



VALUE MANAGEMENT IN CONSTRUCTION PROJECTS

AN.Muthuckannal¹, Dr.G. Chitra²

Student¹, Professor²

Department of Civil Engineering, Thiagarajar College of Engineering,
Madurai, Tamil Nadu, India.

E-mail Id:-muthu1510pearl@gmail.com¹,gcciv@tce.edu²

ABSTRACT

Value management in construction project plays an effective role in reducing cost and improving the functionality or quality of the project. The finding of key factors for value management success allows appropriate allocation of the limited time and resources in order to attain better output. This paper examines to distinguish these factors according to their degrees of importance in relation to success using correlation matrix. A questionnaire survey was conducted to gather views from professionals working in the construction industry about value management. The result of the analysis was by applying value management in construction project will improve the performance, design, constructability, functionality, quality with reduction in cost. Keywords:-Value management, key factors, correlation matrix

INTRODUCTION

VALUE MANGEMENT

Value management is a team-based activity. The bundle of whole-life benefits, a customer is looking for from an undertaking at the suitable expense. It is the important characteristics that must be achieved at all levels, thus resolving planning and design issues to achieve best value for money. It can be applied during the planning and design stage to achieve the best value for money.

Value management has three subsets:- Value planning, Value engineering, Value analysis.

VALUE PLANNING

Value planning is to describe more strategic-type study undertaken at the early conceptual design stage. It refers to the activities in the early phases of a project to define, clarify, and agree a clear understanding of Client objectives.

Value planning extends from Inception to scheme design completion.

VALUE ENGINEERING

The term 'value engineering' is a systematic and organized method to provide and enhance the value of goods or products by using an evaluation of function. The Value Engineering methodology can be concisely stated as a tool that helps construction industry improve cost effectiveness.

Value engineering extends from detailed design to construction completion.

$$\text{Value} = \frac{\text{Function}}{\text{Cost}}$$

VALUE ANALYSIS

Value Analysis is one of the major techniques and a creative approach to eliminate the unnecessary costs. It guarantees the fundamental capacities for the base expense without reducing quality, dependability, execution and appearance.

Value analysis is about the process of post-occupancy evaluation.

AIM OF THE WORK

The aim of the research is to assess whether the process of the Value management being applied in construction projects in the construction

industry without compromising the quality and provide the benefits claimed, and whether potential developments can be achieved.

OBJECTIVE OF THE WORK

The objective of the work are as follows

1. To determine the success factors of value management using quantitative analysis.
2. To find the possibility, importance and benefits of applying value management techniques in construction projects using qualitative analysis

SCOPE OF THE WORK

To address the objectives stated above, the following data collection elements are employed:

1. The current Value management practices prevailing in construction projects were reviewed by using literature and questionnaires.
2. Case studies were collected in order to verify, the benefits and implementation of Value management practices in construction Industry.

LITERATURE STUDY

Brijesh Ramani.et.al (2017), the principles of Value Engineering is applied in building construction projects is explained, in order to reach out better quality with lower cost. Best time to carryout value engineering study is during the design and planning stage of project. Value engineering is not just about cost reduction, but increasing the design standards, making it easier to build the project and saving time and money. About 5% to 10% reduction in construction cost can be achieved using value engineering in building construction.

Qiping Shen.et.al (2018), Value management studies often face pressure caused by limited time and resources. This research is to distinguish the factors according to their degrees of importance in relation to success. A questionnaire survey was conducted to gather views from experts in the construction industry. The result shows that the success of VM studies requires an integrated effort from all parties involved.

METHODOLOGY

The methodology for the project was constructed in the form of flow diagram, consisting of all the steps to be performed in

sequential order. The flow process of methodology is shown in figure 1.

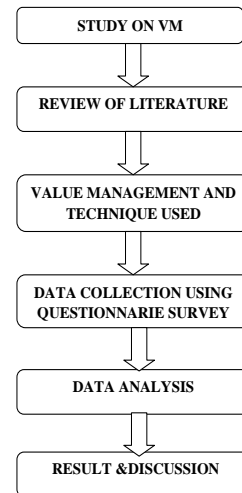


Fig.1:-Methodology for the project

TECHNIQUES USED IN VM PHASES

There are four clearly identifiable and commonly employed approaches to Value management, Kelly, Male and Graham (2004) ,Briefly the four approaches are:-

Each stage has various techniques to aid its successful implementation. The most commonly adopted techniques of each phases of a job plan are discussed in table 1

Table 1 Most commonly adopted techniques in each phase of job plan

Job Plan Phase	Technique used
Information Phase	Functional Analysis
Creative Phase	Brainstorming
Analytical Phase	Evaluation
Development Phase	Report Writing
Presentation Phase	Oral Presentation

ANALYSIS OF THE DATA

The data information was collected through questionnaire survey. The questionnaire was distributed to a range of construction professionals working in the construction industry. It was realized that not all would be familiar with Value Management, however, the objective was to find out the performance, benefits, implementation and understanding of Value management by other construction professionals. A total number of 47 responses were received from a distribution of 63 questionnaires giving a response rate of 72%.

The analysis of data was performed using two statistical methods: Ranking of factors, Correlation matrix. Two test (KMO and Barlett

test of sphericity) was performed to test whether the factors are useful for the analysis or not and to test whether the resulted matrix is an identity matrix or not.

I. RANKING OF FACTORS

The first analysis ranked the factors based on the mean values of the responses received through questionnaire. The factors with means exceeding or equal to 3.7 were recognized as success factors based on the consensus of the respondents. Fifteen factors were identified as success factors having significant influence on the success of VM studies. Table 2 show the ranking of the factors according to the value of their means.

II. FACTOR ANALYSIS

Table 2 Ranking of factors according to their mean value

FACTORS	MEAN	RANK
Clear objective of VM study	4.787	1
Time to conduct VE workshop	4.340	2
Cost of the project	4.319	3
Quality of work	4.277	4
Opinion about VM	4.277	4
Importance of implementing VM	4.213	6
Reduction of project budget by VE	4.128	7
Effectiveness of VE in preliminary stage	4.128	7
Applying VE during design and construction stage	4.106	9
Methods and techniques of VM	4.064	10
Improved design and life cycling cost	4.000	11
Measurable benefits stage in project	3.979	12
Financial support	3.979	12
Time for completion of project	3.809	14
Decision making	3.787	15

III. KMO AND BARLETT TEST OF SPHERICITY

Kaiser-Meyer-Olkin (KMO) is a statistic that indicates the percentage of variance in the variables. The KMO value greater than 0.5 means the factor analysis may be useful for analysis. The KMO value less than 0.5 means the factor analysis won't be useful. The summary of the KMO test is the identified factors may be useful for further analysis.

$$KMO=0.696>0.5$$

Barlett test of sphericity is to test the hypothesis that the resulted correlation matrix is an identity

Factor analysis is a statistical technique identifies a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. Different tests are required for the appropriateness of the factor analysis for the factor extraction. A correlation matrix is a table shows the coefficients between the factors. Every cell in the table shows the correlation between the factors. Figure 2 shows the correlation matrix. The first stage of the factor analysis is to determine the strength of the relationship among the variables, i.e., the 15 identified success factors, measured by the correlation coefficients of each pairs of the variables. The matrix is automatically generated as a part of results of factor analysis.

matrix or not. The significance level value less than 0.05 means the factors analysis may be useful for the analysis and the correlation matrix is not an identity matrix.

The significance level value greater than 0.05 means the factors analysis won't be useful for the analysis and the correlation matrix is an identity matrix.

The summary of the Barlett test of sphericity is the identified factors may be useful for further analysis and the correlation matrix is not an identity matrix.

Significance level=0.0010<0.05

Examine the linear relationship between variables using Pearson correlation coefficient. The larger value of coefficient, stronger the relationship between the variables and smaller

the value of coefficient, weaker the relationship between the variables. The indication of the coefficient shows the heading of the relationship. Table 3 shows the coefficient of correlation.

FACTOR	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
F1	1														
F2	-0.023	1													
F3	0.053	0.070	1												
F4	-0.268	0.184	0.186	1											
F5	-0.091	0.191	0.576	0.360	1										
F6	-0.044	0.100	0.277	-0.064	0.495	1									
F7	0.123	0.020	0.675	0.089	0.516	0.337	1								
F8	0.068	-0.001	0.400	0.013	0.192	0.178	0.424	1							
F9	-0.115	0.172	0.382	0.279	0.625	0.458	0.536	0.280	1						
F10	-0.124	0.141	0.596	0.372	0.693	0.531	0.685	0.483	0.751	1					
F11	0.049	0.294	0.667	0.384	0.416	0.138	0.408	0.182	0.282	0.427	1				
F12	-0.165	0.014	0.153	0.121	0.349	0.327	0.276	0.007	0.375	0.346	0.304	1			
F13	0.030	0.048	0.613	0.221	0.452	0.351	0.629	0.478	0.468	0.714	0.486	0.271	1		
F14	0.003	0.128	0.532	0.059	0.291	0.443	0.781	0.324	0.437	0.555	0.316	0.371	0.517	1	
F15	-0.006	-0.191	0.262	-0.073	0.542	0.427	0.343	0.352	0.382	0.322	0.094	0.276	0.260	0.172	1

Fig. 2:- Correlation matrix of the Success Factors

If both variables tends to increases or decreases together, then the line that represents the slope upward. If one variable tend to increase and other decrease, then the line that represents the slope downward.

Table 3 Coefficient of Correlation

FACTORS	COEFFICIENT
Objective-Effectiveness	0.068
VE workshop-Methods	0.141
Cost-Quality	0.240
Implementation-Benefits	0.327
Quality-Time	0.384
Applying-Implementation	0.458
Time-Cost	0.532
Reduction of cost-Cost	0.636
Methods-Reduction of cost	0.685

A graph was plotted by using the value of coefficient of correlation. The factors are

mentioned in the X-axis and the values are mentioned in the Y-axis.

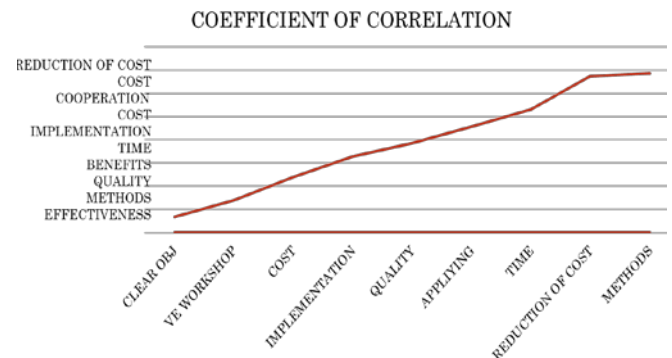


Fig 3:-Coefficient of correlation-graph

From the graph, figure 3 if both variables tend to increase or decrease together, then the line that represents the slope upward. The graph value increase together, hence it defines the positive correlation which means the factors have a strong relationship with each other in the VM study.

CONCLUSION

This study identifies and ranks the success factors according to the importance in the view of expert and to the mean value the analysis of collected response from the questionnaire survey was carried out using the two statistical analysis method. The two tests were performed

to check whether the identified factors are useful for the factor analysis. The result of the test is the identified factors are useful for the factor analysis and the correlation matrix is not an identity matrix. The result of the analysis figure 3 shows the positive correlation which means strong relationship between the identified factors in the VM study. The strong relationship defines that the compared two factors are tend to increase or decrease together, so it is highly interlinked with each other and highly influence the application of VM in construction projects.

This triple constraint decision was based on the opinion and result collected through questionnaire and its analysis. In triple constraints, most common place is “quality” and it is surrounded by cost, scope, time. This is clearly to represent that the quality of a project depends on the project’s scope, budget, and time spent on the project. If the consistent level of quality is to maintain, when making changes to one of the constraint, then the other sides must adjust.

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