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Study on the Crisis Management Performance Evaluation of the Engineering Project Demolition Based On Grey Model

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ABSTRACT

According to the characteristics of engineering project demolition, the whole paper will concentrate on the analysis of crisis management in the new trend of research projects in the field of research and practice. The basic framework of the outline of the crisis management process of modern engineering project in China demolition system has been created from several aspects, the Balanced Scorecard theory construction project the evaluation index system of crisis management units on the performance. And establishes the evaluation model of crisis management organization project demolition performance through the use of AHP multi-level fuzzy evaluation method, evaluation index of factors related were quantified in the example analysis after application. We expect that accurate grasp and evaluation of engineering project crisis management can be used to deal with pollution emergency management level, and provide a useful reference for the formulation of strategies and measures of rational and efficient.

Keywords: *project demolition, crisis management performance evaluation model, the balance scorecard, AHP*

1. INTRODUCTION

After entering in twenty-first century, our country is in the economists predicted "unstable" frequent key stage. On the one hand, the population and resources environment, efficiency and fairness leads to more prominent contradictions, on the other hand, the economy tends to out of control, society might be in disorder condition, psychological imbalance might be incurred easily, political ideology and social ethics need to be adjusted and rebuilt. As the project market in China becoming open, the demolition will be very important and sensitive in China for quite a long time and it will have an immeasurable impact on our overall well-off society. Strengthening the work of crisis management research project will significantly raise awareness of the crisis the demolition project, helpful to master the crisis identification technology, carry out risk assessment and analysis, timely prevent and dissolve the demolition project risk, to improve construction management level in China.

2. REVIEW ON CRISIS MANAGEMENT

2.1 The Basic Definition of Crisis Management

Crisis management mainly refers to basic social values of the decision makers (or organization) and codes is facing a serious threat in the process of operation, emergency and uncertain prospects etc. Through monitoring, early warming, prevention, emergency treatment, assessment and other measures, people carry out a series of management activities for the crisis that they may face in general. It aims to eliminate or reduce the harm crisis, make the organization to survive in a crisis.

Crisis management means that prevention, identification, control, processing and evaluation of a variety of crisis management in the process of project demolition and techniques and programs used in the limited time to make critical decision and the development of a specific crisis response measures, to ensure the smooth implementation of the demolition project and the expected economic benefits realization. From the perspective of process, it is the whole process management of the crisis in before, during and after phases; from the perspective of motivation, processing demolition crisis is not just limited to focus on the "control", also includes the demolition crisis-use, or even the intention to expand the crisis, making the crisis from the value and use; Judging from the value orientation, the demolition crisis management goal, not to negatively maintain peace, but are designed to maintain social stability, and promote the national interest to maximize.

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2.2 Crisis Management Mode

Crisis event itself is a comprehensive, three-dimensional polyhedron. From the vertical perspective, the crisis event is a line; crisis event is a chain form the horizontal. On crisis management mode, different scholars have different definitions. For instance, the famous 6-stage model of Augustine (as shown in Fig.1) is a good interpretation of the crisis management mode.

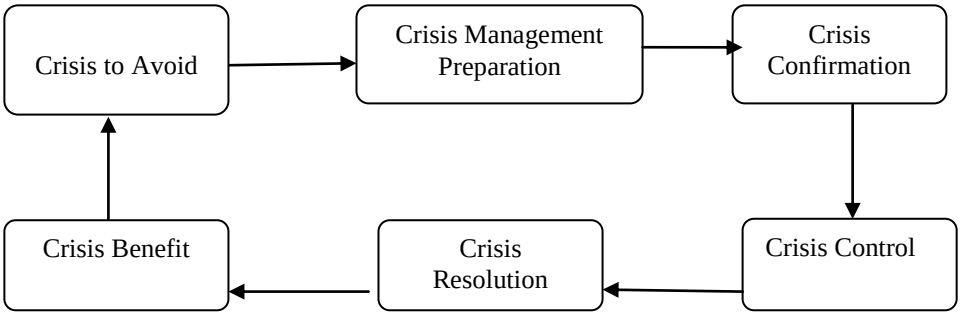

Fig.1 The 6-stage Model of Crisis Management of Augustine

According to the different laws of the developing of the crisis, this paper intends to divide crisis management into three stages of crisis warning (anti-) stage, the crisis control processing stage, the crisis stage of dealing with the aftermath.

① Crisis Warning (anti-) Stage

"Forewarned is forearmed, without prejudging the waste". Early warning of crisis management is an integrated, dynamic process, requires a complete monitoring system to gather the full range of resources and wisdom precursor to crisis at the crucial moment, have accumulated a certain energy, will soon lead to a crisis the object. Through appropriate warning to strengthen preventive measures will to prevent the occurrence of the crisis.

② The Crisis Control Processing Stage

The crisis control processing stage is the core of the crisis management, but is the most difficult and complex stage in the entire process of crisis management. Different crisis management strategies need to be applied to a different stage in crisis response organization, but usually ferocious crisis, ever-change, allowing people to make an effective reaction time is very short, so the coordination, have a control system, to integrate all the emergency resource is very important for crisis management.

③ Deal with the Aftermath of the Crisis Stage

The end of the treatment phase of crisis control-does not mean that the crisis management process has been completed, but into a new stage—after the crisis stage of processing. Dealing with the aftermath of the crisis events is generally as the following: first, the post-crisis mechanism shift; second, the evaluation of mechanism performance after the crisis; third, to restore the social mentality after the crisis; fourth, the adjustment of social mechanism after the crisis; fifth, the mechanism in the post-crisis reconstruction and optimization. No matter what type of crisis event, stakeholders should analyze the cause of the crisis in the process in time, sum up lessons, and cultivate a sense of crisis, crisis response skills.

3. THE MAIN CONTENTS OF THE PROJECT DEMOLITION CRISIS MANAGEMENT SYSTEM

3.1 Crisis Management System Overview

The project demolition is full of risk and emergency, also it is comprehensive. According to research conducted by Xue Lan (2003), the crisis developed stage by stage: the precursor stage, the emergency phase and persistent phase. Process of engineering demolition crisis should be based on the different characteristics of the crisis of the development cycle, take corresponding measures, suit corresponding measures to related conditions, in order to achieve the ideal management effect.

From the practical situation of crisis management in some engineering project construction process at home and abroad in recent years which occurred in the demolition event, crisis management is not just a response after the outbreak of the demolition crises, the practice needs from the system point of view the introduction of new technology and new methods in the target level, construct a set of scientific and effective the system of crisis management and crisis management model.

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3.2 Project Demolition in Crisis Management Performance Evaluation Model

Project demolition in the crisis events often cause serious harm to the society, and the various causes of the incident, performances, cycles are complicated, different. From the analysis of the current situation at home and abroad project demolition event crisis management point of view, the relevant organizations and citizens methods to deal with different removal incidents, and each of the measure is not identical. However, on the whole people are still using the balance score card of Kaplan and Norton to establish improved framework of crisis management, performance evaluation model of engineering project in the demolition, the crisis management system and crisis management model to construct a set of engineering project demolition, and coping with the high-efficient project demolition crisis has great practical effect. The performance evaluation framework of crisis management model as shown in Fig.2

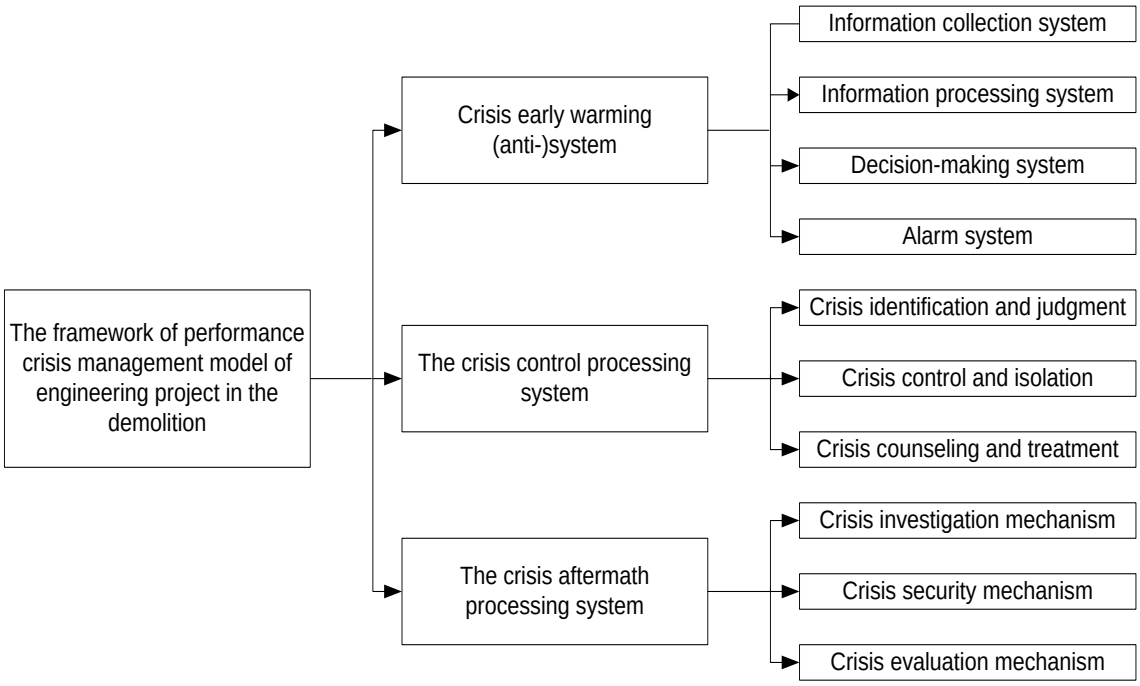

Fig.2. The performance evaluation framework of crisis management model

3.3 Indictor System and the Performance Evaluation Model

The paper is based on the BSC theory, through AHP multi-level fuzzy comprehensive evaluation method to establish the index weight, which is based on the performance evaluation model to get related crisis management performance level. The specific process is as follows:

Determine the Evaluation Index Set: Main factors layer index set:

$$u=\{u_i\},\quad i=1,2,\cdots,m; \tag{1}$$

Sub-factor layer index set: $u_j=\{u_{is}\},\quad s=1,2,\cdots,h$

Determine the Index Weight Set: The weight of main factor level evaluation index set:

$$A=(a_1,a_2,a_3,\cdots,a_m) \tag{2-1}$$

$$B=(b_1,b_2,b_3,\cdots,b_n) \tag{2-2}$$

$$C=(c_1,c_2,c_3,\cdots,c_j) \tag{2-3}$$

Where $\sum_{i=1}^{m} a_1=1, \sum_{i=1}^{n} b_1=1, \sum_{i=1}^{j} c_1=1$

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The weight of sub-factor layer index set:

$$A_h = (a_{i1}, a_{i2}, a_{i3}, \cdots, a_{ih}) \quad (3\text{-}1)$$

$$B_k = (b_{n1}, b_{n2}, b_{n3}, \cdots, b_{nk}) \quad (3\text{-}2)$$

$$C_t = (c_{j1}, c_{j2}, c_{j3}, \cdots, c_{jt}) \quad (3\text{-}3)$$

Where $\sum_{s=1}^{h} a_{is} = 1; \sum_{s=1}^{k} b_{ns} = 1; \sum_{s=1}^{t} c_{js} = 1$

Through statistical analysis of the expert scoring, level indicators, two indicators and three indicators weight of each index value, which are shown in Table 1.

Tab. 1 Index Weights Table

I layer indicators	I layer weights	Ⅱ layer indicators	Middle weight	The final weight	Ⅲ layer indicators	Middle weight	The final Weight
Crisis early warning (anti-) system （A）	0.369	Information collection system	0.391	(A_{11}) 0.144	Comprehensiveness	0.375	0.054(A_{111})
					Timeliness	0.383	0.055(A_{112})
					Correlation	0.242	0.035(A_{113})
		Information processing system	0.067	(A_{12}) 0.025	Information arrangement	0.300	0.008(A_{121})
					Information identification	0.469	0.012(A_{122})
					The transfer of information	0.231	0.006(A_{123})
		Decision-making system	0.424	(A_{13}) 0.156	Forward-looking	0.297	0.046(A_{131})
					Rapidity	0.540	0.084(A_{132})
					Bounded rationality	0.163	0.025(A_{133})
		Alarm system	0.118	(A_{14}) 0.044	Alert level	0.320	0.014(A_{141})
					Alarm sensitivity	0.558	0.025(A_{142})
					Alarm content	0.122	0.005(A_{143})
The crisis control processing system （B）	0.537	Crisis identification and judgment	0.257	(B_{11}) 0.138	Program normative	0.438	0.060(B_{112})
					Efficient method	0.562	0.078(B_{111})
		Crisis control and isolation	0.519	(B_{12}) 0.279	Analysis and evaluation	0.174	0.049(B_{121})
					Basic principles	0.261	0.073(B_{122})

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					Administration	0.565	0.158(B_{123})
		Crisis counseling and treatment	0.224	(B_{13}) 0.120	Goal clarity	0.501	0.060(B_{131})
					Degree of specialization	0.320	0.038(B_{132})
					Decision-making authoritative	0.179	0.022(B_{133})
The crisis aftermath processing system (C)	0.094	Crisis investigation mechanism	0.283	(C_{11}) 0.027	Crisis inquiry	0.297	0.008(C_{111})
					Crisis impact survey	0.540	0.015(C_{112})
					Causes survey	0.163	0.004(C_{113})
		Crisis security mechanism	0.362	(C_{12}) 0.034	Acute should Support tasks	0.219	0.007(C_{121})
					Rapid mobility support	0.485	0.016(C_{122})
					Timeliness of Support personnel	0.141	0.005(C_{123})
					Security mode flexibility	0.155	0.005(C_{124})
		Crisis evaluation mechanism	0.355	(C_{13}) 0.033	The purpose Of clarity	0.473	0.016(C_{131})
					Procedural transparency	0.282	0.009(C_{132})
					Evaluation of justice	0.195	0.006(C_{133})
					Evaluation of extensive	0.050	0.002(C_{134})

Main factors layer index set: $u=\{u_A,u_B,u_C\}$; Sub-factor layer index set:

$$u(A)=\{u(A_1),u(A_2),u(A_3),u(A_4)\} \quad (4\text{-}1)$$

$$u(B)=\{u(B_1),u(B_2),u(B_3)\} \quad (4\text{-}2)$$

$$u(C)=\{u(C_1),u(C_2),u(C_3)\} \quad (4\text{-}3)$$

The Weight Set
The weight of main factor level evaluation index set:

$$P=\{p(A),p(B),p(C)\}=\{0.369,0.537,0.094\} \quad (5)$$

Sub-factor layer evaluation index weight set:

$$P(A)=\{P(A_1),P(A_2),P(A_3),P(A_4)\}=\{0.144,0.025,0.156,0.044\} \quad (5\text{-}1)$$

$$P(B)=\{P(B_1),P(B_2),P(B_3)\}=\{0.138,0.279,0.120\} \quad (5\text{-}2)$$

$$P(C)=\{P(C_1),P(C_2),P(C_3)\}=\{0.027,0.034,0.033\} \quad (5\text{-}3)$$

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The evaluation set is composed of a collection of analysis and which may be made by a variety of total evaluation results, denoted by V.

$$V = V_A + V_B + V_C \quad (6)$$

$$V_A = \{P(A_{11})A_{11} + P(A_{12})A_{12} + P(A_{13})A_{13} + P(A_{14})A_{14}\} P(A) \quad (6\text{-}1)$$

$$A_{11} = a_{111}P(A_{111}) + a_{112}P(A_{112}) + a_{113}P(A_{113}) \quad (6\text{-}1\text{-}1)$$

$$A_{12} = a_{121}P(A_{121}) + a_{122}P(A_{122}) + a_{123}P(A_{123}) \quad (6\text{-}1\text{-}2)$$

$$A_{13} = a_{131}P(A_{131}) + a_{132}P(A_{132}) + a_{133}P(A_{133}) \quad (6\text{-}1\text{-}3)$$

$$A_{14} = a_{141}P(A_{141}) + a_{142}P(A_{142}) + a_{143}P(A_{143}) \quad (6\text{-}1\text{-}4)$$

$$V_B = \{P(B_{11})B_{11} + P(B_{12})B_{12} + P(B_{13})B_{13}\} P(B) \quad (6\text{-}2)$$

$$B_{11} = b_{111}P(B_{111}) + b_{112}P(B_{112}) \quad (6\text{-}2\text{-}1)$$

$$B_{12} = b_{121}P(B_{121}) + b_{122}P(B_{122}) + b_{123}P(B_{123}) \quad (6\text{-}2\text{-}2)$$

$$B_{13} = b_{131}P(B_{131}) + b_{132}P(B_{132}) + b_{133}P(B_{133}) \quad (6\text{-}2\text{-}3)$$

$$V_C = \{P(C_{11})C_{11} + P(C_{12})C_{12} + P(C_{13})C_{13}\} P(C) \quad (6\text{-}3)$$

$$C_{11} = c_{111}P(C_{111}) + c_{112}P(C_{112}) + c_{113}P(C_{113}) \quad (6\text{-}3\text{-}1)$$

$$C_{12} = c_{121}P(C_{121}) + c_{122}P(C_{122}) + c_{123}P(C_{123}) + c_{124}P(C_{124}) \quad (6\text{-}3\text{-}2)$$

$$C_{13} = c_{131}P(C_{131}) + c_{132}P(C_{132}) + c_{133}P(C_{133}) + c_{134}P(C_{134}) \quad (6\text{-}3\text{-}3)$$

In the process of crisis management of construction project in the demolition in china, by using the method of questionnaire which asked 5 experts to assign to each index (10 –point scale), the evaluation criteria is very high(8.5-10), high(7.0-8.4), moderate(5.5-6.9), low(3.0-5.4), remote(less than 2.9).

3.4 The Empirical Analysis

Trade city A is approved in 2012 by related department of the national commercial network construction demonstration project, and also in the focus of investment projects in local area. Its total investments will over $100 million, covering an area of 187 acres, and the removal of 435 households. Beginning in May 2012, the news media have reported the trade city in the process of building demolition illegal, including implicate the families of public officials arrested refused to dismantle the masses, violent beatings, relocates, etc., brought great trouble to the local social stability. In June 2012, the relevant government departments identify the event, “This is a collective abuse of executive power, illegal to harm the interests of the masses and caused a very bad impact on the event”. In this paper, I will take the demolition event processing as an example of empirical analysis, using the expert consultation corresponding to weights of the index number model.

$$A_{11} = 11.979; A_{12} = 2.122; A_{13} = 12.562; \mathrm{A}_{14} = 2.960;$$

$$\mathrm{B}_{11} = 9.984; B_{12} = 22.629; B_{13} = 9.046;$$

$$\mathrm{C}_{11} = 2.342; C_{12} = 2.688; C_{13} = 2.512;$$

These multiplications of the corresponding level of total order weight can be obtained after comprehensive score for each level:

$$V_A = \{P(A_{11})A_{11} + P(A_{12})A_{12} + P(A_{13})A_{13} + P(A_{14})A_{14}\} P(A) = 1.427 \quad (7\text{-}1)$$

$$V_B = \{P(B_{11})B_{11} + P(B_{12})B_{12} + P(B_{13})B_{13}\} P(B) = 4.713 \quad (7\text{-}2)$$

$$V_C = \{P(C_{11})C_{11} + P(C_{12})C_{12} + P(C_{13})C_{13}\} P(C) = 0.022 \quad (7\text{-}3)$$

$$V = V_A + V_B + V_C = 1.427 + 4.713 + 0.022 = 6.162 \quad (8)$$

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Therefore, the demolition event of crisis management organizational performance composite score is 6.162.

The demolition of crisis management performance evaluation model of engineering project evaluation grade known as medium, that means performance of the event is not very good, crisis management is similar to the demolition event needs to be further strengthened. It should be noted that the above performance evaluation model is built on the universal and ideal basis, which can be modified according to the actual conditions of different regions in the specific application, evaluation objective and reasonable to crisis management for engineering project demolition effect.

4. CONCLUSION

In order to build "beautiful china" and promote the integration of urban and rural, project management organization should be in line with the principle of people-oriented, the demolition of the risk factors that may occur, the risk level and the consequences of such analysis and assessment, management and control of the risk process. At the same time, take feasible measures, all kinds of risk preventions, reduction and elimination of damage the interests of the masses, harm social stability. By reforming at all levels of project management organization's crisis management performance appraisal system to make the management organization at all levels become public. Only in that way can people fundamentally reduce demolition crisis in construction projects and overall accelerate the pace of a well-off society.

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