Sources of Error in Conventional Risk Management Process

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1. Introduction

Theoretically, the essence of the conventional risk management process (RMP) is based on the risk efficiency concept[1]. The conventional RMPs typically compose of logical sequential processes i.e., risk identification, risk structuring, risk analysis, and risk response processes. The aim of the RMPs is to assist decision maker in systematically and efficiently managing risks occurring in the project. Through the consisting processes of the RMPs, the degree of risk and expected impact are produced as outputs of the RMPs. These two values could be subsequently portrayed in the degree of risk and expected impact map to present the efficiency condition associated with each response.

Any decision set obtained from analysis model is considered unreasonable for use and invalid generally because of at least two reasons. The model could not represent the real system and when the decision is made, outputs of that decision differ from outputs of real system over a tolerable limit for error[2]. Although, previous proposed RMPs have been elaborately developed to encounter the various imperfections, the outputs are often distressed by errors. In order to minimize these errors, sources of error, which could falsify the outputs of the RMPs should be identified. In modeling, the sources of uncertainties and errors can be associated with at least six major characteristics: model topology, model parameters, model scope, data, optimization technique, and human subjectivity[2].

2. Identified Sources of Error

To identify the sources of error associated with the RMPs, the literature review and post-evaluation studies of a formerly proposed RMP by the authors entitled the multi-party risk management process (MRMP) have been conducted. According to the methodological identification as shown in Figure 1, a number of sources of error could be identified and categorized in following categories: process scope, input data, process, and subjectivity. This paper attempts to reveal and discuss these identified sources of error.

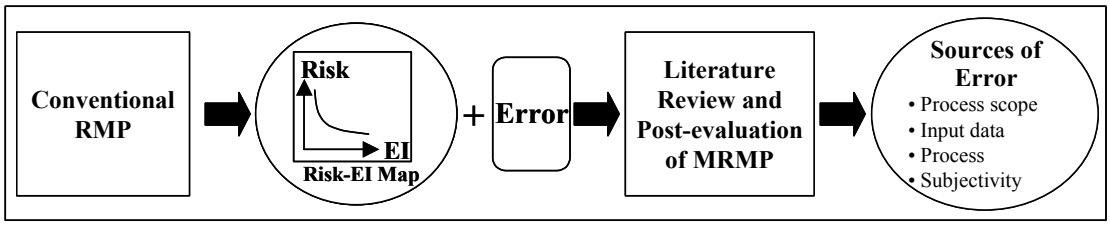

Figure 1: Methodological identification of sources of error

Process Scope

Scope is particularly important where the system is controlled by many relatively independent decision makers, who usually have different objectives[2]. Since construction project is considered as a multi-party environment, which several parties are involved, by neglecting the importance of other parties' objectives and way in managing the risks, this could increase degree of risk and difficulty in managing the entire project. Eventually, the project objectives can be deteriorated, and all parties will probably suffer. Many researchers have proposed and discussed the RMPs to cope with risks occurring in construction project. However, these RMPs are discussed on the basis of one party viewpoint in managing risks influencing his/her objectives. When a risk affects several parties involved in the project, the processes particularly risk analysis and risk response evaluation in the conventional RMPs usually do not incorporate those involved parties' viewpoints.

To overcome this source of error, the MRMP was previously proposed by the authors and applied to a real infrastructure construction project to discuss its applicability. The basis of MRMP fulfills two Asian values: (1) the maintenance of harmony in group situations; and (2) the pursuit of profit for all involved parities. According to its application in a real infrastructure construction project, a number of features, which are extensively developed from the other conventional RMPs, include multi-party risk-response-risk, 'objective' evaluation of each party, multi-party response efficiency, and response characteristics evaluations[3].

Input Data

Based on the definition of risk defined by various researchers, the characteristic of risk could be presented as following simple equation: risk = probability of event × magnitude of loss or gain. The probability of occurrence and impact of an event then are considered as major input variables in the RMPs. They could be generally evaluated by two ways of assessment i.e., objective or subjective depending on the recurring conditions and uniqueness of environment of that event.

In case of objective assessment, the sources of error are associated with the issues of insufficiency, inaccuracy, and inapplicability of that objective data. Most of the case, the historical data is usually unavailable and insufficient. In application of the MRMP, due to unavailability of objective data in evaluation of probability of occurrence and impact, the subjective assessment was adopted. Even the historical data is available; it might not be accurate and applicable due to the uniqueness of project environment.

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Process

The source of error in this category is related to inattention on uncertainty event in the processes. The conventional RMPs normally use the probability impact grid as a basic tool for risk prioritization and distinction by considering that if an event has higher probability and impact, that event has more priority. However, to distinguish risks by using this tool could lead the decision maker to neglect the importance of low probability and high impact event, which is often called uncertainty event. To define the terms uncertainty, the uncertainty exists when either probability of occurrence of event or outcome is not known and both are not known[4]. According to the MRMP application and post-evaluation study, for example, the economic crisis risk, which could be considered as a low probability risk, actually occurred in the case studied project. It resulted substantially delay approximately 53 percent delay from its original contract duration. As an example, this could illustrate that the necessary attention should be put on this type of event. We should not discard this type of event during the risk prioritization and distinction, which is considered as one source of error in the conventional RMPs.

Subjectivity

Another source of error is related to the risk perception issue. When we consider risk perception issue in the conventional RMPs, since the conventional RMP is a method developed to systematically obtain risk-efficient responses for a single party, it could be understood that the risk perception of other parties towards the response is beyond the scope of the RMPs. When a risk management study is undertaken from the viewpoint of one party, the most desirable response may be derived without significant difficulty[3].

Nonetheless, associated with the source of error in the category of process scope, when viewpoints of multiple parties have to be incorporated, only providing a set of efficient responses to them is probably insufficient. As a feature of the MRMP, the response characteristics evaluation enables the understanding of response characteristics to a risk perceived by involved parties, which is significant in a multi-party environment[3]. However, to understand risk perception will be beneficial for determining the risk attitude, which is a person's willingness to either take or avoid risks, and evaluating how to response risks. Thus, it is necessary to investigate the risk perception of each involved parties towards responses portrayed in the degree of risk and expected impact map in order to determine efficient response that matches with the party's perception of risk. This is still not achieved by the MRMP. Moreover, from the past literature review study, it was found that the area of risk perception is still not intensively studied in field of construction[4], although there are a number of risk perception researches in other fields such as psychology, insurance and culture.

In subjective assessment, bias is inevitable. The human judgmental ability is often defected by various biases, which distort the correct perception. The possible biases include availability, selective perception, illusory correlation, conservatism, law of small numbers, wishful thinking, illusion of control, logical construction, and hindsight bias[5]. Chapman (1997) stated that as a result of limited information processing ability, people normally adopt heuristics when estimating uncertainty, which can lead to error in estimates. Three types of bias are listed up: adjustment and anchoring, availability, and presentational effects. For example, from the MRMP application result, in construction stage of the case studied project, the contractor's assessment of probability of occurrence of economic crisis risk was distorted by availability bias. Since the contractor was suffering from the financial problem caused by economic crisis during the MRMP application study, the contractor then overestimated probability of occurrence of economic crisis risk as high, even though the economic crisis is considered rare event.

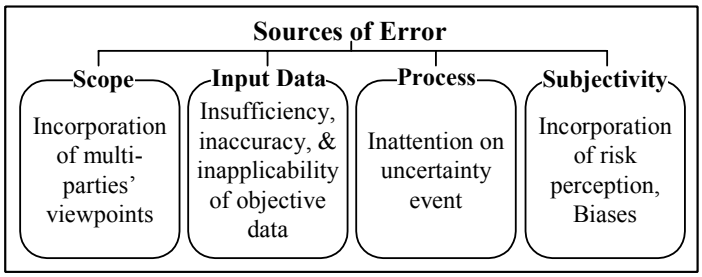

Figure 2: Identified sources of error

3. Conclusion

Even though several RMPs were developed and proposed, there are still a number of sources of error, which could falsify their consequent outputs. From the studies of literature review and post-evaluation of the MRMP application, the sources of error are identified and categorized into four groups: process scope, input data, process, and subjectivity. The identified sources of error comprise of incorporation of multi-parties' viewpoint; insufficiency, inaccuracy and inapplicability of objective data; inattention on uncertainty event; incorporation of risk perception and biases. Figure 2 summarizes the identified sources of error associated with the RMPs. Considering the theoretical development of the RMP, to further develop the new RMP, it is desirable to incorporate these issues in the processes.

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