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Factors affecting contractors' risk attitudes in construction projects: Case study from China

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Abstract

Risk-based decision making (RBDM) is critical in successful construction project management, in which decision makers' attitudes towards risks play an important role. Most previous studies in construction project risk management have been focusing on the factors contributing to the success of risk management, but little attention was given to factors significantly affecting decision makers' risk attitudes in construction projects. To improve RBDM, we investigate the critical factors affecting contractors' risk attitudes in construction projects in China in this research. Literatures reviews, interviews and questionnaires are used for the identification of factors affecting contractors' risk attitudes. Statistical methods of ranking analysis and factor analysis are also implemented for verification and further analysis. The results show that the most important three factors are: "consequences of decision making", "engineering experience", and "completeness of project information". Results from factor analysis on the identified critical factors reveal that they can be grouped into four categories, namely: (1) knowledge and experience; (2) contractors' character; (3) personal perception; and (4) economic environment. The significance of this research is that the findings do not only provide decision making support for contractors by deepening their understandings of the factors that affect their risk attitudes, but also serve as a useful reference for further studies under this topic.

Keywords: Risk attitude; Contractor; Construction projects; Decision making; China

1. Introduction

Risk-based decision making (RBDM) is in the core of construction risk management (Sturk et al., 1996; He and Huang, 2007). During the lifecycle of construction projects, especially in the planning phase, the participants are confronted with enormous RBDM problems, which are usually addressed through identifying, analyzing and responding to potential risks, and ultimately optimizing solutions (Al-Bahar and Crangell, 1990; Raftery, 2003; Zeng et al., 2007).

Over the past decades, researchers have developed a diversity of methods to enable a more objective RBDM process. The most commonly applied methods include the expected profit and loss value decision method, the decision diagram method, the matrix decision method, the marginal decision method, the Bayesian decision method, and the Markov decision method. A detailed description of these methods is shown in Table 1 (Cai, 1992; Xu, 1998; Liu and Gao, 1993).

For the majority of the methods presented above, they are based on the expected value principle, which requires iterative decision making processes for adequate data collection. This is because the expected value could not be calculated from a one time RBDM case. Furthermore, Alexopoulos et al. (2009) stated that decision makers perceive risks differently in various situations, which is affected by factors such as early experience, education background, personal beliefs, and culture. Those subjective perceptions cause variations in decision making, making it impossible for people to make correct decision in all the situations in

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Table 1
Descriptions of prevailing risk-based decision making methods.

No.	Methods	Descriptions and decision criteria
I	Expected profit and loss value decision method	Scheme with maximum expected profit value or minimum loss value will be identified as the best one
II	Decision diagram/tree method	The decision making process is expressed and described by diagrams/trees, which makes the process more legible and easily calculated. The decision criterion is the same as method I
III	Matrix decision method	To some degree, this method is an extension of the method I. However, it is more useful when dealing with problems of great complexity. In this method, the profit or loss values of schemes are presented through matrix
IV	Marginal decision method	Scheme with maximum expected marginal profit value or minimum marginal loss value will be identified as the best one
V	Bayesian decision method	In this method, some information will firstly be obtained by means of experiments, investigations and statistical analysis. Then the posterior probability will be calculated based on Bayesian principles. Finally related alternative schemes can be identified for decision makers
VI	Markov decision method	This method can be used to assist in decision making by predicting probable state of the objective according to its current state and trends. The basic tool for forecast and decision making is transition probability matrix

pursuit of maximum expected value. In that case, the maximum expected value theory is an unsatisfied tool to explain humans' behavior in the RBDM process.

In general, RBDM is a kind of human behavior highly related to the decision maker's subjective perceptions (Alexopoulos et al., 2009). A party's general attitude towards risks refers to their preference for different risk/return tradeoffs (Ward et al., 1991). Risk attitude was defined as "chosen state of mind with regard to those uncertainties that could have a positive or negative effect on objectives" by Hillson and Murray-Webster (2007). Therefore, people's risk attitudes reflect their personal characteristics and experience, as well as the economic, policy and management environment which they belong to. This explains why, even in the same decision situations, different decision makers would make different, sometimes even opposite judgment and decisions. The subjective judgment highly related to the human factors in the decision making process is customarily depicted as risk attitude, which plays an important role in decision making. Therefore, decisions made without considering the decision maker's risk attitude might not be persuasive or reliable. Nevertheless, what factors are influencing decision makers' risk attitudes in construction projects remains an important and unsolved problem.

In this paper, we aims at identifying the critical factors affecting contractors' risk attitudes, which pervade in a large number of decision making activities in construction projects. The paper starts from reviewing the previous studies related to risk attitudes. Then it moves onto introduce the methodology adopted in this study. Afterwards, the results of the questionnaire are presented. Subsequently, a factor analysis is employed to categorize the identified critical factors. Finally, this paper reaches a conclusion with a summary of the key findings, as well as some issues worth further investigation. It is expected that the findings could not only provide a solid basis for the Chinese contractors to understand the major factors influencing their risk attitudes in decision making, but also serve as a useful reference for researchers to launch similar research into risk attitudes, such as other major decision makers' (such as clients, engineers, etc.) risk attitudes in construction projects.

2. Previous studies related to risk attitude

The relationship between attitude and decision making behavior has been studied in many fields including the construction management area (Au and Chan, 2005). Theory of planned behavior by Ajzen (1993) is one of the most prevailing models for illustrating the relationship between attitude and decision making behavior, which is illustrated in Fig. 1. In that model, attitudes, subjective norms and perceived behavior control influence behavioral intentions, which in turn determine the likelihood of behavior occurring (Weber et al., 2002). According to Teo and Loosemore (2001), the attitude is based on individual's positive or negative evaluation on consequences of a particular type of behavior, as well as personal beliefs or knowledge about the consequences. Therefore, even in the same situation, various risk attitudes could be adopted, and these would lead to different actual behaviors and consequences (Hillson and Murray-Webster, 2007). From this perspective, the attitude plays an important role in shaping the decision makers' behavior. In the domain of construction risk management, it would be difficult and inaccurate to investigate the decision makers' decision making behaviors without a good understanding about their risk attitudes.

Many researchers have realized the importance of decision makers' risk attitudes within the decision making process. Harvey (1988) developed a decision model for analyzing the attitude toward risk, based on which he studied the effect of risk attitude on public policy appraisal decision making across different time spans. To consider whether the risk-taking attitudes of Scottish chartered accountants are similar to or different from managers of other businesses in the UK, Helliar et al. (2002) conducted a large survey to examine their attitudes to risk. Based on the survey results, a number of strategies were suggested to be adopted to control risk. In addition, Han et al. (2005) investigated the risk attitude and decision behavior in international bidding projects based on series of experi-