risk identification & allocation
15		Contractual motivation
16		Adequacy of plans & specification
17		Formal dispute resolution process
18		Procurement process
19		Realistic cost & time estimates
20	Project Participants	Competency of project team member
21		PM commitment & involvement
22		Capability of project team member
23		Top management support
24		Project team turnover rate
25		Project team track record
26		Project team level of service
27		Project leader stability
28	Interactive process	Design communication
29		Construction Communication
30		Functional plan
31		Design complete at construction start
32		Constructability program
33		Level of modularization
34		Level of skilled labor required
35		Report updates
36		Budget updates
37		Schedule updates
38		Design control meetings
39		Construction control meetings
40		Site inspection

41		Work organization chart
42		Common goal
43		Motivational factor
44		Relationships
45		Quality control & assurance
46		Safety
47		Technology transfer
48		Weather condition

IV. Methodology

After Studying the various Literatures 55 factors have been selected related to success of Infrastructure Projects which were further finalized in to 48 by Pilot Study under 4 Major Group which has been Prioritized using significance index method and Further data Accuracy of analyzed factor was done by Spearman's rank correlation method.

Critical Success factors are the factors which are the most crucial for the success of any project. Project success is not only determined exclusively by the PM, monitoring, and control efforts. It is also determined by CSFs. After studying the Literatures 55 factors related to project success have been identified for the study. Mostly in all the papers analysis was done using Statistical tools and data collection was done by Questioner survey.

Table -2 respondent response

Sr.no	Respondent	Questionnaire Distributed	Responses Return	Responses Percentage	% Of respondent
1	Site engineer	100	73	73%	41.01
2	Contractor	80	57	71.25%	32.02
3	Consultant	60	27	45%	15.16
4	Owner	50	21	42%	11.79
Total		290	178		100
Responses percentage			61.73%		

This chapter introduces the methodology which is applied in this research to achieve the research aim. Basically, this research work includes five different sections. First section of research covers the project title and identification of the objectives. Second section of research covers review of literatures. Third section of research includes overview of critical success factors. Fourth section includes factors affecting to infrastructure projects. In this section data analysis was done by SIGNIFICANCE INDEX METHOD to rank the factors. In this method data accuracy check is performed by spear's man co-relation method.

Significance Index method

It is useful to analyse the relative significance of the CSFs and SSFs. Following Table indicates the description of Significance scale

Table -3 significance index scale

Significance scale	Description
0	Not applicable
1	Not significant
2	Fairly significant
3	Being significant
4	Very significant
5	Extremely significant

The following simple formula is developed to convert linearly 0-5 scale used in the questionnaire survey to a 0-100 scale with 0 representing the lowest and 100 the highest significance .this means that "5","4","3","2","1", and "0" have significance indexes of 100,80,60,40,20 and 0,respectively

$$\text{significance index } S_i = \frac{R_{i0} \times 0 + R_{i1} \times 20 + R_{i2} \times 40 + R_{i3} \times 60 + R_{i4} \times 80 + R_{i5} \times 100}{R_{i0} + R_{i1} + R_{i2} + R_{i3} + R_{i4} + R_{i5}} = \frac{20R_{i1} + 40R_{i2} + 60R_{i3} + 80R_{i4} + 100R_{i5}}{R_{i0} + R_{i1} + R_{i2} + R_{i3} + R_{i4} + R_{i5}}$$

Where,

S_i =significance index for the i_{th} factor,

R_{i0} =number of responses as "0" for the i_{th} factor,

R_{i1} =number of responses as "1" for the i_{th} factor,

R_{i2} =number of responses as "2" for the i_{th} factor,

R_{i3} =number of responses as "3" for the i_{th} factor,

R_{i4} =number of responses as “4” for the i_{th} factor,
 R_{i5} =number of responses as “5” for the i_{th} factor.

The top 10 critical success factors for infrastructure projects according to the different stakeholders are as given as below:

Table -4 identification of top 10 critical success factors for infrastructure projects

Sr.no	Contractor	Owner	Consultant	Engineer
1	Adequacy of Funding	Adequacy of plans & Specification	Adequacy of Funding	Adequacy of Funding
2	Adequacy of plans & Specification	Safety	Project Planning	Adequacy of plans & Specification
3	Safety	Adequacy of Funding	Quality control & assurance	Safety
4	Quality control & assurance	Quality control & assurance	Safety	Technology transfer
5	Project Planning	Project Planning	Adequacy of plans & Specification	Project Planning
6	Technology transfer	Technology transfer	Project Control	Quality control & assurance
7	Project Control	Project Control	Technology transfer	Project Control
8	Risk identification & Allocation	Risk identification & Allocation	Technical Approval Authorities	Technical Approval Authorities
9	Technical Approval Authorities	Project Size	Level of skilled labor required	Project Size
10	Site Condition	Site Condition	Procurement Process	Risk identification & Allocation

V. CONCLUSION

- These finding factors are those inputs to the management system that lead directly or indirectly to the success of the infrastructure projects. The purpose of this study is to define factors affecting to the infrastructure projects.
- Findings in this study asserted that the critical factors perceived as most influential in Avoiding or preventing to better performance within infrastructure and they are likely to improve success in infrastructure projects.
- The overall top 5 factors which affects the infrastructure projects according to contractor are: adequacy of Funding, Adequacy of plans & Specification, Safety Quality control & assurance, Project Planning.
- The overall top 5 factors which affects the infrastructure projects according to owner are: Adequacy of plans & Specification, Safety, Adequacy of Funding, Quality control & assurance, Project Planning.
- The overall top 5 factors which affects the infrastructure projects according to consultant are: Adequacy of Funding, Project Planning, Quality control & assurance, Safety, Adequacy of plans & Specification.
- The factors affects according to engineer are: Adequacy of Funding, Adequacy of plans & Specification, Safety, Technology transfer, Project Planning.

REFERENCES

- [1] Albert P. C. Chan” *Critical Success Factors for PPPs in Infrastructure Developments: Chinese Perspective*” JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT © ASCE / MAY 2010
- [2] Ahmed, S. M., and Kangari, R. (1995). “*Analysis of client-satisfaction factors in construction industry.*” J. Manage. Eng., 11(2), 36–44.

- [3] Alarcon, L. F., and Ashley, D. B. (1996). "Modeling project performance for decision making." J. Constr. Eng. Manage., 122(3), 265–273.
- [4] Baker, B. N., Murphy, D. C., and Fisher, D. (1983). "Factors affecting project success." Project management handbook, Cleland, D. I., and King, W. R., eds, Van Nostrand Reinhold, New York, 669–685.
- [5] Chan, D. W. M., and Kumaraswamy, M. M. (1997). "A comparative study of causes of time overruns in Hong Kong construction projects." Int. J. Project Manage., 15(1), 55–63.
- [6] Chua, D. K. H., Kog, Y. C., Loh, P. K., and Jaselskis, E. J. (1997). "Model for construction budget performance-neural network approach." J. Constr. Eng. Manage., 123(3), 214–222.
- [7] Chua, D. K. H., Kog, Y. C., and Loh, P. K. (1999). "Critical success factors for different project objectives." J. Constr. Eng. Manage., 125(3), 142–150.
- [8] D. K. H. Chua" critical success factors for different project objectives" JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT / MAY/JUNE 1999
- [9] M. K. Parfitt "checklist of critical success factors for building projects" Journal of construction engineering & Management in civil Engineering, Vol. 9, No. 3, July, 1993. Paper No. 5015
- [10] Megha Desai , "Critical Causes of Delay in Residential Construction Projects: Case Study of Central Gujarat Region of India" International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue4- April 2013
- [11] Nipin Joseph Babu " Factors Affecting Success of Construction Project" School of Building Science Civil Engineering Dept, Hindustan Institute of Technology & Science, Chennai India
- [12] Paulinus Woka Ihuah "A review of Critical Project Management Success Factors for sustainable social housing in Nigeria" Gulf Organisation for Research and Development International Journal of Sustainable Built Environment(2014)
- [13] Paek, J. H., Lee, Y. W., and Napier, T. R. (1992). "Selection of design/ build proposal using fuzzy-logic system." J. Constr. Eng. And Mgmt., ASCE, 118(2), 303–317.
- [14] Pinto, J. K., and Slevin, D. P. (1987). "Critical factors in successful project implementation." IEEE Trans. on Engng. Mgmt., 34(1), 22–27.
- [15] Pocock, J. B., Hyun, C. T., Liu, L. Y., and Kim, M. K. (1996). "Relationship between project interaction and performance indicators." J.Constr. Engng. and Mgmt., ASCE, 122(2), 165–176
- [16] Tam, C. M., and Chan, A. P. C. ~1996!. "The effect of safety management strategies on safety performance in Hong Kong." 1996 Construction Industry Board, Beijing, Inter. Conf., Beijing.
- [17] Tam, C. M., Hui, M., and Chan, A. P. C. ~1995!. "The new reality in managing quality in a public transport organization: Total quality management." Proc., 1995 Nat. Conf. of the Australian Institute of Project Management, Adelaide, 129–134.
- [18] Uher, E. T. ~1999!. "Partnering performance in Australia." J. Constr. Procure., 5~2!, 163–176.
- [19] Xueqing Zhang" Critical Success Factors for Public–Private Partnerships in Infrastructure Development" JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT © ASCE / JANUARY 2005
- [20] Y. H. Chiang, "Exploring Critical Success Factors for Partnering in Construction Projects" JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT © ASCE Vol. 130, No. 2, ISSN 0733-9364/2004/2-188–198, MARCH/APRIL 2004