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Evaluation of Critical Success Factor in Construction Industry

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Abstract: ***The main objective of project management is to ascertain success of the construction project and identification of the paramount factors which play a vital role in the prosperity of the project. However, to identify these success factors there is no such scale available, due to its wide variation which depends on objective of the project and the construction project scope. In this review an endeavour is made to identify the critical success factors, which attributes towards the success of the construction project. Sundry critical factors are to be identified through an extensive literature survey. Consistent judgment of experts is required to analyze the factors by Relative Important Index to govern the success of project. The survey is to be carried out in two stages where the judgment of the respondent who are having experience more than 15 years varies from those who have experience less than 10 years, withal the opinion varies between participant contractor and consultant.***
Keywords: Critical Success Factors (CSF), Relative Important Index (RII), SPSS, etc.

I. INTRODUCTION

A. General

The Construction Industry is the second largest economic activity next to agriculture. It is a complex array of interdependent activities that some would say is at best organized chaos. Broadly construction can be classified into 3 segments as Infrastructure, Industrial and Real Estate. There is a high fragmentation of Indian construction industry. There are number of disorganized players in the industry which work on the subcontracting substratum. To execute more critical projects, nowadays bids are incrementing placed in consortium. As a result, Subcontracting is a prevalent phenomenon in the construction industry. The ultimate goal of every business activity is "Success". There are number of definitions for success. Traditionally, it is defined as the degree to which goals and prospects are met. As the construction industry is changing constantly with advanced methods and technologies, these are to be adopted to be more competitive in this industry and get success in their businesses. Nowadays, there has been an increase in the studies of critical success/ failure factors especially in the field of project management. Conventionally, the success parameters for projects in this industry are cost, time and quality. The purpose of Project Management is to plan the expenditure of resources to achieve goals and objectives. The cost, time, safety, resource allocation, and quality are certain criteria to judge the success of project as determined by the owner.

B. Critical Success Factor (CSF)

"Critical success factors are those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise area, that must be given special and continual attention to bring about high performance. CSFs include issues vital to an organization's current operating activities and to its future success".

Critical success factors are a limited number of key variables or conditions that have a tremendous impact on how successfully and effectively an organization meets its mission or the strategic goals or objectives of the program. Identifying critical success factors can provide business teams insight into which tasks are truly important, providing points of reference from which to direct the success of a program or project.

C. Research Approach

The research approach should include information about Factor Analysis and also the component of factor analysis. Factor analysis is the process which is to be carried out in the SPSS software. Statistical Package for Social Scientist i.e. SPSS software is used to analysis the responses received. Factor analysis is related to PCA (Principal component analysis). It is a widely used method for factor extraction which is the first phase of EFA.[9] Factor weights are computed to extract the maximum possible variance, with successive factoring continuing until there is no further meaningful variance left.[9] The factor model must then be rotated for analysis. Common factor analysis, also called principal factor analysis (PFA) or principal axis factoring (PAF), seeks the least

number of factors which can account for the common variance (correlation) of a set of variables.

Image factoring is based on the correlation matrix of predicted variables rather than actual variables, where each variable is predicted from the others using multiple regression.

Alpha factoring is based on maximizing the reliability of factors, assuming variables are randomly sampled from a universe of variables. All other methods assume cases to be sampled and variables fixed.

Factor regression model is a combinatorial model of factor model and regression model; or alternatively, it can be viewed as the hybrid factor model, whose factors are partially known.

II. RELATIVE IMPORTANT INDEX BY SPSS

Relative Weight Analysis is a useful technique to calculate the relative importance of predictors (independent variables) when independent variables are correlated to each other. It is an alternative to multiple regression technique and it addresses multi co-linearity problem and also helps to calculate the importance rank of variables. It helps to answer " Which variable is the most important and rank variables based on their contribution to R-Square".

A. Background

When independent variables are correlated, it is difficult to determine the correct prediction power of each variable. Hence, it is difficult to rank them as we are unable to estimate coefficients correctly.

Statistically, multi co-linearity can increase the standard error of the coefficient estimates and make the estimates very sensitive to minor changes in the model. It means the coefficients are biased and difficult to interpret.

B. How it Works

It creates a set of new independent variables that are the maximally related to the original independent variables but are uncorrelated to each other. Because these new transformed independent variables are uncorrelated to each other, the dependent variable can be regressed onto this new set of independent variables producing a series of standardized regression coefficients.

C. Project Performance Measurement

In every walk of life, we need to measure performance either in order to draw valuable conclusions about the individual or to compare the competing individuals.

Measuring the performance of a project in terms of success or failure is, in fact, a difficult task. This is because success/failure has different meanings for different participants. Further, defining the success of a project has always been full of ambiguity and there is no universal definition of success. McCoy (1986) observes that a standardized definition of project success does not exist; nor is there an accepted methodology to measure it.

Success is viewed from the different perspectives of individuals and the goals related to a variety of elements including technical, financial, educational, social and professional issues. Each industry, project team, or individual has a definition of success. Failures and successes are relative terms and they are highly subjective (Parfitt and Sanvido 1993).

The definition of success or failure can even change from project to project. As stated, success for one participant may be failure for another (Iyer and Jha 2004b, de Wit 1988). When we say this, consider a situation in which the participants are an architect, an engineer, an accountant, a human resources manager, and a chief executive officer. Observe the disparity in points of view of these participants.

The architect may consider success in terms of aesthetic appearance; the engineer in terms of technical competence; the accountant in terms of rupees spent under budget; the human resources manager in terms of employee satisfaction; and the chief executive officer in terms of the stock market (Freeman and Beale 1992). For the same project, notice the different yardsticks employed by different participants to measure the success.

Parfitt and Sanvido (1993) quote the definition of overall success of a project given by de Wit, which is as follows:

The project is considered an overall success if the project meets the technical performance specifications and/or the mission to be performed, and if there is a high level of satisfaction concerning the project outcome among: key people in the parent organization, key people in the project team, and key users or clientele of the project effort.

Traditionally, success is defined as the degree to which project goals and expectations are met and the project requirements are fulfilled. However, modern projects involving multiple designers, contractors, subcontractors, construction managers, consultants and specialists from different disciplines, and increasing domain of project requirements have compounded the problem further, and

understanding the success of a project has become all the more complicated. From the above discussion, we can realize the difficulty in measuring the performance of a project in terms of success and failure. Nonetheless, there are certain criteria that are in vogue for measuring the performance of a project and are described below.

D. Criteria for Project Performance Evaluation

Criteria are the set of principles or standards by which judgement is made (Lim and Mohamed 1999) and are considered to be the rule of the game. Traditionally, project performance is evaluated using schedule, cost and quality performances, also known as the 'iron triangle' (Atkinson 1999). Subsequently, different researchers have proposed different sets of success evaluation criteria in addition to the iron triangle. You can make an analogy of these criteria with the performance measurement of a student in a particular course, attendance, discipline or marks obtained, and so on. All of these criteria's are discussed by Baker et al. (1983), Ashley et al. (1987), Freeman and Beale (1992), Maloney (1990), Norris (1990), Parfitt and Sanvido (1993), Songer and Molenar (1997), and Lipovetsky et al. (1997) for evaluating the performance of a project in their respective journal papers.

A close look at the success criteria suggests that these can be kept under two broad categories—objective and subjective. Making an analogy with the student example, marks obtained in a course can be objectively defined, while discipline and other criteria can be taken as subjective. In the case of project evaluation, the objective criteria are those that are tangible and measurable, such as schedule, cost, quality, safety and dispute, while the subjective or intangible criteria may include client satisfaction, contractor satisfaction and project management team satisfaction.

Based on the above discussion, it can be concluded that distinguishing a project along broad terms such as success or failure is always going to be contradictory. Similarly, there is hardly any coherence in the opinion on how to measure the performance of a project i.e., what set of criteria to employ.

Construction projects are vital for the growth of a nation and so is the need to make all-out efforts in ensuring the successful outcome of a project. In the next section, we discuss some of the attributes that are considered key to ensure the success of a project.

E. Project Performance Attributes

Project attributes are the variables that influence the outcome of a project. The attributes can be people (project participants and their traits), resources, technology, working environment and system, or tasks. 'Project success is repeatable and it is possible to find certain success attributes,' has been the genesis of many research works in this area (Ashley et al. 1987). Also, there are certain attributes termed as failure attributes, which when present lead to failure of the project. Finding the success attributes and maximizing them is as important as finding the failure attributes and minimizing them. Accordingly, researchers have put their energy into identifying success attributes and failure attributes, with the common objective of enhancing the chances of project success.

III. DATA COLLECTION AND ANALYSIS

In the first round survey analysis of collected data is to be done on SPSS (Statistical Package for the Social Sciences) software.

The analysis will includes the Factor analysis of the data etc.

Relative Important Index is used for the ranking of the factors. ANOVA (Analysis of Variance) cannot be used on this type of survey because it is for the hypothesis testing.

Simple analysis is done on data collected in second round of survey.

Ranking of the factors are done on the basis of RII

Relative importance index RII =

$$\frac{\sum w}{A * N}$$

where w is the weight given to each attribute by the respondents and ranges from 1 to 5, A is the highest weight (i.e., 5 in this case), and N is the total number of respondents.

For Example

In combined analysis if there are 60 total responses, the sum of all responses for particular factor, (consider PM competency factor) is 258 then calculation for RII will be

RII = 258/ (5*60) = 0.8600

So RII factor for PM competency is 0.8600

The range for the RII is 0.2 to 1.0

Statistical Package for Social Scientist (SPSS) software is used in the analysis of the factors. Analysis is done separately on responses from consultancy and contractor and also combined analysis is done in order to compare.

IV. RESULTS AND INTERPRETATIONS

The analysis of the projects directs towards outcome of the project which will include the outcome from first round of survey i.e. most important factors.

The ranking of the factors for the after first round are done according to RII as explained in previous sections. Another Questionnaire is used to carry out the second round of analysis.

V. CONCLUSION AND FUTURE WORK

This study helps to identify the rankings of the critical success factors for the construction projects according to project management consultancy and contractor point of view. The factors can be further categorised in to following three group i.e. Supercritical, Critical and Subcritical.

From the analysis of ranking based on contractor and consultant groups, the results are mixed, so we can conclude that Consultant and Contractor do have the different approach or opinion on factors which can affect success of the project. The work can be carried on success factors according to contractor point of view in real estate project or in infrastructure project and the same with consultant point view. And after comparing that results will be more sophisticated. It is suggested that the critical factors identified in the analysis above should be followed during the execution of the project.

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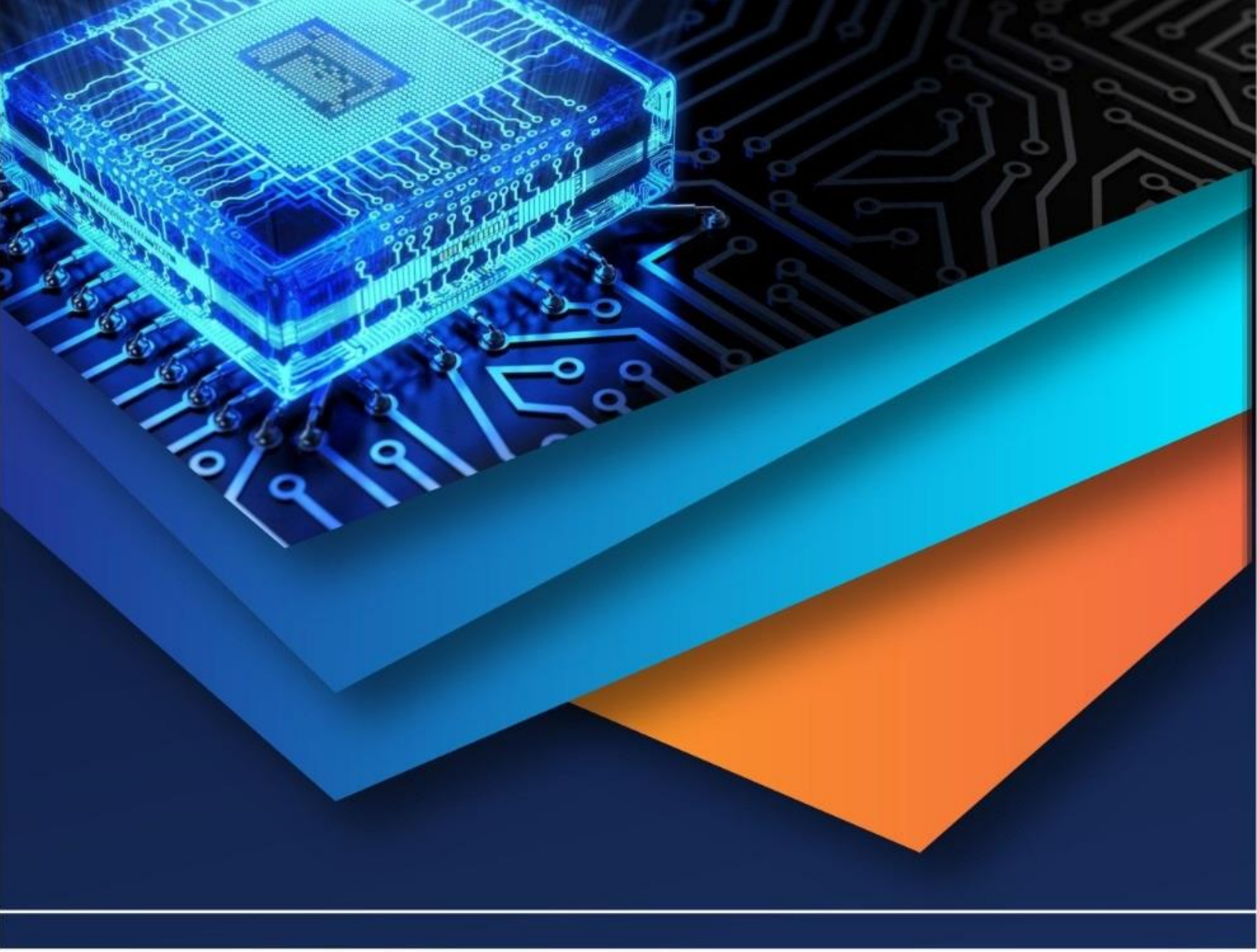

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