Analysis on the Influencing Factors of the Implicit Cost of Construction Engineering Based on Fuzzy-Dematel

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Abstract

In order to strengthen the management of implicit costs in the implementation of Construction projects, an indicator system of invisible factors was constructed, and the theory of triangular fuzzy numbers was introduced. A fuzzy-Dematel-based evaluation model of implicit costs of hydropower projects was established and calculated using examples. The centrality and cause of the influencing factors, the correlation between mining factors, and the identification of the main factors affecting the implicit costs. The results show that personnel organization, management system, operation mechanism, construction organization, material security, change of claims and natural conditions are the main factors, and management factors and technical factors are the key targets for control.

Keywords

Implicit cost; Construction projects; Fuzzy Dematel analysis.

1. Introduction

With the fierce competition in the construction project market and the decreasing profit space, cost management is particularly important. The implicit cost is an important part of the project cost, but it is universal but it is insufficiently valued. At present, there are many research results on the implicit cost related content. However, researches mostly focus on financial and financial management, corporate management, and other aspects, and do not analyze and evaluate the implicit costs of construction projects. Therefore, this paper proposes five recessive cost performance forms for construction engineering, establishes a comprehensive evaluation index system for the implicit cost influencing factors of hydropower projects, and uses Fuzzy - DEMATEL method to analyze the influencing factors and provide reference for the implicit cost management of construction projects.

2. Index System of Recessive Costs of Construction Projects

The implicit costs of construction projects are included in the total project construction costs. Due to many influencing factors, they cannot be reflected in the financial books in the form of actual costs. They are not easy to be noticed, but the costs are continuously accrued with the project. The construction project construction has the characteristics of complex environment, high technical requirements, long investment cycle, and many staff involved in construction. The implicit costs of construction projects mainly include implicit quality costs, implicit period costs, implicit security costs, and implicit cost costs. There are five forms of implicit environmental costs. The specific meanings are as follows: 1 Recessive quality costs. Mainly refers to the project construction costs due to the project intentional or unintentional misconduct caused project shutdown, repair and other issues. 2 Implicit duration costs. Mainly due to contractors, force majeure and other factors, resulting in delays in the project and an additional increase in the cost of rushing to work. 3 Recessive security costs. It mainly refers to the indirect investment in safety management and the additional expenses related to compensation costs due to the decrease of market competitiveness and the loss of interests. 4 implicit cost costs. Mainly manifested as increased costs due to capital advances, exchange rate changes, etc. 5 Recessive environmental costs. Mainly refers to the increase in environmental

protection costs due to environmental destruction and pollution caused by hydropower development easy to generate friction. This kind of cost is not valued by people and is hard to calculate.

3. Evaluation Model of Recessive Costs of Hydropower Projects

Identification of influencing factors is the basis and prerequisite for implicit cost management of hydropower projects. The DEMATEL method calculates the causality and relative importance of expression factors based on matrix tools and graph theory. Because the expert group judgement has the characteristics of subjectivity and ambiguity, it introduces the concept of triangular fuzzy number to carry out fuzzification, and establishes an evaluation model of the implicit cost influencing factors of hydropower projects based on Fuzzy-Dematel.

3.1 Triangular Fuzzy Number

The triangular fuzzy number is the number of intervals that defines the membership function. It is written that A = (a, b, c) represents the expected interval of the evaluation result. Assume there are n influencing factors, which are evaluated by p experts. The result represents the triangular fuzzy number of the degree of influence of factor i given by kth expert on factor j, and each factor gives the influence of each factor on other factors. The triangular fuzzy influences the matrix directly. of production costs, improve work efficiency and optimize the production process.

In order to defuzzify the data, a CFCS method is chosen that is easy to operate and has a relatively small numerical loss after transformation.

3.2 Dematel Method for Calculating Comprehensive Influence Matrix

The normalized influence matrix D is calculated by directly influencing the matrix Z. Since the matrix D can only show the direct influence between the indicators, it needs to calculate the comprehensive influence matrix T that contains the direct influence and the indirect influence.

Degree of influence R represents the combined effect of each factor on other factors. The larger the value, the stronger the effect of this factor on the other factors in the system and can be considered as the main factor. The degree of influence, C, represents the combined influence of each factor on other factors. The larger the value, the more likely it is that the factor will be affected in the system.

The definition of centrality (R + C) is the sum of the degree of influence and the degree of influence of each factor, indicating the position of the factor and the size of its effect. The larger the value, the more obvious the influence of the factor in the system. Is the main factor. The defined degree of cause (R - C) is the difference between the degree of influence and the degree of influence of each factor. A value greater than 0 indicates that the factor is biased towards affecting other factors, called a cause factor; a value less than 0 indicates that the factor is susceptible to other factors. The effect is called the result factor.

4. Case Analysis

In order to comprehensively analyze and evaluate the influencing factors of the implicit costs of construction projects, the engineering expert group assesses the degree of mutual influence on the basis of the index system of invisible cost factors of construction projects and obtains the triangular fuzzy direct influence matrix of each expert. The deblurring process is performed by the formula to obtain the following table of the direct influence matrix of the expert group's evaluation of the implicit cost of the hydropower project with 10 indicators.

Tab. 1 Initial direct - relation construction project implicit cost influencing factors

Factor	C1	C2	C3	C4	C5	C6	C7
C1	0.75	0.00	0.54	0.53	0.64	0.46	0.25
C2	0.70	060	0.74	0.67	0.78	0.54	0.75
C3	0.69	0.71	0.87	0.83	0.52	0.76	0.65
C4	0.72	0.45	0.54	0.55	0.78	0.76	0.75

C5	0.74	0.54	0.72	0.54	0.52	0.54	0.64
C6	0.73	0.75	0.85	0.53	0.55	0.67	0.85
C7	0.75	0.64	0.64	0.53	0.52	0.57	0.66

From the table and graph, we can see that C1, C7, and C 8 have greater influence on other factors in the system than the degree of impact, which is the cause factor. C2, C3, C4, C5, C6 are result factors. Personnel organizations (C1) have the greatest degree of influence and are ranked as the causal structure diagram of the influencing factors indicates that the personnel organization factor can significantly affect other factors and has a strong initiative; similarly, the change claim (C7) and the natural condition (C4) are also strong active factors; the management system (C2) and the disbursement of funds (C6) are ranked 1 and 2 respectively, and the order of influence is 7 and 9, respectively, indicating that these two factors are closely related to other factors and show strong passiveness; The mechanism (C3), construction organization (C4), and material security (C5) are closely related to the degree of influence and degree of impact, and in essence exhibit a certain degree of volatility; the impact and the degree of influence are both low. The relationship between (C5) and market economy (C10) and other factors is more distant. In summary, the rankings of the influence degree and centrality of C1, C2, C3, and C 8 are all on the front, and the calculation results of C 4 and C5 are ranked in the middle. The influence degree of C7 is much higher than that of C7 and C 5. The degree of influence can therefore be considered as the main factor; while the degree of influence and the degree of centrality of C6 are all ranked later, and they are considered to be non-main factors. The results show that the management factor (B1) is the direct cause of the implicit costs. Among them, the personnel organization (C1) is the most important factor for the implicit costs; the natural condition (C7) is the key factor that affects the implicit cost of hydropower construction. One of them; the technical factors (B2) and frequent change claims (C7) of hydropower projects are also the key control targets in the implicit cost management process.

5. Conclusion

The influencing factors of implicit costs of architectural projects are numerous and complex. This paper proposes an evaluation method based on Fuzzy-Dematel's influence factor index system, identifies the main factors, makes timely adjustments to the implicit cost management program, and improves work efficiency for contractors. Underlying the implicit cost control provided the basis.

The influence of management factors and technical factors on the implicit costs of hydropower projects is obviously greater than that of other factors, which is the key to the implicit cost management of construction projects.

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