INTEGRATED MODEL OF VALUE ENGINEERING AND RISK MANAGEMENT APPROACHES IN EMPOWERMENT PROJECTS (THE EXTERIOR DESIGN)

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Abstract -Advantages of using two valuable approaches of value engineering and risk management in projects has a long history and their effectiveness in better implementation of projects is proved. In this article we have tried to put a greater emphasis on project construction phase. The suggested model is simple, functional and as much as possible away from the problems of previous researches by combining value and risk" .Optimized value index" is a result of the "risk factor" multiplied by the normal value index. This index is a measure for decision of value engineering team and facilitates the decision-making with clarifying the advantages and disadvantages of each idea.

Key words- value, risk, integration, optimization index

I. INTRODUCTION

In recent years, the necessity of doing risk management process of projects as an important part is widely considered by leading institution in field of project management. In fact the risk management is a multi step process which has an important role in improving the project performance to achieve the predetermined goals. This is done by maximizing the positive possible events and minimizing the negative ones [1] [2]. It's also the most successful value engineering methodology to solve problems, reduce costs and improve performance. The different aspects of function-oriented value engineering are achieving the high-speed delivery solutions in the early stages of the process [3]. Combining the risk management and value engineering will result in cost optimization by balancing between risk and value instead of incremental approach of risk management and decline approach of value engineering.

1-2 key definitions:

The important key words for describing the implemented procedure are as following:

- Value: is the ratio of performance to cost. By improving the performance or reducing the cost, the value can be increased.
- Operation cost: is the required cost of resources to perform a function.
- Value index: is the ratio of operating costs to cost function. This index is used to determine the opportunities to improve value and is detected in the performance analysis phase.
- Risk: is defined as the possible phenomenon which it's occurrence can have positive or negative effect on project objectives.
- The probability of occurrence: it is the extent to which an event is likely to occur.
- The severity of the impact of risk: it's defined as the amount of deflection of project's goals due to risk. The higher the effect of risk of project means the higher the severity of risk impact.
- The degree of difficulty of risks: it is the product of two quantitative criteria: risk likelihood and severity of the impact.
- Probability and impact matrix: it is a tool to prioritize risks based on the degree of difficulty [4] [5].

1-3 The reasons for combination risk management and value engineering

1. 3.1Researchers Reasons

.The main reasons are:

- complementary of value and risk
- consistency of risk and value of processes [6] [7]

1.3.2The benefits of the combination of value and risk

A - Combination of value and risk at the same time which empowers the consequences.

B - Combination will increase the efficiency of study, not only by improving its quality, but also by reducing the required workshops and meetings also contributed to this.

C - Using an integrated approach eliminates ambiguities and contradictions and promotes a common language for team understanding and to realize the objectives of the project.

D - The application of value engineering principles combined with risk management can give optimized reaction and a different way, with value and with acceptable risk for the project [8].

2. Integrated approach Methodology to risk management - Value Engineering:

The definition of risk value if properly applied will have positive results. The correlation for calculating of value index can be improved as following [6]:

$$\text{Value index} \quad \text{<< Optimized >>} = \frac{\text{Operating costs}}{\text{Function of costs}} \times \text{Risk factor}$$

The first step: The pre-study activities should be done from value engineering study. An expert of risk management should be added to team.

Step Two: In this step, the process described in the Value Engineering Workshop will be conducted. The best ideas ultimately recognized and the value index of leading ideas on the basis of normal value is calculated. Along with the implementation of this process, the predefined questionnaire will be given to all the participants. Based on the experiences of the participants it will be asked to add other risks to the questionnaire.Now, for each risk identified, the average number of the probability and severity of the impact will be calculated and with the aid of probability matrix used for calculation of risk effect.

Step Three: Calculating the value of "optimized" value index is done at this step. A special brainstorming session is held, and tries to identify the other possible risks which might exist.Then as explained before the risk assessment will be calculated. Due to the positive or negative nature of the risk, any new risk can be an opportunity or a threat. To create opportunities, the calculated risk factor for it to should be positive and for a threat it should be negative.According to the table which is set the sum of positive and negative values of risk assessment should be obtained. The sum obtained in the preceding stage will be added with one. This number represents a risk factor. (The reason for summation with one is to balance the 'optimized" relationship of logical value index)

2.1 Presentation phase**:**

All top priority ideas based on the optimal value of the combined approach of "risk management - Value Engineering" will be categorized in its final report and is given to employer.

Step Four :The post study: The main purpose of the study process is to ensure the recommendations of the integrated approach studies "Risk Management - Value Engineering" will be implemented and the changes will be approved. Team leader follows the progress of the implementation of its recommendations.

3-The implementation of the model: better enforcement exterior

The steps presented in the case study research method (Run exterior) was done in a district of Tehran and according to the three types of stone and brick, composite materials, separately.

Step 1: In a pre-study, the primary data was collected with the help of human resources, documentation and preliminary studies and also several meetings with experts.Along with this step the early identification of project risks gather information from similar projects and experts were performed. Then the value engineering study, the environment and with the participation of 14 specialists with over 10 years experience was done in construction management.

Step 2: With regard to the current situation and with the aid of 10 experts, the risks for the exterior are determine as following:

Table 1-prioritization of identified risks

degree of difficulty	Risk	Row
0.8	Lack of financial resources	**1**
0.543	Error Design	**2**
0.57	Unskilled labor	**3**
0.61	Lack of supervision	**4**
0.36	Low motivation	**5**
0.5	Lack of familiarity with new technologies	**6**
0.622	Location inappropriate	**7**
0.6	Weather conditions	**8**
0.498	Inappropriate materials	**9**
0.528	Low productivity	**10**

The value Index for the top idea is as following:

Table 2: Estimates of the value of the stone façade

Value index	The price performance	Current Price Per m²	Top ideas	Row
1.13	6.000.000	6,800,000	Parallel with joinery	1
1.15	5.900.000	6,800,000	Run hybrid or composite facade with brick	2
1.26	5.400.000	6,800,000	Increase of team experts	3
1.34	5.100.000	6,800,000	Unloading and transportation of materials by machines	4
1.11	6.120.000	6,800,000	Depo working materials required for each class of floors of the building facade	5

Table 3: Estimates of the value of brick facade

Table 3: Estimates of the value of brick **façade**

Value index	The performance price	Current Price Per m²	Top ideas	Row
1.17	3.570.000	4,200,000	Buy Direct from factory	1
1.25	3.350.000	4,200,000	Increase of team experts	2
1.33	3.150.000	4,200,000	Unloading and transportation of materials by machines	3
1.17	3.570.000	4,200,000	Depo working materials required for each class of floors of the building facade	4
1.11	3.780.000	4,200,000	Early work conducted in the project implementation firm	5

Table 4: Estimates of the composite facades

Value index	The performance price	Current Price Per m²	Top ideas	Row
1.33	4.050.00	5,400,000	Increase of team experts	1
1.43	3.780.000	5,400,000	Unloading and transportation of materials by machines	2
1.27	4.266.000	5,400,000	Depo working materials required for each class of floors of the building facade	3
1.12	4.806.000	5,400,000	Early work conducted in the project implementation firm	4

Table 5: Prioritize the new risk ideas and calculate of risk factor in correlation of optimized

The nature of risk	Risk difficulty	Abundance	Risk rating	Description of the risk factors identified for each idea	Risk Priority	No. risk	Row
(-)	0.6	2	High	Lack of access to materials for thin team work	1	1	1
-	0.53	3	High	Lack of coordination between team work	2	7	
-	0.4	1	Average	Non-compliance with safety rules	3	4	
-	0.3	2	Low	Poor working environment due to congestion caused people	4	8	
-0.47375				Weighted average risk positive and negative values difficulty			
1+(-0.47375)=0.52625				Calculated "risk factor" in the optimized value index			
-	0.71	2	High	Delays in project delivery	1		2
-0.71				Weighted average risk positive and negative values difficulty			
1+(-0.71)=0.29				Calculated "risk factor" in the optimized value index			
-	0.5	1	Average	Rework on the run	1		3
-	0.4	1	Average	Poor working environment due to congestion caused people	2		
-	0.36	2	Average	Non-compliance with safety rules	3		
-0.405				Weighted average risk positive and negative values difficulty			
1+(-0.405)=0.595				Calculated "risk factor" in the optimized value index			
-	0.72	1	High	Broken Machines	1		4
-	0.5	1	Average	Executive restrictions	2		
-	0.47	2	Average	Lack of expertise	3		
-0.54				Weighted average risk positive and negative values difficulty			
1+(-0.54)=0.46				Calculated "risk factor" in the optimized value index			
-	0.45	2	Average	Poor working environment	1		5
-	0.43	1	Average	Accidents	2		
-0.44				Weighted average risk positive and negative values difficulty			
1+(-0.44)=0.56				Calculated "risk factor" in the optimized value index			

Table 6: Prioritize the new risk ideas and calculate of risk factor in correlation of optimized value of Brick

The nature of risk	Risk difficulty	Abundance	Risk rating	Description of the risk factors identified for each idea	Risk Priority	No. risk	Row
-	0.35	1	Low	Delays in ordering and procurement	1		1
-0.35				Weighted average risk positive and negative values difficulty			
1+(-0.35)=0.65				Calculated "risk factor" in the optimized value index			
-	0.5	1	Average	Rework on the run	1		2
-	0.4	2	Average	Poor working environment	2		
-	0.39	1	Average	Non-compliance with safety rules	3		
-0.4225				Weighted average risk positive and negative values difficulty			
1+(-0.4225)=0.5775				Calculated "risk factor" in the optimized value index			
-	0.7	1	ighH	Broken Machines	1		3
-	0.45	1	Average	Executive restrictions	2		
-	0.43	2	Average	Lack of expertise	3		
-0.5025				Weighted average risk positive and negative values difficulty			
1+(-0.5025)=0.4975				Calculated "risk factor" in the optimized value index			
-	0.42	2	Average	Poor working environment	1		4
-	0.4	1	Average	Accidents	2		
-0.41				Weighted average risk positive and negative values difficulty			
1+(-0.41)=0.59				Calculated "risk factor" in the optimized value index			
-	0.5	1	Average	Rework on the run	1		5
-	0.47	1	Average	Manpower shortage	2		
-	0.45	2	Average	Poor working environment	3		
-0.4675				Weighted average risk positive and negative values difficulty			
1+(-0.4675)=0.5325				Calculated "risk factor" in the optimized value index			

Table 7: Prioritize the new risk ideas and calculate of risk factor in correlation of optimized value of composite

The nature of risk	Risk difficulty	Abundance	Risk rating	Description of the risk factors identified for each idea	Risk Priority	No. risk	Row
-	0.51	1	Average	Rework on the run	1		1
-	0.45	2	Average	Poor working environment due to congestion caused people	2		
-	0.42	1	Average	Non-compliance with safety rules	3		
-0.4575				Weighted average risk positive and negative values difficulty			
1+(-0.4575)=0.5425				Calculated "risk factor" in the optimized value index			
-	0.65	1	ighH	Broken Machines	1		2
-	0.53	1	Average	Executive restrictions	2		
-	0.5	2	Average	Lack of expertise	3		
-0.545				Weighted average risk positive and negative values difficulty			
1+(-0.545)=0.455				Calculated "risk factor" in the optimized value index			
-	0.55	2	Average	Poor working environment	1		3
-	0.35	1	owL	Accidents	2		
-0.48				Weighted average risk positive and negative values difficulty			
1+(-0.48)=0.52				Calculated "risk factor" in the optimized value index			
-	0.5	1	Average	Rework on the run	1		4
-	0.47	1	Average	Manpower shortage	2		
-	0.45	2	Average	Poor working environment	3		
-0.4675				Weighted average risk positive and negative values difficulty			
1+(-0.4675)=0.5325				Calculated "risk factor" in the optimized value index			

Table 8: Estimated savings for stone facades, with top ideas from the combinat

The saving almost certainly the result of applying the risk factor (the amount of the Treaty)	Optimized Value index Risk Factor * (cw)	Risk factors related to the optimal value index (RS + 1)	**Selected priority**	**owR**
421000	0.59	0.52625	3	1
261000	0.33	0.29	5	2
833000	0.75	0.595	1	3
782000	0.62	0.46	2	4
380800	0.62	0.56	4	5

Estimated to save almost certainly:

Table 9: Estimated savings for brick, with top ideas from the combinati

The saving almost certainly the result of applying the risk factor (the amount of the Treaty)	Optimized Value index Risk Factor * (cw)	Risk factors related to the optimal value index (RS + 1)	**Selected priority**	**owR**
409.500	0.76	0.65	3	1
491.300	0.723	0.578	2	2
522.900	0.662	0.498	1	3
371.700	0.69	0.59	4	4
223.860	0.591	0.533	5	5

Table 10: Estimated savings for facades, with top ideas from the combination of value and risk

The saving almost certainly the result of applying the risk factor (the amount of the Treaty)	Optimized Value index Risk Factor * (cw)	Risk factors related to the optimal value index (RS + 1)	**Selected priority**	**owR**
733050	0.722	0.543	2	1
737100	0.65	0.455	1	2
587600	0.66	0.52	3	3
319800	0.6	0.533	4	4

3.1 Presentation phase:

After the presentation of results, the increase of team experts (idea 3) for Stone ideas and the use of use of machines in the evacuation and transportation of materials (ideal 3) has been chosen to run for stone and brick facades.According to the importance of risk factors calculated for each idea, the ability of ideas to get the opportunity to save money is achievable.

3.2 The post Study:

During the process of implementation, the comparison of planned and ongoing projects will be carried out to determine the type of project progress based on the plan. According to the evaluation carried out, the idea of this project is implemented in accordance with which it can reduce the cost and time effort. For other options the depot of materials and

increase of team experts to run each class of building floors are suggested to improve working conditions.

CONCLUSION

Due to the simplicity of the proposed method by integration approach of value and risk, this method can be used widely. Also, the index value calculated in this way is closer to reality and has effective role in decision-making for the project team plays.
As the appraisal Index for value management is value and the one for risk management is risk, the integration approach is compatible with both.

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