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.

I.INTRODUCTION

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. In developing countries, performance measurement of construction projects has become even more important due to its immense potential in addressing the problem of poverty, unemployment, inequitable distribution of resources in different regions etc. Academic researchers with a view to overcoming the limitations of the traditional performance evaluation criteria of time, cost and quality have suggested the inclusion of additional measures of performance. These include safety of the project site, environmental impact, community/client/customer satisfaction etc. None of the above has provided a balanced set of Key Performance Indicators (KPIs) which would capture all essential and unique features of a public sector construction project. Further, these studies have not talked about the appropriate facilitating factors that can help project managers achieve success on KPIs identified above. The identification of these factors, also known as critical success factors (CSFs), is very important for ensuring success of any project because it enables project managers to commit resources on specific factors. The CSFs have been classified in various ways by the researchers (as has been revealed in Literature Review Chapter) based on the common characteristic features of construction projects. However, there is hardly any study which has attempted to identify CSFs of construction projects based on the KPIs of the same specifically with reference to public sector construction projects. With this backdrop, the present study is an attempt to identify the KPIs amongst construction projects and on the basis of these KPIs, identify appropriate CSFs relevant for success of public sector construction projects and find out the influence of these CSFs on project success. The relationship between project success and overall project performance in terms of the KPIs is also investigated in the current study.

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.

Hari Garbharran et.al,2008, gives an insight on the construction industry is one of the largest job creators in developing countries and is highly competitive. The high number of project failures suggests the existence of underlying critical success factors which have not been identified. This article assesses the perceptions of contractors and project managers on the critical success factors that lead to project success in the construction industry. This article is based on the four COMs model (comfort, competence, communication and commitment). A survey was conducted among 95 project managers and 61 active grade four contractors in Durban, South Africa. The findings reveal that both project managers and contractors strongly support the identified critical success factors as significant in achieving project success. There was no significant difference in their perception of critical success factors, based on the biographic characteristics. The recommendations presented may be used as a guideline for successful execution of construction projects.

Mahmood Shahid(2012) says that the construction industry is an important sector of any economy and has multiple backward and forward linkages with other sectors. This industry contributes significantly to socio-economic development, along with creating employment opportunities. Construction companies are the building blocks of construction industry and their success or failure significantly affects the construction industry. There are many factors that influence the success or failure of construction companies and projects. Since the stake holders involved in a project have different needs and expectations, therefore they interpret project success according to their own perception. The objective of this study was to find replies for the questions, how we define success and what criteria should organizations use to identify success? Which factors lead to success of construction projects and companies?
This study has focused to identify the Critical Success Factors (CSFs) of the construction companies working in and around Islamabad. The survey data has been collected through a questionnaire from 36 construction companies. The results have been analyzed by using descriptive analysis, frequency analysis and the relative importance index (RII) technique. The research has identified 35 CSFs and they have been ranked as per evaluation on RII and weighted average of Likert scale. The most significant CSFs have been identified and analyzed for the consideration of management of construction companies to address these issues for increasing chances of their success at the construction projects. Construction companies therefore need to re-visit their existing policies and positions with respect to CSFs identified in this study. It would not only enhance their profitability, productivity, compatibility and quality but would also enhance the sustainability of national economic growth and strength of construction industry.

Olatunji S. O(2014), made a study on construction projects which suggests that the construction industry is made up of professionals whose various disciplines are to ensure that construction work can be completed. This study evaluates the effects of the performance of construction professionals on construction project success in Nigeria. The study adopted a survey research design with the use of a well structured questionnaire which was administered on construction professionals, 68 copies were retrieved and used for the analysis out of the administered 139. Frequency and percentiles was used to analyse the distribution of demographic descriptors of construction professionals while mean score and mean difference was used to analyse the roles of construction professionals and factors influencing the performance of construction professional. The findings revealed that the major role of an architect is to translate the user's needs into builders requirement, engineer is most concerned with the calculation of load and grade requirements, liquid flow rates and materials stress points to ensure that the structure can withstand stress, the quantity surveyor is mostly concerned with management and control of costs within the construction projects while a builders major role is building production management.

K. N. JHA and K. C. IYER,2006, had made a detailed study on the reasons for the underperformance of the quality of Indian construction projects were studied to suggest possible remedial measures. A preliminary survey identified 55 attributes responsible to impact quality performance of the projects. Statistical analysis of questionnaire responses on the attributes resulted into two distinct sets of success and failure attributes. Further analyses of individual sets of success attributes and failure attributes separately grouped them into fewer critical success and failure factors. The critical success factors obtained were: project manager's competence; top management's support; monitoring and feedback by project participants; interaction among project participants; and owners' competence. The factors that adversely affected the quality performances of projects were: conflict among project participants; hostile socio-economic environment; harsh climatic condition; PM's ignorance & lack of knowledge; faulty project conceptualization; and aggressive competition during tendering. Analyses also led to the conclusion that the extent of contribution of various success factors varies with the current performance ratings of the project.

Neringa Gudienė (2013) explains in his paper that Construction is a risky business and the possibility of failure always exists, so construction companies have to consider the factors that can have a direct effect to their success in construction project performance. The purpose of this study is to identify and to rank the critical success factors of construction projects in Lithuania. A survey with 71 critical success factors was distributed among to 15 construction professionals and experts from 5 construction companies who have projects management knowledge and related experience. The data were processed by expert judgment. Based on the results ten factors including experience of project management, project value, experience of project manager, technical capabilities of project manager, experience of contractor, project size, competence of project team members, clear and realistic goals, decision making effectiveness of projects management and technical capability of project management were determined as the most important success factors for construction projects.

Nicholas Chileshe and Theo C. Haupt, (2005) explains through his research: the purpose of this paper is to model the critical success factors of construction project management (CPM). Despite the emergence of construction project management as an academic discipline, existing instrument found in literature were for measuring the importance of Construction Managers and Project Managers skills or attributes yet the combined dual role of Construction Project Management as a discipline or profession remains under researched. After collecting 58 empirical observations from within the South African construction related organisations, the paper tests the theoretical relationships by using the structural equation modelling (SEM) technique. The research identifies six factors which are critical for the effectiveness of CPM. The study also highlights the benefits of modelling the factors using tradition methods such as bivariate correlation and multiple regression analysis techniques to extract factors of CPM. The results indicate that correlation between the "hard" and "soft" skills is necessary for the effective implementation of Construction Project Management. The proposed theoretical model not only has the potential to enhance competitive success but can act as a valuable diagnostic tool in addressing the effectiveness of construction project management.

Inuwa Ibrahim (2013) aims to identify a comprehensive list of critical success factors for construction projects in Lithuania. Based on the available literature review, this paper identified 71 success factors under 7 broad groups. Based on the survey results, ten factors including project manager competence, project management team members' competence, project manager coordinating skills, client clear and precise goals/objectives, project value, project management team members' relevant past experience, project manager organising skills, project manager

effective and timely conflict resolution, client ability to make timely decision, and project manager experience were determined as the most important success factors for construction projects. These critical success factors are of great significance both to researchers and industry practitioners.

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:
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.

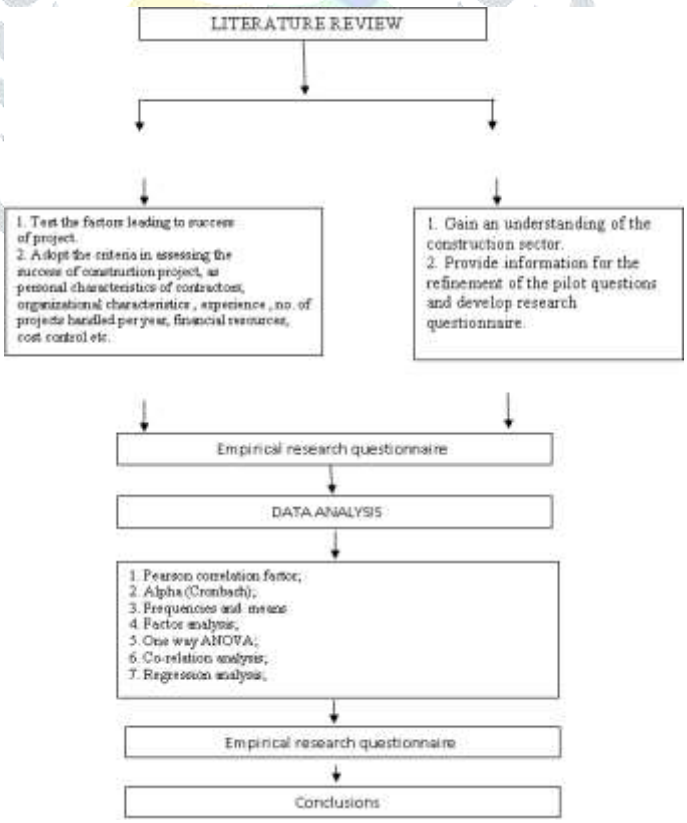

Figure 3.1: Overall research framework for this research study

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

QUESTIONNAIRE DELIVERING AND RECOVERY

A list of contracting companies specialized in the field of construction in and around Tamilnadu, especially around Trichy,Tanjore and Chennai which were officially registered with the BUILDERS ASSOCIATION OF INDIA of the contractors union until 22/5/2015 is obtained from contractors union, this list includes companies names, and addresses. Contractors are contacted and delivered by the questionnaires, after that they were recovered through a period of one to five weeks as follows:

•The pilot study sample was 30 companies and it was carried out during the first and second weeks, then it is eliminated from the original sample, which become 70 companies only.
•Questionnaire is delivered in the third and fourth weeks, and contractors were followed and motivated to fill the questionnaire by telephone calls, fax and visits.
•An amount of 100 filled questionnaires is collected in the fifth week.

QUESTIONNAIRE VALIDITY

The research study begun with a review of relevant materials from textbooks, professional journals, conferences papers, research reports, and internet information to capture background knowledge about critical success factors. The objective of the literature review is to develop a frame work for the research study and to prepare for the structured interviews and questionnaire survey. The identified factors have be scrutinized and verified through a series of face to face interviews with a number of selected experts in construction project management and the site management staffs of client's consultants and contractors.

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:

TABLE 4.1 Project type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	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	

The above 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 was11%, Industrial estates were 51%, educational projects were 16%, domestic projects were 22% out of the total sample space of 100 respondents.

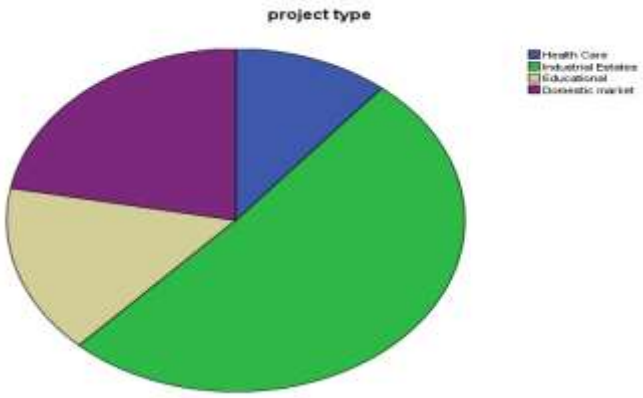

Figure 4.1 Project type

Project position:

TABLE 4.2 Project position

Project Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Client	15	15.0	15.0	15.0
	Consultant	28	28.0	28.0	43.0
	Contractor	57	57.0	57.0	100.0
	Total	100	100.0	100.0	

The above table shows the frequency distribution of the project position from which the samples were collected and it was found that the respondents from the stakeholders of the construction project was found to be 15% of the clients, 28% of consultants and 57% of the contractors.

4.2.3 Years of experience

Based on the years of experience of the respondent we can have a precise conclusion that the respondent will have a precise experience on the type of survey conducted.

TABLE 4.3 Years of experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 3 years	8	8.0	8.0	8.0
	3 – 6 years	19	19.0	19.0	27.0
	over 6 years	73	73.0	73.0	100.0
	Total	100	100.0	100.0	

The table 4.3 shows that about 8% of the project respondents had an experience below three years in a project which says that they are mostly a fresher. About 19% of the respondents were having a minimum of 3 to 6 years of experience and around 73% of the respondents were having minimal experience over 6 years of the total respondents of 100.

FACTOR ANALYSIS (FA) SCALE

The data in the study comprising 100 responses was used to carry out FA on performance measurement variables in order to identify the KPIs of construction projects. First, the descriptive statistics of the performance measurement variables are presented and subsequently the factorability of the variables is assessed before the variables are subjected to FA.

Descriptive statistics of performance measures

The responses on 30 variables relating to project performance provided by the respondents were included in the present study. The findings regarding the minimum score, maximum score, mean and standard deviations of the scores on responses to performance measurement variables were found through mean analysis. The minimum and maximum values were 1 and 5 respectively for 28 out of 30 variables, indicating that, in general, respondents used the entire 5 point survey scale. The mean score ranged between 2.84 *(29.)* accidents were often reported during the project) and 4.25 *(*Design Complexity of project (Type, size, nature and number of has influenced the project cost and time)*).* Standard deviations were found to be above 1 except in some variables.This shows that the means represent a good measure of the distribution of scores in the survey data. However, the standard deviation values of the variables being close to 1 indicate that the responses to these questions varied considerably amongst the respondents.

MEAN RANK

The mean ranking analysis is used to find out the most significant of all the key performance indicators based on the response of the likert scale analysis. The rank with the highest score is considered to be more significant in order with the other performance indicators. Ranking analysis is done to find out which of the above stated performance variable is most agreeable by the respondents. Based on the ranking, the highest ranked value will be given more priority than the lowest ranked performance variable. Here, the highest priority of ranking is given to Design Complexity of project (Type, size, nature and number of has influenced the project cost and time) (20.83) thereby proving, the more complex the project more cost and time is considered and this is followed by, Site Managers possessed requisite skills necessary for the kind of projects executed(20.36). The least priority is given to accidents were often reported during the project, thereby proving there was sufficient safety measures and insurance in big scale construction projects.

FACTOR ANALYSIS FOLLOWING VARIMAX ROTATION

Principal components analysis (PCA) was used with varimax rotation given that the primary purpose was to identify the underlying factors. Initially all 30 variables were allowed to load freely on various factors so long as they had eigenvalue greater than one. This approach, together with the screen plot generated enabled the researcher to fix the number of factors to be extracted at six. Therefore, while identifying the final factors underlying the Key Performance Indicators (KPIs), the process was subjected to four conditions: (i) the number of factors fixed at six, (ii) deletion of items with loadings of less than 0.5 or cross loadings of greater than 0.5, (iii) retention of only those factors with at least two items and (iv) the number of factors extracted should account for at least 60% of the variance (Field, 2005; Hair et al. 2006; Malhotra and Dash, 2011).

Assessing the factorability of project success variables

Assessment of factorability of project success variables was done based on correlation matrix shown in Table 4.6. It was observed that the correlation matrix had a chi square value of 5466.934 and significant level of .000 based on Bartlett's sphericity test. This suggested that inter-correlation matrix contained sufficient common variance to allow for factor analysis. Similarly, the KMO value for the entire matrix was found to be above the suggested threshold of 0.500 (Hair et al., 2006).
However, observation of the anti image correlation matrix revealed that three success variables had individual KMO values below 0.5, which indicated that the dataset, in
its current form, was still not suitable for factor analysis (Hair et al., 2006). These values were sequentially eliminated one after another, starting with the one whose
KMO value was lowest, until 30-item scale with an overall KMO value of 0.758 and individual KMO value of at least 0.5 was obtained for each item.

TABLE 4.4 KMO TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.758
Bartlett's Test of Sphericity	Approx. Chi-Square	971.173
	df	253
	Sig.	.000

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.

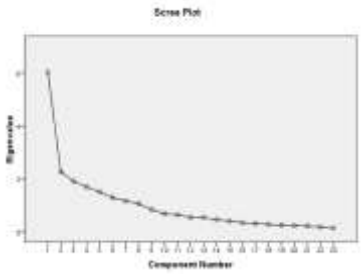

Figure 4.2 Eigen Vs component number

Observation of the shape of the screen plot generated (Figure 5.8) revealed that six factors could adequately capture variance amongst the success variables. During factor analysis, all success variables loaded appropriately based on the four conditions (already mentioned in section 5.3.3) which yielded a 6-factor 30-item instrument, accounting for 73.5% of the variance in the dataset. In this study, factors were named as Project management related, Cost related, Quality related, Time related, organisational set up.

TABLE 4.5 Rotated component matrix

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
Project Management Factors					
No changes were introduced in the designs of the current during project execution	.860				
Harmonious relationship between labour and management existed in the project site and hence no work disruptions were reported during project execution	.800				
A clear plan was formulated and an efficient planning and control system was designed to keep the current project up-to-date	.750				
The client had adequate experience on similar kind of projects.	.682				
Continuous monitoring of actual expenditures and project schedules and their comparison had been done regularly.	.599				
Project planning, Scheduling and control were adequately done on this project.	.570				
Expense factors					
The level of technological sophistication considered in the project was satisfactory.		.665			
The required equipments were available at pre budgeted rates		.638			
All required resources for the project were delivered on time during execution of this project		.567			
The project experienced minimum variations hence, hardly any additional cost attributable to variations was incurred.		.491			
Quality assurance					
The construction work adhered to the requisite Quality standards.			.869		
At the time of handover, the current project was free from apparent defects.			.803		
Site Managers possessed requisite skills necessary for the kind of projects executed.			.790		
Delay factors					
Weather and climatic conditions did not have much impact on delaying the project				.669	
The client's decisions were timely and objective				.627	
The client secured necessary funds for the project and hence there were no delays in material acquisition and payments to contractor		.		.589	
There has not been any increase in the cost of raw materials during the period of the project.				-.577	
Organisational factor					
There was a formal organization structure for dispute resolute within the project organization					.735
Proper medical facilities were available for people working on the project					.639
There has been increase in solid waste in the site construction of the current project					-.629
accidents were often reported during the project					-.621
Eigenvalue	4.128	3.854	3.705	3.045	3.031
Percentage of variance explained	15.289	14.275	13.721	11.279	11.225
Cumulative percentage	15.289	29.564	43.285	54.564	65.789
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					

From the analysis, it is evident that six variables loaded under factor 1 seem to associated with project management . The second factor comprises four variables which reflect the cost dimension of project performance. The three variables under factor 3 represent construction project performance relating to Quality factors whereas the three variables under factor 4 attempt to capture *Time* dimension of project performance and the four variables under factor 5 are associated with project organisational set up . The above table reveals that 'project management' is the most important measure of construction project performance, having the highest eigenvalue of 4.128 and accounting for 15.289% of the variance in the dataset. This is followed by the measure 'Cost performance factor' with an eigenvalue of 3.854 which explains 14.275% of the total variance. The third most important performance measure was found to be '*time factor'* with an eigenvalue of 3.705 and explaining 13.721% of the variance while the fourth important measure turns out to be 'Organisational factor' with an eigenvalue of 3.045 and contributing to 11.279% of the total variance. The last performance measures in order of importance were 'Quality performance factor' with an eigenvalue of 3.031 and variance is 11.225%. These five constructs of performance constitute the KPIs of construction projects.

ASSOCIATION BETWEEN STAKEHOLDERS' (CLIENT, CONSULTANT AND CONTRACTOR) ON CONSTRUCTION PROJECTS AND OCCURRENCE OF COST OVERRUN, TIME OVERRUN AND QUALITY DEFECTS.

The chi-square test for independence, also called Pearson's chi-square test or the chi-square test of association, is used to discover if there is a relationship between two categorical variables. This particular test is carried out in order to find out the relationship between stakeholders' (client, consultant and contractor) on construction projects and occurrence of cost overrun, time overrun and quality defects. The simplified results are as shown in the table 4.8

TABLE 4.6 CHI^2 VALUE (COST,TIME,QUALITY VS PROJECT TYPE)

Variables	F-value	significance	result
Cost	.692	.766	positive
Time	.653	.778	positive
Quality	.326	.954	positive

A anova analysis was run to examine the extent of differences in the occurrence of cost overrun, time overrun and quality defects across different types of construction projects. The variables predicted F=.653, R2=.778. All variables are not significant to the prediction, p=.05 R square tells, how much of dependent variable is explained by the independent variable. Here it is 0.778 that means 77.8% variation in dependent variable.

CORRELATION ANALYSIS

The Pearson's correlation to understand whether there is an association or relationship between two variables. The relationship between the variables can be positive or negative. A positive correlation value indicates that the relationship between the two variables is positive and a negative correlation value indicates that the relationship between the two variables is indirect.

The relationship between the position of stakeholders (client, contractor, consultant) and type of project (industrial, domestic, hospital, agricultural) towards success factors of construction projects: In order to study the relationship between the position of stakeholders (client, contractor, consultant) and type of project (industrial, domestic, hospital, agricultural) towards success factors of construction projects correlation analysis was used.

TABLE 4.7 Correlation analysis 1

DV	IV	R	R^2	Adj R^2	F	sig	Standard Error(coef)	Beta	t	Sig
1.Time	Proj mang	.831	.691	.675	42.100	.000	.021	.794	9.966	.000
	Expense						.026	.092	1.429	.156
	Quality						.031	.103	1.671	.098
	Delay						.028	-.024	-.361	.719
	Org						.046	-.055	-.758	.450
2.Cost	Proj mang	.881	.750	.782	51.517	.000	.031	.894	9.996	.000
	Expense						.036	.102	1.459	.166
	Quality						.041	.113	1.691	.100
	Delay						.038	-.034	-.371	.739
	Org						.056	-.075	-.798	.468
3.Quality	Proj mang	.731	.534	.509	21.531	.000	.021	.844	8.621	.000
	Expense						.026	-.136	-1.716	.090
	Quality						.031	-.065	-.864	.390
	Delay						.028	-.256	-3.162	.002
	Org						.046	.012	.134	.894
4.Environmental impact	Proj mang	.700	.490	.463	18.041	.000	.025	.065	.630	.530
	Expense						.032	-.128	-1.540	.127
	Quality						.037	.050	.637	.526
	Delay						.033	.732	8.661	.000
	Org						.055	-.128	-1.365	.176
5. Disputes	Proj mang	.273[a]	.075	.250	1.517	.192	.028	.028	.199	.842
	Expe						.035	.	.	.

	nse							008	074	941
	Quality						.041	.239	2.250	.027
	Delay						.037	.083	.728	.469
	Org						.061	-.063	-.497	.621

Correlation analysis was used to determine the correlation of factor's at the 0.05 level of significance. It has highlighted the fact that there is a significant positive correlation between the stake holders , their project position and the type of project undertaken as it has a significant positive correlation with critical success factors of the construction project. The table reveals there is a direct relationship of project management to cost (r=.394) and time(r=.433).And there is an indirect correlation between project type and quality(r=-.851).

The relationship between factors determining the success and the outcome of prediction factors based thesis (cost, time, quality and disputes) towards factors determining the success of construction projects.

In order to study the relationship between factors determining the success and the outcome of prediction factors based thesis (cost, time, quality and disputes) towards factors determining the success of construction projects**.**

TABLE 4.8 Correlation analysis 2:

	time	cost	quality	Environ-mental	dispute	Proj mang	Cost	Quality	Time	Org
time	1	.005	.534**	.279**	.002**	.001**	.408**	.364**	.355**	.461**
cost	.095	1	.114	.160	.237*	.104	.092	.259**	.127	.022
quality	.534**	.004	1	.003	.141	.667**	.095	.113	.053	.389**
Environ-mental	.279**	.160	.003	1	.082	.269**	.130	.178	.681**	.145
dispute	.272**	.237*	.141	.082	1	.247*	.112	.793**	.025	.119
Proj mang	.819**	.104	.667**	.269**	.247*	1	.394**	.316**	.433**	.610**
Cost	.408**	.092	.095	.130	.112	.394**	1	.258**	.347**	.273**
Quality	.364**	.259**	.113	.178	.793**	.316**	.258**	1	.218*	.150
Time	.355**	.127	.053	.681**	.025	.433**	.347**	.218*	1	.357**
Org	.461**	.022	.389**	.145	.119	.610**	.273**	.150	.357**	1

REGRESSION ANALYSIS:

Regression analysis is used to study the degree of a relationship, i.e., the extent to which the independent variables are influenced by the dependent variables. Therefore, the impact of a dependent variable over the independent variable can be studied.

4.8.1 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:

In order to study the extent of the impact of factors determining the success and the outcome of the prediction factors based thesis (cost,time,quality&disputes) towards factors determining the success of construction projects we use regression analysis.

TABLE 4.9 Regression analysis 1

DV	**IV**		**R^2**	**Adj R^2**	**F**	**sig**	**Standard Error(coef)**	**Beta**	**t**	**Sig**
1.Time	Proj mang	831	.691	.675	42.100	.000	.021	.794	9.966	.000
	Expense						.026	.092	1.429	.156
	Quality						.031	.103	1.671	.098
	Delay						.028	-.024	-.361	.719

	Org						.046	-.055	-.758	.450
2.Cost	Proj mang	881	.750	.782	51.517	.000	.031	.894	9.996	.000
	Expense						.036	.102	1.459	.166
	Quality						.041	.113	1.691	.100
	Delay						.038	-.034	-.371	.739
	Org						.056	-.075	-.798	.468
3.Quality	Proj mang	731	.534	.509	21.531	.000	.021	.844	8.621	.000
	Expense						.026	-.136	-1.716	.090
	Quality						.031	-.065	-.864	.390
	Delay						.028	-.256	-3.162	.002
	Org						.046	.012	.134	.894
4.Environmental impact	Proj mang	700	.490	.463	18.041	.000	.025	.065	.630	.530
	Expense						.032	-.128	-1.540	.127
	Quality						.037	.050	.637	.526
	Delay						.033	.732	8.661	.000
	Org						.055	-.128	-1.365	.176
5. Disputes	Proj mang	273[a]	.075	.250	1.517	.192	.028	.028	.199	.842
	Expense						.035	.008	.074	.941
	Quality						.041	.239	2.250	.027
	Delay						.037	.083	.728	.469
	Org						.061	-.063	-.497	.621

The impact of the factors determining the success and the outcome of prediction factors based thesis (cost,time,quality, environment and disputes) towards determining the success of construction projects was studied with the help of regression analysis.The significant values are cost(F=51.519) followed by cost (F=42.1) and the least significant factor was disputes (F=1.517). The percentage of the variability in the dependent variable explained by the independent variable is found to be the maximum at cost 78.2% and time 67.5% and it was found to be the least with disputes (25%).

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^2	Adj R^2	F	sig	Standard Error(coef)	Beta	T	Sig
1.Time	Type of project	.243	.059	.400	3.055	.052	.113	.237	2.386	.000

	Position of stakeholder						.147	.235	2.349	.000
2.Cost	Type of project	.172	.030	.800	1.484	.232	.009	.120	8.188	.000
	Position of stakeholder						.005	.110	8.093	.000
3.Quality	Type of project	.068	.005	.106	.225	.799[a]	.095	.068	.670	.504
	Position of stakeholder						.122	.005	.046	.964
4.Environmental impact	Type of project	.135[a]	.018	-.092	.900	.410[a]	.109	.053	.524	.601
	Position of stakeholder						.140	-.118	-1.162	.248
5. Disputes	Type of project	.050[a]	.002	.018	.120	.887[a]	.067	-.050	-.489	.626
	Position of stakeholder						.087	-.010	-.102	.919

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. 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.

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