Emergency procurement risk assessment Based on Matrix evaluation Method

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Abstract

Emergency procurement risk control is a key aspect in material supply of coping with public emergency. Aiming at the features of emergency procurement, a risk assessment model is constructed by matrix evaluation method according to the risk classifications of emergency procurement. It is proved that this method is useful to assess an emergency procurement risk level.

Keyword: procurement risk, risk assessment, Matrix evaluation Method

Emergency procurement refers to the procurement departments in case of emergencies for the completion of the urgent task of procurement. The risk is the uncertainty of loss (or possibility), it is a function of the probability and consequences of adverse events, that risk is a measure of the likelihood of the target can not be achieved under the provisions of cost, schedule, and technical constraints [1]. Government emergency procurement risk is the role of a variety of factors, procurement departments can not achieve the procurement efficiency, resulting in the loss of the possibility of.

1. Emergency procurement risk type

At present，it is no harmonization of classification criteria for emergency procurement risk in China. According to the formation mechanism of the emergency procurement,
It is divided into management risk, information about risk, moral credit risk, quality risk, contract risk, the risk of disclosure of the six major categories. According to the characteristics of emergency procurement and risk management requirements, building risk assessment index system. The management risk is the possibility of quality accidents in the procurement process due to administrative reasons. Information about risk is due to the possibility of asymmetric information and incomplete information caused by the loss of purchasing. The moral credit risk refers to the procurement of suppliers and procurement personnel ethical shortcomings risk. Quality risk is the possibility of special emergency procurement tight schedule and quality requirements, but the quality of procurement reach the predetermined requirements. Contract risk is in the draw up a contract, award a contract, performance of a contract process, Consider improper or suppliers in violation of the terms of the contract, direct or indirect economic losses caused by the purchaser. The risk of disclosure is due to leakage of trade secrets of the suppliers or procurement the secret of procurement has unsafe character.

2. risk assessment use the Matrix Assessment Act

Matrix assessment method is a combination of qualitative and quantitative risk assessment methods, it assess risk mainly from two aspects of the possibilities of the risk occurring and the consequences of the risk. It divided into

emergency procurement risk investigate, probability of risk occurrence and the degree of risk impact calculate.

2.1. Emergency procurement risk investigate

In materials emergency procurement risk assessment, risk investigation is based on the assessed needs by experience in procurement experts and front-line procurement personnel of various risk probability and influence degree assessment.

A risk investigation form is filled in risk questionnaire by investigation objects. Therefore the rational design of the questionnaire is an important part of the risk assessment. Materials emergency procurement risk investigation, the design of the questionnaire as shown in Table 1.

Table1　questionnaire

Risk factor	Risk probability　%	degree of risk impact				
		key	Important	general	small	negligible

In Table 1, the risk probability antitheses risks probability description table (Table 2) fill specific figures; Risk affect the degree of antitheses the degree of risk impact description table (Table 3) to determine the degree of importance of each risk, and the corresponding table 2.

Table2　Risk probability Description

risk probability range（%）	description
[0,20]	hardly occurs
(20,40]	less likely to occur
(40,75]	may occur
(75,90]	is likely to occur
(90,100]	almost certainly occur

Table3　risk influence degree level description

risk impact of grade	risk impact value	level definition
keyQ_1 importantdermaQ_2	5	once the risks, emergency procurement project was forced to terminate
general Q_3	4	once the risk occurs, the variety and quality of the shopping materials affected
small Q_4	3	once the risk occurs, the procurement project by the moderate part of the goal to achieve, but the materials using the affected
negligible Q_5	2	once the risks occurs, procurement projects are mild, but the main goal is still to reach
	1	once the risks occurs, have no effect on the emergency procurement, procurement objectives can be fully able to achieve

Risk investigation, you need to pay attention to the selection of the object being investigated. Industry experts and procurement personnel with procurement experience should be the proportion of each, usually choose 3:2. Experts should be representative, the professional nature of the work and the unit should be dispersed, should not focus on the individual units and individual areas of expertise. The number of objects to be investigated should be moderate, too many, will increase the workload of the

investigation and statistical analysis; too little, not a representative. This paper suggests Select 15 as the object being investigated.

2.2. probability of risk occurrence and the degree of risk impact calculate

On the basis of the risk investigation, the use of statistical analysis methods, to determine the probability of risk occurs and degree of risk impact, the calculation step is as follows:

(1)Suppose there are 15 experts，Expert i think that the probability of risk j occur is P_{ij}, the degree of risk impact for Q_{ij}, risks affect the value of q_{ij}, wherein $i=1,2,\cdots, 15, j=1,2,\cdots, 6$.

(2) Experts fill in Table 1 based on risk probability table (Table 2), the risk of occurrence of the quantitative value of probability is given. Risk occur probability of 15 experts in the table is calculated, probability of occurrence of the risk j.

$$P_j = \frac{\sum_{i=1}^{15} P_{ij}}{15} \qquad (1)$$

Based on the assessment results, sort in descending order of risk probability, to get risk probability orderly value.

(3) The affect of the risk is divided into 5 levels, use Q_k （$k=1,2,\cdots, 5$）expressed, are key Q_1, important Q_2, genera Q_3, small Q_4, negligible Q_5. Experts according to the actual situation fill in Table 1 contrasting Table 3 the definition of each grade, given the risk degree of influence, calculate 15 experts on risk affect assessment, and converted to the

corresponding risks affect t value, affect the value of risk j is

$$q_j = \frac{\sum_{i=1}^{15} q_{ij}}{15} \qquad (2)$$

According to the results of the assessment of the risk affect value, are sorted in descending order of risk affect value obtained risk impact sequence value.

Build risk affect of membership function to determine the degree of risk affect, the affect the degree of membership value of the risk of j is

$$f_j(Q_k) = \frac{M(Q_k)}{n} \qquad (3)$$

$$(k = 1,2,3,4,5)$$

Where: M （Q_k）belongs to the number of the Q_k, n is the number of experts involved in the assessment, $f_j((Q_k)$ is membership values of risk j belongs to Q_k. Membership functions of risk j can be obtained according to the membership function values obtained by the formula (3).

$$f_j = \frac{f_j(Q_1)}{Q_1} + \frac{f_j(Q_2)}{Q_2} + \qquad (4)$$

$$\frac{f_j(Q_3)}{Q_3} + \frac{f_j(Q_4)}{Q_4} + \frac{f_j(Q_5)}{Q_5}$$

Formula (4) " — " is not the line between the numerator and the denominator, but is a mark. The grade of risk effect is determined according to the principle of maximum degree of membership.

Table4   statistical results of quality risk affect the degree

quality risk	keyQ_1	importantQ_2	generalQ_3	small Q_4	negligibleQ_5
The number of (a)	2	11	2	0	0

Obtained risk value of "quality risk"is q_4=4.0 according to formula (2), obtain

membership function of degree of effect for the risk according to formula (4)

$$f_5 = \frac{0.13}{key} + \frac{0.73}{importment} + \frac{0.13}{genera} + \frac{0}{small} + \frac{0}{negligible}$$

(4) To determine the level of risk

To determine the levels of risk based on risk occur probability and degree of risk effect both. Risk levels are divided into three levels (high, medium, low), the level of risk can be get by the probability of risk occurrence and degree of risk level, as shown at Table 5.

Table 5   Risk Level Table

Risk probability (%)	degree of risk effect				
	negligible	small	general	important	key
[0,20]	low	low	low	low	medium
(20,40]	low	low	low	medium	high
(40,75]	low	medium	medium	high	high
(75,90]	medium	medium	high	high	high
(90,100]	medium	high	high	high	high

(5) Determine the Borda count

The degree of risk importance of risk events is determined by Borda number methods. The more the risk event's Borda number is, the more critical the risk event is in emergency procurement, the specific calculation method is:

$$_i b = (N - r_{i1}) + (N - r_{i2})$$

Where, N is the total number of risk of emergency materials procurement, r_{i1} is risk affect sequence value of risk number i, r_{i2} is risk probability sequence value of risk number i.

(6) Determine Borda rank value

The Borda sequence value is determined according to the Borda count. A given risk, Borda sequence value refers to the number of more serious risk than the degree of risk. Borda number of risks descending order, its corresponding Borda sequence value is *0, 1, ...,* Such a risk Borda count is biggest, then the corresponding Borda sequence value is 0.

3. Conclusion

A method of emergency procurement risk assessment is presented in this paper, risk assessment is divided into two stages of the risk survey and analysis calculated; risk affect attainment is divided into five level, determining its corresponding probability range, using matrix evaluation methods to calculate the probability of the risk occurring and its effect degree; proved through instances test the method, the method is simple and efficient, and the result is reasonable.

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