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Risk Assessment Based On Fuzzy Network (F-ANP) In New Campus Construction Project

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Abstract

From the characteristics of New Campus Engineering Project, the paper uses the method of F-ANP to evaluate risks of New Campus Engineering Project by combining the ANP and fuzzy comprehensive evaluation. New Campus Engineering Project belonging to higher risk project is obtained, so as to provide evidence for control the risk of New Campus Engineering Project.

Keywords: risk assessment; F-ANP; new campus construction project

1. Introduction

Since 1999, in order to realize to change advanced education from “elite education” to “mass education”, various universities carried out expanding enrollment and the number of the enrolled students again and again. According to the Ministry of Education website data: 1997 National university entrance 1 million, the number of the enrolled students for the 3.17 million; 2009, the higher education enrollment 6.4 million, the number of the enrolled students for the 28.27 million; 2010 plan enrollment 6.57 million, the number of the enrolled students is still rising. With the number of the enrolled university students increased and universities faced to expand the campus area, teaching facilities, accommodation and logistics facilities, increase faculty and other urgent needs. In recent years, university construction in full swing for the development of advanced education provides a good opportunity.

However, new campus engineering project with building long-aging, time-critical, large amount of investment characteristics, while new campus construction project management there are also many problems, making a huge risk existing in the new campus construction project. To evaluate risks provide for the risk control of New Campus Construction Project. As a special construction projects, university new campus construction project risk factors, respectively, by the owners (universities) and the Contractor, and this paper analysis the risks of new campus construction project assumed by universities.

2. Method selection of risk evaluation

Analytic network process (ANP) based on the analytic hierarchy process (AHP) pay more attention to the domination role of low-rise factors to high-rise factors in the hierarchical internal, namely feedback. The network is composed by the control factors layer decided by setting goals and decision criterion, and the network layer constituted by the factors dominated by the control factors layer. It forms a network structure for the influence each

other between each system elements, and the elements interdependence, mutual dominate and not independent of internal layers. That is consistent with the risk assessment system structure of new campus construction project. So the ANP applies to the new campus construction project risk assessment. Meanwhile, weight assuring also adopt the ANP ideas, integrating strong explanatory of subjective weighting with high precision of objective weighting. But as the ANP use 1-9 discrete values, without considering uncertainty and fuzziness, fuzzy comprehensive evaluation can help to solve this problem.

The following factors were considered for using fuzzy comprehensive evaluation for risk assessment:

- ①、Most of the risk factors in the project can not use mathematical to quantitatively describe its property and their consequences, and fuzzy mathematics can quantify the fuzzy information.;
- ②、Transform the benefit and loss of risk into the interval values by the theory of fuzzy centralization statistical, so that the evaluation results easy to be accepted and identified.
- ③、Correction to weights by the theory of information entropy makes the actual objective effectiveness of the weight to be reflected.

In a word, while the new campus construction project with few risk factors, but the particularity of participating subject make its risk assessment is more complicated. This paper applies the fuzzy- analytic network process (F-ANP) to evaluate the risk of new campus construction project.

3. Risk evaluation index system of new campus construction project

On the basis of researching of literatures and the risk identification conclusion of new campus construction project, the risk evaluation index system of new campus construction project is established according to the principle of building and screening index system.

- Establish targets layer: setting up the risk evaluation index system of new campus construction project is for the risk evaluation of the new campus construction project and the formulation of risk prevention strategies. So each index of the whole index system all should embody the key risk factors of new campus construction project while establishing the index system.
- Establish index layer: based on the features of new campus construction project, the index layer can be set to two levels, and determine the various indices and the evaluation elements according to the component factors of targets layer.

The risk evaluation index system of new campus construction project designs four first grade indexes: education policy risks, investment risks, financial risks and management risks, and 11 second grade indexes. (Table 1)

Table 1. Risk evaluation index system of new campus construction project

Project risks (C)				
first grade indexes	education policy risks (C ₁)	investment risks (C ₂)	financial risks (C ₃)	management risks (C ₄)
second grade indexes	education budget adjustment (e ₁₁) education structure adjustment (e ₁₂)	resettlement (e ₂₁) economic environment (e ₂₂) natural risk (e ₂₃)	financing risk of construction period (e ₃₁) financial risk of operation period (e ₃₂)	decision risk (e ₄₁) organizational risk (e ₄₂) contract risk (e ₄₃) credit of participation risk (e ₄₄)

- (1) Education policy risks (C₁). The education policy is the premise of new campus construction project. The adjustment of education budget (e₁₁) and education structure (e₁₂) will directly affect the necessity and the scale of new campus construction project.
- (2) Investment risks (C₂). Investment risks are the investment expansion risks caused by uncertain factors of period, raw material prices, resetting of levy land and related investment, including three indexes: resettlement(e₂₁), economic environment(e₂₂)and natural risk (e₂₃).
- (3) Financial risks (C₃). On the one hand, whether to raise enough money to ensure project smoothly will bring

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