



## **Tests Research on Engineering Risk Management Model Based on "Grid"**

Weiwei Zhang

College of Civil and Architectural Engineering, North China University of Science and Technology, Tangshan Hebei 063210, China

**Abstract:** The risk of engineering project covers the whole life cycle of the project. The complexity and uncertainty of risk factors are extremely difficult for risk assessment. How to carry out engineering risk management is an important research content. Based on the grid management concept, the grid is applied to the control of engineering risk unit modules, and the new engineering risk management model is bridged by four modules, which provides a new management model and research ideas for engineering risk management.

**Keywords:** risk factors; grid management; management model.

### **1. Introduction**

Engineering risk management aims to reduce losses and control costs through analysis and control of project environmental uncertainty. Project risk management is a systematic project that connects all aspects of project management through the identification, evaluation, control and decision-making of engineering risks.

At present, engineering risk management is still in its infancy, risk management methods are not good, and risk management is not comprehensive. Based on the linear characteristics of engineering projects and the network relationship of engineering risks, this paper introduces a grid management model, embeds engineering risk management, and builds a new engineering risk grid management<sup>[1]</sup>. The essence of grid management is the management method of effective integration of resources, and it is also a cooperation mechanism and configuration system. As a way of organization management, network management is a system innovation<sup>[2]</sup>. At present, the grid management model is widely applied to social management, medical, economic and other aspects and shows excellent performance. From the perspective of engineering projects, from the macro and micro perspectives, network management is applicable to the overall governance of engineering projects and the single risk

management mechanism of engineering. Therefore, this paper attempts to introduce the grid management model into the engineering risk management model, hoping to manage the project risks more efficiently, reasonably and comprehensively, and avoid major losses.

## **2. Grid management**

### 2.1 Grid management principle

Grid management theory is a new management theory in management science. The grid management method based on system theory, cybernetics and synergy has digital, refined and dynamic management characteristics<sup>[3]</sup>. It is a typical closed-loop management model. According to the idea of computer grid management, the management object is divided into several sub-grid units by using certain standards. With the help of modern information technology and coordination mechanism between sub-grid units, data transparency can be realized between each sub-grid. The communication is smooth, and each sub-grid is monitored, processed and fed in real time to form a network of relational interconnections. The grid structure of cross-over and mutual communication makes the management efficiency greatly improved, and the integration project is fully realized<sup>[4]</sup>. The management model of life cycle resources and improving the efficiency of engineering risk management and control effectively avoids the lack of data in management and the difficulty of managing multiple factors and multiple time periods.

### 2.2 Features of grid management

The characteristics of grid management are standardization, comprehensiveness and digitization. First, the grid is divided according to the unified standard, so that the grids have similar functions and the same structure, so as to facilitate unified management<sup>[5]</sup>. In the horizontal direction, the interconnection between the grids allows the resources to move laterally, so that the information can be effectively symmetrical and can be quickly reflected. In the vertical direction, each grid resource can be optimized and centralizedly regulated. Each grid belongs to the entire system according to certain standards. Once an emergency occurs, the entire grid management system can quickly make an emergency response and handle it accordingly.

## **3. Engineering risk identification and analysis**

Engineering risk identification and analysis is the basis of engineering risk management. Only comprehensive and accurate identification and analysis of engineering risks can achieve engineering risk management. This paper identifies the risk factors that have an impact, horizontally from the perspectives of technology,

economy, environment, management and political risk, vertical identification from the four perspectives of progress, quality, cost and security risk<sup>[6]</sup>. The risk factor of horizontal identification is used as the criterion layer, and the indicator layer is vertically analyzed based on the criteria layer: national policies and regulations, macroeconomic environment, administrative intervention risk; design reliability and feasibility, construction risk; target control risk, contract risk, management and The quality of construction personnel; investment environmental risks, inflation risks, interest rate changes risks, capital supply and demand risks; meteorological risks, geological risks, unfavorable geographical locations.

#### 4. Grid-based engineering risk management model

##### 4.1 Engineering risk gridding

According to the grid division principle of “engineering stage, stage attribute, risk type”, it is divided into first, second, third and fourth levels<sup>[7]</sup>. The whole project is a first-level grid. Secondly, the previous planning, construction period and handover period are unitized into a secondary grid, and then the secondary grid is further divided into natural environment, political factors, technical factors and economic factors. The unit is transformed into a three-level grid, and finally a specific risk factor is used as a four-level grid.

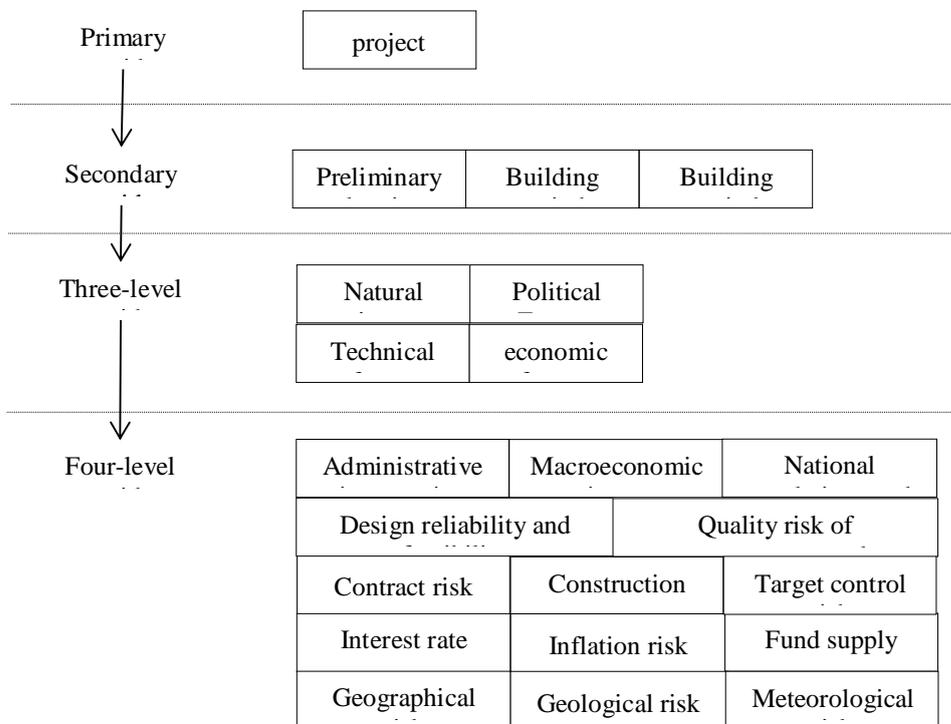


Fig. 1 Engineering Risk Factor Grid

#### 4.2 Engineering Risk Management Model

The engineering risk management model will work in accordance with the basic module and the core module. The basic module is the risk information collection and feedback module, that is, the real-time information of the project is obtained. The core module includes a risk processing module, a risk evaluation module, and a supervision management module. The risk processing module is based on the risk information collection and feedback module to obtain relevant information in real time and process the event to realize the event processing, and at the same time, the data is retained. In dealing with other risk factors, the related incidents can be investigated, traced, and supported. The risk statistical evaluation module analyzes the risk processing results and conducts comprehensive evaluation based on the pre-treatment evaluation results of the risks and the re-evaluation results after the risk treatment, and formulates risk prevention and control measures and countermeasures based on the comprehensive evaluation results, and simultaneously on the engineering projects. Corresponding optimization to avoid the adverse effects brought by risks; risk supervision and management module is to avoid the risk factors in the whole process of the project can not achieve the correlation, the supervision and management can effectively avoid the blind spots of risk analysis, and in the dimension of the project phase The risk factors of the project are dimensioned to ensure that the entire grid is coordinated and the modules are processed efficiently.

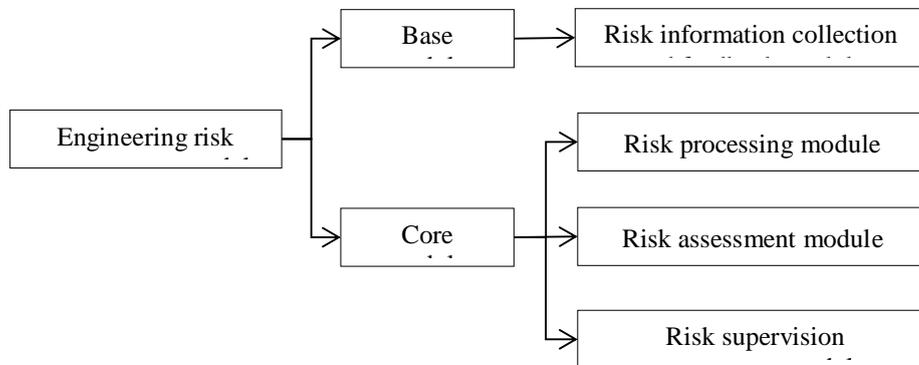


Fig. 2 Grid Engineering Risk Management Model

### 5. Conclusion

By introducing the grid management mode, the engineering risk factors are divided into first, second, third and fourth grids, and the engineering projects are aggregated and managed from the perspective of risk. According to the risk information collection and feedback module, The risk processing module, risk assessment module and risk supervision management module realize the monitoring and management of the risk of the whole life cycle of the project, thereby maximizing the efficiency of project project management, minimizing project cost, maximizing safety and optimizing

quality.

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