Discussion of "Risks in Chinese Construction Market—Contractors' Perspective" by Dongping Fang, Mingen Li, Patrick Sik-wah Fong, and Liyin Shen

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The paper presented a study which applied a quantitative analysis, based on a structured questionnaire survey, to a large variety of practical problems relevant to risk factors in the construction market from mainland China. The study provided a mature research methodology and useful discussions based on survey data. Having said this, we wish to share our opinions with the writers by commenting on problems we identified in statistical analysis, risk classification, and risk identification involved in the study.

Problems in Statistical Analysis

The paper simply indicated that Alpha (Cronbach) model was used to conduct a reliability analysis of survey data. However, additional information is needed to justify the reliability of the data. By using the Alpha (Cronbach) model, researchers have to examine some basic requirements: for example, observations should be independent, errors should be uncorrelated between items, each pair of items should have a bivariate normal distribution, and scales should be additive. These requirements ensure that each item is linearly related to the total score (Norušis 2004). Without these examinations, the Alpha (Cronbach) coefficient 0.928 (p. 857) presented in the paper is less convincing.

On the other hand, the paper stated that a Cox and Stuart's test for trend was conducted to create an order between the risk event and the variance (pp. 855, 857). Generally speaking, the Cox and Stuart's test for trend is mostly interpreted as a method for modeling time-to-event data in the presence of censored cases (Conover 1980; Norušis 2004), and there are also some requirements for using the test. Some of these are that observations should be independent, and the hazard ratio should be constant across time or the proportionality of hazards from one case to another should not vary over time (known as the proportional hazards assumption) (Norušis 2004). After examining all 45 risk events listed in Table 2, we think that these requirements were not met, because there are clearly interrelationships among some of these 45 events. For example, Risk Events $H1$ and $Y4$ are not independent. Thus, Cox and Stuart's test appears to be inadvertent.

With regard to the approach to risk index, the paper provides only a simplistic method for calculation [cf. Eqs. (1) and (2)], which results in a group of relatively higher variances for each risk event than the general statistical levels (refer to Table 2). As it is stated on page 855 that differences exist in both education and experience among responders, we believe one direct reason for the higher variance is that those differences are ignored in the calculation. It is thus recommended to use a set of correction coefficients to overcome the obstacles of deviation.

Risk Classification

Defects existing in the classification of risk events (Fig. 1 and Table 2) introduce biases in the statistical analysis. It is clear that the paper adopts a taxonomy-based risk identification method in the classification, but an unreasonable taxonomy may bring in confusions. For instance, the nine elements of Internal Risk Event in Fig. 1 are actually classified based on two different kinds of criteria, namely, the roles in construction and the phases of construction. This mixed-criteria classification can easily lead to interrelationships among risk events, and thus their interdependence and interference in statistical analysis. On the other hand, the paper does not provide a comprehensive risk classification. For example, geological exploration unit plays an important role in the construction market in mainland China, and it seems that it was not considered a risk factor in the paper. Regarding the risk classification based on the Chinese construction industry, the main difference between the classification adopted in the paper and others such as the risk classification for Sino-foreign construction joint ventures by Shen et al. (2001) is that the former paper focuses on the whole construction project environment in which various sectors are involved in. For an extensive and practical project-oriented risk taxonomy no matter which construction market it may focus on, we believe that the *PMBOK Guide* (PMI 2004; Barkley 2004) and the *Construction Process Protocol* (Kagioglou et al. 1998) are two essential references, although some other risk identifications for the construction sector, such as the *Private Financing Manual* (TCFO 2004), are also valuable toward building such a taxonomy.

Risk Identification

Appropriate risk identification can benefit both quantitative and qualitative risk analysis; otherwise it is difficult to make a reasonable risk analysis. According to the survey result, Risk Event $W7$ (inflation and sudden changes of prices) is the 30th most important risk (Table 2), and an explanation refers to the stable political and economic environment in mainland China. Our experience, obtained from working the construction industry in mainland China, tells us that nearly all contractors and managers do pay much attention to risks from price change throughout the whole period of construction projects, and there are many real cases in which construction contractors finally failed or seceded in bids

because they insisted on their claims for compensating price change. As an example, a joint venture for the Xiaolangdi hydroelectric power plant project, in mainland China, failed in the bid of intake and outlet works even though their price was the lowest, because the client did not agree to compensate on price change in negotiations (SPG 2004). Without a clear identification of risk of price change, the paper might have distorted views in its conclusions.

On the other hand, it seems that the paper doesn't pay attention to risk factors in relation to occupational illnesses associated with construction operations. Previous research on occupational health in mainland China has identified that some serious illnesses, including lung cancer and leukemia, are real occupational illnesses from the construction industry around metropolises to include Shanghai, Tianjin, Chengdu, and Guangzhou (Du et al. 1996; Wang et al. 1996; Adegoke et al. 2003). As stated in the paper, most construction workers in mainland China are farmers with little professional training (p. 859), and they frequently do not know enough to protect themselves from exposures to occupational hazards in their daily working environment, especially when low-energy-efficient equipment and high-hazard-embodied materials are applied on-site. Some contractors in mainland China had to pay for the results from such risks due to exposures to occupational hazards, and the contractors are also required to provide necessary training to workers to prevent the risk of occupational illnesses, under the Construction Act 1998 in mainland China.

In addition to the risk factors of price change and occupational illness, technical risks such as Risk Event *F*1 (subcontractors' poor technology) (ranked 12th) and Risk Event *M*9 (unpredicted technical problems in construction) (ranked 39th) are not in the mainstream list according to the survey result. It is common knowledge that geological explorations into construction sites are extremely important in order for contractors to control and reduce adverse impacts to neighboring buildings, which are caused by settlement movements during excavation and foundation construction. Thus, geological condition is always a key technical problem throughout foundation construction. It would be much more useful if the paper under discussion could have described in detail a location-based technical risk distribution, because construction technologies for different geological conditions differ according to project and area in mainland China.

Overall, the paper presents a good overview of construction risks encountered by contractors. We hope our suggestions can further improve the study.

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Closure to "Risks in Chinese Construction Market—Contractors' Perspective" by Dongping Fang, Mingen Li, Patrick Sik-wah Fong, and Liyin Shen

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The discussers' concerns can be summarized by the following four statements, and are addressed after each:

1. **The presented results and the risk checklist disagree with the discussers' perceptions. Some risk events the discussers view as important are not in the mainstream list (such as W7, F1, and M9), nor are others included in the risk checklist—for instance, occupational illnesses and geological explorations**.

   The surveyed subjects were top Chinese contractors. Their risk perspectives vary with experience, personality (optimistic or pessimistic), and risk tolerance. After a review of the returned questionnaires, the writers found three questionnaires where the risk events of W7, F1, and M9, respectively, ranked first in the risk importance rankings. This demonstrates that the discussers share the same perspective as some respondents. However, the results in the paper were based on the collected sample and presented the subjects—Chinese contractors' risk perspectives on the Chinese construction market. The disagreement between the results and the discussers' perceptions implies the complexity of the Chinese construction market.

   The survey was carried out through a standardized question-

naire, which has its own weaknesses. As Babbie pointed out, by designing questions that will be at least minimally appropriate to all respondents, you may miss what is most appropriate to many respondents (Babbie 2001). Kangari (1995) stated that it is necessary to keep the questionnaire short enough to ensure the greatest possible participation, meanwhile obtaining as much information as possible. Therefore, although the writers tried not to miss important risk events when designing the risk checklist, it is possible that some risk events the discussers considered important were not included in the checklist. The selection of risk events was not only based on the writers' insights into the Chinese construction market, but also by referring to the papers of the time (the survey was carried out in July 2001) published in top journals in the construction management field, such as *JCEM*, *CME*, *JME*, and *IJPM*. Furthermore, the completeness of the checklist was examined and improved through more than 10 expert interviews. It is believed that the final risk checklist in the questionnaire represents the Chinese contractors' risk perspectives of the time.

The risk event of geological explorations, as raised by the discussers, was included in M9. With regard to the risk event of occupational illnesses, according to the writers' experience of several years in the field of construction occupational safety and health, it has not actually come to the Chinese contractor's attention as deserved even now.

2. **The paper does not provide a comprehensive risk classification and the criteria for classification is mixed as to lead to interrelationships among risk events**. The main work of the paper is to evaluate risk events and prioritize them for further discussions. Thus the completeness of the checklist is a must, while the criteria for classification are not the focus. In fact, the risk classification was not provided to the contractors in the questionnaire. There are many kinds of risk classifications in the construction management research. The classification in this paper has been examined and validated through expert interviews, which we believe is most acceptable and understandable to the respondents. However, the consideration of risk classification should have been presented in the paper. It is true that interrelationships between risk events did exist in the risk classification; however, this did not threaten the achievement of the paper's purpose. With regard to the significant interrelationship between the risk events of H1 and Y4, it was the writer's intention to describe the same risk event with different expressions so as to examine whether the respondent's answers to H1 and Y4 were consistent or not and to ensure the validity of the returned questionnaires. This should also have been explained in the paper.
3. **The requirements for using the statistical methods, such as the Cronbach's Alpha test and the Cox–Stuart test for trend, are not examined in the paper**. In the construction management field, requirements for using many statistical methods are difficult to meet perfectly. For instance, many statistical methods require that variables be on an interval or ratio scale, but in reality many variables are on a nominal or ordinal scale. So are other cases like dependence between variables and sample size. Therefore, in order to use these statistical methods in the construction management field, one has to rely on hypotheses, approximation, and so on.

   Use of the Cronbach's Alpha test in the paper was based on Kaming et al. (1998) and Li et al. (1999) works, and it was assumed that requirements for the test were met. The Cox–Stuart test for trend is not limited to time-series data, but it does require independence between variables (Conover 1999). It was assumed that the variables (risk events) in the paper were mutually independent. In fact, the variables in real-life situations do not meet the requirement.
4. **Variances of the statistical results in the paper are of a higher level than in general cases**. The writers agree that the variances of the statistical results in the paper are higher than in general cases. The causes of the high level of variances are thought to be the geographically wide distribution of the returned questionnaires, the great diversity of the economic levels and market structures of the distributed areas, the differences in background and experience among the respondents, etc.

In conclusion, the purpose of the paper was to disclose the main risks encountered by Chinese contractors in the Chinese construction market, to give valuable references to international contractors. The research was conducted through a questionnaire survey, which generally consists of the following steps: questionnaire design, data collection, and data analysis. Every step is critically important to the success of a study. However, looking into the research in the field of construction management, we have to say that most of the similar works are far from perfect from a statistician's point of view. Researchers should pay attention to these limitations when designing studies. It is a great challenge for researchers in the construction management field to obtain useful and reliable results in such an imperfect environment.

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