Research on EPC Engineering Corruption Risk Prevention and Control Evaluation System

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Abstract. The scope of application of EPC model in China is constantly expanding, and the work of corruption risk prevention and control is continuously carried out in the EPC project, so it is necessary to evaluate the corruption risk prevention and control management level in the EPC project field. This paper studies and constructs the evaluation index system of EPC project corruption risk prevention and control, and establishes the evaluation model of EPC project corruption risk prevention and control management level by AHP. Through case analysis, it is proved that the model can effectively evaluate the corruption risk prevention and control management level of EPC project. Supervision based on the evaluation results can further improve the strength and efficiency of risk prevention and control work, and provide guarantee for the healthy development of EPC project.

1. Introduction

In recent years, the scale and difficulty of infrastructure construction projects in China are increasing gradually. The government requires more and more comprehensive ability of contractors. The traditional construction mode has been unable to meet the requirements. EPC mode is favored in the general contract market with its significant advantages[1]. EPC (Engineering Procurement Construction) mode refers to that enterprises with EPC qualification sign a lump sum contract with the owner, accept the entrustment of the owner, contract the whole process or several stages of the design, procurement, construction and trial operation of the engineering construction project according to the agreement, and be responsible for the quality, safety, cost and progress of the project[2-3]. With the continuous development of our country, the economy of our country and the world economy are more and more inseparable, and EPC mode is gradually and rapidly applied to some industries with strong specialization, large amount of capital and difficult management[4-5].

According to the definition of EPC mode, the owner legally transfers most risks of the project to the general contractor. The rights of the general contractor are far greater than those of the traditional contractor. Once corruption occurs, the consequences are very serious. Therefore, it is necessary to evaluate the corruption risk prevention and control level of the EPC project[6].

This paper studies the establishment of EPC project corruption risk prevention and control management level evaluation index system, the application of analytic hierarchy process to build EPC project corruption risk prevention and control management level evaluation model, quantify the effectiveness of corruption risk prevention and control, do a good job in EPC project corruption risk prevention and control work after the summary evaluation.
### 2. EPC project corruption risk prevention and control evaluation system

#### 2.1. Establishment of EPC project corruption risk prevention and control index system

Combined with the actual situation of EPC project corruption work, according to the principles of systematization, independence and effectiveness, this paper constructs the EPC project corruption management evaluation index system from the four aspects of corruption management input, corruption management process, corruption management output and corruption management impression. The complexity of EPC project corruption management requires the corruption and coordination of the evaluation indicators. Only four aspects of common coordinated development can make EPC project corruption management work achieve better results, and then improve the income of the enterprise.

According to the above analysis, this paper constructs the EPC project corruption management evaluation index system. Using the indicators to evaluate the corruption management of EPC project can comprehensively reflect the corruption management of EPC project. See Figure 1 for the overall framework of the evaluation index system.

The specific corruption risk prevention and control index evaluation system is shown in Table 1. The above evaluation index system has a large number of indicators and covers a wide range. The indicators are both interconnected and independent of each other, reflecting the purpose and requirements of the previous layer of indicators. It has strong operability, comparability and measurability, reflecting the actual needs of the assessment of the corruption risk prevention and control level.

**Table 1. EPC project corruption management evaluation index weight**

| First level indicator                                      | Second level indicator                                                                 | Third level indicator                                                                 |
|------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Investment in corruption risk prevention and control management | Input of incorruptible management personnel 0.3315                                     | EPC full time discipline inspection and supervision personnel 0.3315                  |
|                                                           | Input of incorruptible management fund 0.3348                                           | EPC part time discipline inspection and supervision personnel 0.3348                  |
|                                                           | Input of incorruptible management material 0.3337                                       | Third party supervisor of EPC project 0.3337                                           |
|                                                           |                                                                                        | EPC project corruption risk prevention and control special funds 0.6125               |
|                                                           |                                                                                        | EPC project discipline inspection cadre education and training cost 0.3875            |
|                                                           |                                                                                        | Allocation rate of special equipment for Discipline Inspection of EPC project 0.6125 |
|                                                           |                                                                                        | Informatization of discipline inspection and supervision of EPC project 0.3875        |

![Figure 1](image_url)
2.2. Evaluation method

Based on the establishment of an evaluation index system for the corruption and risk prevention and control management of EPC projects, this article uses the analytic hierarchy process (AHP method) to determine the weights of indicators at all levels. By quantifying the knowledge and experience of decision-makers and experts, the method can improve the accuracy and efficiency of overall decision-making [9].

2.2.1. Determine indicator weight. EPC project corruption management evaluation index system is a collection of evaluation index factors at all levels. Although they exist in the entire index system, they have different status and importance. This paper uses the analytic hierarchy process (AHP method) to determine the weight of indicators at all levels[10].

(1) Construction of judgment matrix

Ten experts with both theoretical knowledge and rich work experience are invited to solicit their opinions and suggestions, score each index, and form a corresponding pairwise comparison judgment matrix.
(2) Calculate weight and $\lambda$ max value

According to the hierarchical single-rank calculation formula, the weight values and $\lambda$ max values of the indicators at each level can be obtained.

(3) Hierarchical ordering and consistency check

For a certain factor in the upper layer, the importance of each factor in this layer is ranked and the consistency is checked.

(4) Hierarchical total ranking and consistency check

Using the analytic hierarchy process, the total hierarchical ranking results of each index are calculated and the consistency check is performed to obtain the final weight value of each evaluation index.

Finally, the grading of all the above-mentioned experts is calculated step by step according to the analytic hierarchy process, and the consistency check is performed to obtain the index weight required by the EPC project corruption management evaluation index system. See Table 1 for the numerical value table of the EPC project corruption management evaluation index weight.

From the weight of the final evaluation index, we can see that in the first level index, the weight of incorruptible management system and incorruptible management effect is larger, followed by incorruptible risk prevention and control investment and incorruptible risk prevention and control management impression. It also shows that the evaluation of the corruption risk prevention and control management level of EPC project is mostly based on the corruption risk management system and the corruption management effect.

2.2.2. Level of corruption risk prevention and control management. After the weight of each index is determined by AHP, the expert scoring method is used to evaluate the corruption management level of specific EPC project cases. Use the 0-10 point system to score the corresponding indicators of the specific project, and finally get the score of corruption risk prevention and control management of EPC project by weighted summary to determine the level of prevention and control. The score rating table is shown in Table 2.

| score | level     |
|-------|-----------|
| 0-6   | fail      |
| 6-7   | pass      |
| 7-8   | secondary |
| 8-9   | good      |
| 9-10  | excellent |

3. Evaluation case analysis

Based on the case analysis of the corruption risk prevention and control management of the 110kV power grid reinforcement project in the east of XX City, this paper analyzes the corruption risk prevention and control work, the corresponding corruption management input, system, output and corruption management image in the process of project implementation. According to the EPC project corruption risk prevention and control evaluation system, sort out the situation of each evaluation index in the process of project implementation. According to the 0-10 scoring method, invite ten experts from the project stakeholders, including the site representative of the project construction unit, the management department representative of the general contractor and the site representative of the supervision company, to evaluate and grade the indexes at all levels of the project, and take the average score as each index final score. Finally, through the weighted summary of the index scoring results and the index weight determined by AHP, we can calculate the level of corruption risk prevention and control of the EPC project.

According to the evaluation index system, the score of the corruption risk prevention and control management of the EPC project is 7.8878. Therefore, it can be concluded that the corruption risk prevention and control management level of the project belongs to the medium level. It can be seen
that this method can be used to evaluate the corruption risk prevention and control level of the EPC project.

4. Conclusion
For the EPC mode project, as the EPC general contractor, it should be fully responsible for all stages of design, procurement, construction and commissioning, and needs to bear more extensive risks. Corruption risk prevention and control can effectively prevent the occurrence of corruption in engineering projects, and the basis and premise of corruption risk prevention and control of engineering projects is to do a good job in the whole process, that is, the corruption risk prevention and control and management of key points. This paper analyses the corruption risk of EPC project, establishes the evaluation index system and evaluation method of corruption risk prevention and control level by using AHP, which provides a reference for the evaluation of corruption risk prevention and control work in the process of EPC project implementation. And according to the evaluation results, concerned people can understand the corruption management situation of EPC project and make suggestions for the follow-up work.

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