RISK FACTORS INFLUENCING INTERNATIONALLY FUNDED PUBLIC INFRASTRUCTURE PROJECTS IN THAILAND

Borvorn Israngkura Na Ayudhya

Received: June 14, 2012 ; Revised: August 18, 2012; Accepted: August 24, 2012;

Abstract

Risks associated with the construction of internationally funded public projects in Thailand are determined. A face-to-face interview technique was used in a field survey of 120 public infrastructure projects. The interviews focused on 39 factors grouped into 7 categories: estimation, project, competition, fraudulent practices, construction, economics, and politics. The survey revealed that critical risk factors influencing the success of project delivery were adjustment and anchoring, delay in payments, civil disorder, political instability, market conditions, influence of power groups, fluctuation in labor costs and materials, project complexity, exchange rate, and motivational biases. Minimal risks in internationally funded public projects would require transparency in evaluation of estimations, familiarity in overseas disbursement procedures, adequate skilled staff, selection of a competent consultant, and a reliable contractor.

Keywords: International risk, public work, Thailand

Introduction

Construction organizations are vulnerable to numerous risks. It is inevitable to avoid influences by surrounding environments. Internationally funded public infrastructure projects in particular are exposed to international-domestic economic, social, and domestic political risk (Walewski and Gibson, 2003). Completion of a project relies on the decision making of key persons in the process of analyzing risks. The decisions require expertise, knowledge of the global financial market, and prior knowledge of national, regional, and global economic prospects (Yates, 2007). The strength of national economies, exchange rates, and currency controls are vital factors that need to be understood and taken into consideration in strategic decision-making in international construction projects (Kapila and Hendrickson, 2001). Similar studies have been reported in Nigeria (Aibinu and Odeyinka, 2006), Vietnam (Long *et al*., 2004) and Malaysia (Lim and Mohamed, 2000). Thailand is still

Department of Civil Engineering, Rajamangala University of Technology Krungthep, 2 Nanglinchee, Sathorn Tungmahamaek, 10120, Bangkok, Thailand. E-mail: borvorn.i@rmutk.ac.th, ayudhya 2003@yahoo.com

* *Corresponding author*

recognized by the World Bank as one of several South-East Asia fund recipient countries. Large and complex infrastructure projects still need financial assistance from international financial institutions and agencies (PDMO, 2011). In 2005, Thailand received an official development fund from the World Bank and the Japan Bank for International Cooperation of US$ 84.29 millions and US$ 1,956.82 millions, respectively. With these amounts, 88% of the loans went to transportation projects, 5% to energy projects, and 4% to potable water projects (PDMO, 2005). Factors influencing bilateral and multilateral agencies' investment decisions with international capital facilities can be complex and vary significantly from region to region and project to project. Han *et al*. (2008) reported that risk factors associated with overseas construction projects could diminish the projects' profitability. Kangari and Lucas (1997) also mentioned that failures in client communication, understanding the new market, avoiding local politics, and supervising the diverse group of professionals were major causes leading to failure of international project success. Similarly, Will and Levitt (2010) reported an increase of misunderstanding, delay, and costs resulting from an unfamiliar environment; different factors such as regulations, the norm, and cognitive-cultural belief with diverse participants are critical factors. For a decade, construction practitioners have introduced several conceptual frameworks for procurement (Ahmad, 1990; Cheung *et al*., 2003; Eriksson and Westerberg, 2010). However, contractors still take a greater proportion of the risks. These risks were transferred from the client or owner to the contractor, most of which would have traditionally been taken by the client (Eriksson and Laan, 2007). It requires an effort and support from the legal, design, and construction teams in order to minimize the disputes, claims, and delays among construction teams. It is imperative to understand the underlying risks for any corrective actions to be effective. Therefore, this research identified and evaluated the common risk factors in internationally funded public projects from the viewpoint of construction practitioners. The severity index method was used to evaluate the risk factors. Spearman's ranking technique was employed. The present results aim to add relevant knowledge to the construction practitioner's concerns and decisions which affect the success of internationally funded public projects in Thailand.

Literature Review

In developing countries, it is likely that large projects will be funded from several sources, since government funds are invariably inadequate. It is common practice for the governments of countries to seek aid from external sources. Construction activities in developing countries such as Thailand can be affected by fluctuations in foreign exchange rates, governmental exchange controls, and many other risks associated with undertaking work in a foreign country (Israngkura Na Ayudhya, 2006). The risks influence the international construction projects from the bidding stage through to project completion (Ogunlana *et al*., 1996; Raftery *et al*., 1998; Wang, 2000; Chan, 2001). These risks can be legal requirements, construction systems, technology, and management techniques (Dikmen *et al*., 2007). By concentrating on the lowest bid offer, the owner aims to accept the tender of the contractor who performs the work at the lowest cost. Consequentely, this increases the risk of cost and schedule growth due to a higher number of changed orders (Assaf and Al-Hejji, 2006; Wardani *et al*., 2006). The projects that fail to meet their scope, budget, and schedule can result in a host of impacts with serious economic, social, and political ramifications. Therefore, the success of the contractor can hinge on an understanding of the risks associated with such projects. Dikmen and Birgonul (2004) reported that contractors face fewer difficulties when they have a more comprehensive understanding of the commercial, political, constructional, and operational uncertainties

and risks of the projects. Naturally, owners tend to choose those familiar procurement procedures they have, a habit of using them regardless of any differences between projects (Love *et al*., 2005). However, internationally funded projects require an international recognition procurement procedure. Construction practitioners of recipient countries do not feel confident of how to use the procedure and have negatives attitudes towards its effect on outcomes (Tysseland, 2008). Moura (2003) reported that an increase of claims and disputes in public construction projects brings up negative effects to the project management. (Toor and Ogunlana, 2008) mentioned that a lack of resources, poor contractor management, shortage of labor, design delays, planning and scheduling deficiencies, changed orders, and contractors' financial difficulties are problems causing delays in major construction projects in Thailand. Additionally, Matijevic (2008) reported that distinctive problems that cause disputes in international construction projects included negotiations, litigation with expert analysis, and domestic or international arbitration. Many contractors are unfamiliar with risk factors in internationally funded projects and also lack experience and knowledge in management risks, and these lead to a failed delivery of the works. Therefore, construction practitioners including the owner, consultant, and main contractor should fully understand the risk impact so that they know how to avoid risks in such a way that an agreed completion of the project can be delivered. In this study, the main groups of internationally funded public projects' risk factors were identified through an extensive literature review, preliminary reports, and discussions with construction practitioners. The key objective of the study was to identify the risks which frequently occur during the construction phase from the owners', consultants', and main contractors' perspectives. The risk factors were categorized into 7 main risk groups: estimation-related, project-related, competition-related, fraudulent practices-related, construction-related, economics-related, and politics-related.

Method

In this study, the risk factors were identified from a combination of literature review and field survey. The face-to-face interview technique was used in the field survey. Fifteen construction practitioners (owners, consultants, and main contractors) helped in identification of the risks in internationally funded projects. The purpose of the interviews was to validate a preliminary set of construction risk causes gleaned from the literature and to determine from their experiences any other factors which cause construction disputes, delays, and claims in internationally funded projects. This phase resulted in the identification of 7 main risk groups and 39 risk factors. The development of the questionnaire was based on the literature review and the experiences of construction practitioners including academic lecturers. In the distribution and collection of the questionnaire stage, the questionnaires were dispensed to each group of the respondents: owners, consultants, and main contractors. The questionnaires were hand-delivered to minimize low responses. Furthermore, the face-to face interview technique was also used for 20 interviewees. The interviewees were randomly selected among the construction practitioners in related projects. The interviewees were asked to provide their individual perceptions by rating each risk factor for how it affected project performance within their projects. The interviewees stated their points of view as to the probability of the occurrence of the risk and the severity of the risk in the form of a 5-level scale: seldom, not often, moderate, often, and very often; and not severe, fairly severe, moderately severe, severe, and most severe, respectively. The survey results were analyzed by using the severity index approach. Based on the responses to the survey, a severity index was calculated to interpret the degree of seriousness of the effect of the risks. This index was calculated as follows (Babbie, 2009):

$$\text{Severity index } (SI) \frac{\sum_{i=0}^{4}(a_i)(x_i)}{(4\sum x_i)} * 100\% \quad (1)$$

where

a_i = constant expressing weight given to *i*th response: $i = 0, 1, 2, 3, 4$

x_i = variable expressing frequency of *i*

The response for I = 0, 1, 2, 3, 4 illustrated as follows:

x_0 = frequency of very often response and corresponds to $a_1 = 4$;

x_1 = frequency of often response and corresponds to $a_2 = 3$;

x_2 = frequency of moderate response and corresponds to $a_3 = 2$;

x_3 = frequency of not often response and corresponds to $a_2 = 1$;

x_4 = frequency of seldom response and corresponds to $a_1 = 0$.

The calculated severity index was categorized into 5 levels (Babbie, 2009). The 0-15.5% was categorized as not severe, 15.5-38.5% fairly severe, 38.5-63.5% moderately severe, 63.5-88.5% severe, and 88.5-100% most severe. The severity index of a category was the average severity indexes of all its related problems. The results of the survey are shown in Table 4.

Rank Agreement

In order to measure the agreement in the quantitative ranking between different groups of participants, rank agreement was used for any 2 groups which showed the average absolute difference in the factors. The Spearman's rank correlation coefficient, r_s, was used to measure the degree of agreement in the rankings of the owners and main contractors. The significance level was at 5%. The coefficient was computed as follows:

$$r_s = 1 - \frac{6\sum d^2}{N(N^2 - 1)} \quad (2)$$

where

r_s = Spearman's rank correlation coefficient.

d = The difference in ranking in international funding projects, and

N = The number of variables, equal to 39 and 7 for all the risk factors and the main risk groups of internationally funded projects, respectively.

Several studies have classified the risks in international projects. The literature review and the interviews with the construction practitioners in the related area of study resulted in the identification of 39 common risk factors. The identified problems were classified into 7 main groups. The grouping of the main risks was recommended by Balio and Price (2003) in global risk classification.

Results and Discussions

The responses to the questionnaire were analyzed, organized, summarized, and tabulated. Preliminary data analysis of the risk factors involved calculation of averages, measures of

Table 1. Questionnaire return rate

Organization	Number of questionnaires		Percentage return
	Sent	Filled	
Owner	50	41	78
Main contractor (Domestic)	50	34	53
Main contractor (International)	30	27	89
Consultant	50	32	44
Total	180	132	64

dispersion, and the severity index. Considering the above-mentioned risk factors identified by the construction practitioners, Table 1 presents the survey results on type of organization with their response rate. The total rate of return was 64%. Seventy-eight per cent of the owners returned the questionnaire, whilst for the domestic and international main contractors the rates were 53 and 89%, respectively. The evaluation of the overall return rate was considered as good (Babbie, 2009). He suggested that any rate of return over 50% can be reported as considerable, while an overall rate above 60% can be regarded as good. Table 2 shows the type and number of internationally funded projects from where the data were collected. The comparison severity factors in internationally funded projects and the comparison of ranking of the main risk groups are shown in Tables 3 and 4, respectively. These profiles indicated that risks in internationally funded projects were fairly common in Thailand. The construction practitioners have different expectations and perspectives of the risks in internationally funded projects under various sources of funding. Table 5 shows the 10 highest severity index factors agreed by the construction practitioners. Table 6 shows the comparison of the Spearman rank correlation on risks in internationally funded public works projects. Table 7 shows various identified international risk categories from other researchers. Based on the survey and the severity index analysis thereof, the following conclusions could be drawn. The results from the rank correlation analysis from 120 cases suggested that there was a strong disagreement between the owner-consultant perception (12% agreement) on the main risk groups and the owner-main contractor and consultant-main contractor perceptions which were rated as acceptable (43%) and disagreement (36%), respectively. The rank correlation on all risk factors was shown to be positive for owners and consultants (42%), owners and main contractors (66%), and consultants and main contractors (79%). However, it was found from Table 5 that internationally funded projects were affected by these 7 main risk groups at an average level of severity index of 62.2%. This was categorized as a moderately severe level. It was further found that the estimation related group was rated as having the highest overall severity of the main risk groups. It was also found that the adjustment and anchoring factor was the most serious risk factor that affects project performance. This might be the result of bureaucratic transparency and a shortage of experienced engineers which leads to unclear

Table 2. Profiles of financial sources

Classification	Type of funds			Total
	ADB[1]	IBRD[2]	JBIC[3]	
Bridges	14	-	4	18
Buildings	-	7	5	12
Expressway	-	-	14	14
Highways	12	17	13	42
Underground railways	-	-	12	12
Water irrigations	10	5	7	22
Total	36	29	55	120

Note :
1 = Asian Development Bank
2 = International Bank for Reconstruction and Development
3 = Japan Bank for International Cooperation

Table 3. Comparison of severity index factors in internationally funded projects

Risk factors	Owner		Consultant		Main contractor	
	SI (%)	Rank	SI (%)	Rank	SI (%)	Rank
Estimation related group						
Motivational biases	64.6	16	66.5	9	66.0	12
Adjustment and anchoring	79.6	1	81.0	1	75.2	3
Incentives	51.0	35	63.1	15	68.1	8
Cognitive	59.6	27	62.1	16	64.6	16
Project related group						
Project complexity	66.3	11	64.8	12	67.9	9
Scope vagueness	62.3	20	64.0	13	65.6	14
Project size	60.2	25	54.8	30	57.3	24
Project type	72.3	5	61.0	20	53.1	31
Competition related group						
Contractor policies	61.9	21	59.2	24	64.2	17
Need for job	64.2	17	60.0	23	65.8	13
Market conditions	70.0	6	72.3	4	69.0	7
Number of bidders	74.0	2	65.6	10	50.0	33
Fraudulent practices related group						
Corruption	61.5	23	51.5	33	56.3	27
Fraudulent practices	63.3	19	57.5	26	66.7	11
Theft	65.2	14	56.0	29	54.4	30
Collusion among contractors	60.8	24	61.7	17	63.8	20
Construction related group						
Geological conditions	58.5	30	56.3	28	57.9	23
Unexpected site conditions	59.4	28	61.5	18	64.0	17
Weather conditions	59.8	26	58.3	25	61.7	21
Accessibility	58.1	31	60.2	22	59.4	22
Client-generated	51.9	34	51.9	31	55.2	28
Subcontractor-generated	52.1	33	50.0	34	56.9	25
Delay in payments	74.2	2	78.5	2	80.0	1
Economics related group						
Price fluctuations	61.7	22	60.6	21	63.5	20
Inflation	57.3	32	57.3	27	52.7	32
Exchange rate	64.0	17	66.9	8	67.7	10
Interest rates	59.0	28	61.3	19	56.7	26

Table 3. Comparison of severity index factors in internationally funded projects (cons)

Risk factors	Owner		Consultant		Main contractor	
	SI (%)	Rank	SI (%)	Rank	SI (%)	Rank
Politics related group						
Political instability	69.4	7	71.7	5	73.3	4
Political system	44.0	36	43.1	36	40.8	36
Nature of the firm's operation	41.3	37	38.1	37	37.3	37
Civil disorder	72.5	4	75.4	3	78.8	2
Influence of power groups	67.1	9	69.4	6	70.2	6
Labor restrictions	64.8	15	51.5	32	45.2	35
Fluctuation in labor cost and materials	65.8	13	68.5	7	70.8	5
Change in taxation	66.7	10	65.4	11	54.8	30
Supply of local materials	68.5	8	49.4	35	48.3	34
Government relations	66.0	12	63.8	14	64.8	15

Table 4. Comparison of ranking of main risk groups

Main risk group	Owner	Rank	Consultant	Rank	Main contractor	Rank
Estimation related group	63.7	3	68.2	1	68.5	1
Project related group	65.3	2	61.1	4	61.0	5
Competition related group	67.5	1	64.3	3	62.2	2
Fraudulent practices related group	62.7	4	56.7	6	60.1	7
Construction related group	59.1	7	59.5	2	62.1	6
Economics related group	60.5	6	61.5	5	60.2	4
Politics related group	62.6	5	59.6	7	58.4	3
Means	**63.1**		**61.6**		**61.8**	

judgement that can be subjected to errors, biases, and heuristics. Furthermore, interviewees mentioned that the public owner was highly bureaucratic, had a negative attitude, and there were also technical, managerial, and organizational incompetency of the main contractor.

Estimation Related Risk Group

Table 3 shows that foundation work in the construction of the frame and the enclosure, in the utilization of spaces such as method and materials and the required end were common areas in which estimating was erroneous. Interviewees mentioned that the factors affecting the accuracy of evaluating and estimating were the variability of the lowest tenders, the source of cost data used in estimating, the inherent error attached to the estimating technique, and the in suitability of cost data. Interviewees agreed that using previous cost data from projects where quantity surveyors

had experience and using a single source of cost data was likely to improve the accuracy of the cost estimates. Furthermore, a common issue that often arose during the interview sessions was the motivational biases between superiors and their subordinates. Many times the subordinates were afraid to voice their opinions out of fear of contradicting or embarrassing their bosses, which could negatively affect their position or future prospects within the organization. Similarly, the author witnessed numerous instances where expert consultants were unwilling to challenge the assumptions of their clients for fear of jeopardizing current or future work.

Project Related Group

It was found from the construction practitioners that engineering and construction complexities caused by a project's location or early design work led to internal coordination errors between project components. Internal coordination errors caused conflicts and problems between persons involved in the planning and design of a project. Due to the vagueness about the overall scope of a project, the accumulation of many minor changes to the project increased. While individual changes to the scope of a project had only minimal cost effects, the accumulation of these minor changes, which were often not essential to the intended function of the facility, could result in a significant cost increase over time. However, projects often seem to grow naturally as the project progresses from inception through development to construction.

Table 5. Ranking the 10 highest risk factors agreed by construction practitioners

Risk factor	Severity index (%)	Impacted
Adjustment and anchoring	78.6	Moderately severe
Delay in payments	77.6	Moderately severe
Civil disorder	75.6	Moderately severe
Political instability	71.4	Moderately severe
Market conditions	70.4	Moderately severe
Influence of power groups	68.9	Moderately severe
Fluctuation in labor cost and materials	68.4	Moderately severe
Project complexity	66.3	Moderately severe
Exchange rate	66.2	Moderately severe
Motivational biases	65.7	Moderately severe

Table 6. Comparison of Spearman rank correlation in risks on internationallyfunded projects

Correlation	Spearman rank correlation coefficient	
	Main risk groups	All risk factors
Owner-Consultant	0.12	0.42
Owner-Main contractor	0.43	0.66
Consultant-Main contractor	0.36	0.79

Correlation is signification at the 0.5 level of significant

Competition Related Group

Construction practitioners admitted to a worry about the threat of new entrants and the bargaining power of buyers and suppliers. The interest of construction companies in cost-cutting increased because of the decreasing profit margins or fees for this kind of contract. The advent of increased competition prompted construction companies to seek greater equity-risk sharing through alliances in the construction industry. This allowed financially stable construction firms to expand into new markets. Market conditions could affect the costs of a project, particularly large projects. The interviewees mentioned that the size of the project affected competition for a project and the number of bids that government agencies received for the work. Inaccurate assessment of the market conditions could lead to incorrect project cost estimation. Similarly, several researchers have found that changing market conditions during the development of a project can reduce the number of bidders, affect the available labor force, or result in increased commodity prices, all of which can disrupt the project schedule and budget (Chang, 2002; Woodrow Wilson Bridge, 2002; Pearl, 2004).

Fraudulent Practices Related Group

Construction practitioners mentioned that there were still fraudulent practices in construction projects. These practices range from false application for payment, change order manipulation, billing for work not performed, diverting purchases, and non-payment of subcontractors and material suppliers to theft of equipment/tools. Fraud could be committed by the contractor's employees, owner's employees, contractors, subcontractors, consultants, and participants in successful and unsuccessful projects. These kinds of fraudulent practices can affect the construction cost and performance of the project. The construction practitioners also mentioned that it was impossible to eliminate any kind of fraudulent practices even though frequent checking and further tightening of monitoring policies were implemented. Additionally, on large and/or complex projects, the inter-relationship between the various parties to the contract was often uncertain. In many cases, the people working on a project disagreed on matters which were discussed. This made it easier to blame other participants for problems. It created a reason to pay a bribe, as decisions on cause and effect and their cost consequences could have an enormous impact. However, the interviewees mentioned that influential factors which caused fraudulent practice might arise from understaffing or ineffective internal audit functions. Even if companies had proper controls, these may not be effective if there were not enough qualified people to manage them.

Construction Related Risk Group

As shown in Table 4, the construction related risk group was ranked in 7th, 2nd, and 6th place by the owners, consultants, and main contractors respectively. Within this group, the delay in payments factor had the highest severity compared with other factors in the same group. The impact on the construction performance was rated as at a severe level. With regard to the delay in payment factor, interviewees stressed that the disbursement procedure in Thailand had to comply with the Bank of Thailand rules and regulations which might not be suitable or workable considering overseas rules and regulations. Therefore, there might be difficulties in bringing about the payment of disbursements as stated in the contract. Experience in the disbursement procedure was also one of the important factors which had an influence on improving the performance of disbursement procedures. Nonetheless, the payment of disbursements for a project should be kept as written in the contract. This is a result of prevention in fearing of conspiracy and generosity theory from public thought and awareness. From the engineering aspect, interviewees mentioned that unexpected site conditions were unanticipated occurrences that were not controllable by a government agency. Unforeseen geological conditions were major problems

for project cost overruns. They affected excavation, compaction, and a structure's foundations, thus, resulting in the need for special mitigation work. Utilities were also often present that were not described or were described incorrectly on existing drawings. The interviewees mentioned that a main contractor usually subcontracted work to other contractors who would do the work for less than what the owner paid to the main contractor. This payment difference results in the subcontractor adopting cheap and poor quality work practices to generate certain profits. Subcontractors normally reused old timber until it was worn-out instead of replacing it. This often resulted in such problems as concrete bulging and honeycombed concrete. However, the interviewees admitted that saving on the cost of materials was considered an effective way to cut costs in Thai practice. There was also a lack of supervision from the main contractor of the different levels of subcontractors, which was the main cause for the non-compliance in performing quality work according to the specification. As the number of subcontracting layers increased, a limited profit could be gained for the subcontractor who actually did the work.

Economics Related Risk Group

It was found from Table 4 that the economic related risk group affected the construction performance at a fairly severe level. It was ranked in 4th, 5th, and 6th place by the main contractors, consultants, and owners, respectively. Medium size construction companies with a short economic position would be more affected by foreign currency changes. Further, this caused loss in expected future cash flow. However, a rise in the exchange rate would contribute to further falls in construction costs as it was likely that cuts in public capital construction projects would not be compensated by an improvement in the commercial construction sector. This would cause the sector to lag behind any improvement in the general economy. The interviewees also mentioned that market conditions could affect the costs of a project, particularly large and complex infrastructure projects. Additionally, inaccurate assessment of the market conditions could further lead to an incorrect project cost estimation. Changing market conditions during the development of a project could reduce the number of bidders. Inflation caused the price of commodities and services to increase which affected the owners' and main contractors' liabilities in the short-medium term. The financial experts among the interviewees also admitted that during the global financial crisis in 2008, inflation added to the cost of a project. Inflation adversely affected the project performance. It was further found that the interviewees have various views regarding how inflation should be accounted for in the project estimates and in budgets by the funding sources. Similar results were found by Arditi *et al.* (1985) and Akinci and Fischer (1998). However, there was no ground to support the suggestion that the type of currency used affected the performance of the project.

Politics Related Risk Group

It was found from Table 4 that the owners', consultants', and main contractors' perspectives on severity ranked this related risk group in 5th, 7th, and 4th place, respectively. Political instability and civil disorder were among the 2 highest concern factors in the politics related risk group. Civil disorder relating to a new constitution or agitation for higher wages by construction workers might lead to a delay in the delivery of projects. It was often found that inflation and an increase in the interest rate were the causes of agitation for higher wages. This could cause the non-availability of transportation and the closure of a site by a protest-action group. Construction practitioners mentioned the influence of power groups and government relation factors that put political and diplomatic pressure on the competition in bidding, procurement types, and procedures. A joint venture with a financial donor's construction company was more likely to result in the possibility of suspect pre-determined tender results. Regarding labor restrictions, one of the frequent violations

of labor standards was unqualified labor and illegal overseas workers. This was the result of a shortage of skilled labor and legal overseas workers in subcontractor level chain. For the subcontractor who actually would do the work, the payment from the owner was so significantly reduced to a level that could not cover the necessary materials and qualified or legal labor costs. Therefore, the subcontractor employed cheap labor and poor materials, resulting in poor quality of work and further time spent on correction of unacceptable work done.

Comparison with Other Studies

Table 7 showed the sources of global risk factors from previous researchers. It can be categorized into technical, managerial, resource, productivity, design, payment, client and subcontractor, estimator related, design related, competition related, fraudulent practices related, construction related, economic related, and political related risks. With the questionnaire survey of construction practitioners, the results showed that the major causes affecting project performance in internationally funded projects were adjustment and anchoring, delay in payments, civil disorder, political instability, market conditions, influence of power groups, fluctuation in labor cost and materials, project complexity, exchange rate, and motivational biases. However, there were differing perceptions among the interviewees. Based on their viewpoints in each survey, the degree of seriousness of each risk is varied by many influences, especially from those involved in the project. Therefore, construction practitioners must refrain from currently prevalent adversarial attitudes and shift to more cooperative and partnering methods in order to minimize and mitigate risks in construction projects.

Conclusions

This study overviews the risk factors in the construction industry and, it is hoped will raise construction practitioners' awareness. Mainly, this study categorized the risks into 7 main related groups which were related to estimation, project, competition, fraudulent practices, construction, economics and politics. The identified results showed that all the 3 groups of respondents generally agreed that, out of a total of 39 factors, the top 10 risk factors arranged in descending order of severity were:

- Adjustment and anchoring
- Delay in payments
- Civil disorder
- Political instability
- Market conditions
- Influence of power groups
- Fluctuation in labor cost and materials
- Project complexity
- Exchange rate
- Motivational biases

Table 7. Comparison of results with other studies for source of global risks.

Adnan (2008)	Internal risk, project-specific risk, external risk
Dikmen and Birgonul (2006)	Technical risk, managerial risk, resource risk, productivity risk, design risk, payment risk, client risk, and subcontractor risk
Balio and Price (2003)	Estimation related, design related, competition related, fraudulent practices related, construction related, economics related, and politics related
Miller and Lessard (2001)	Completion risk (technical, construction, and operational), market related risk (demand, financial, and supply), and institutional risk (regulatory, social acceptability, and sovereign)
Bing *et al*. (1999)	Internal risk, project-specific risk, and external risk
He (1995)	Nation/region risk, construction industry risk, and company and project risk

The results (Table 5) showed that the owners, consultants, and main contractors all agreed that the esimation related group was the one which most severely affected the construction performance. The competition related group was considered the second most severe in internationally funded public projects followed by the project related group, economics related group, construction related group, politics related group, and fraudulent practices related group. The accumulated risk experiences among the construction practitioners have clearly pointed to transparency in the evaluation of estimation as a main contributing factor to the causes of great concern for the success of internationally funded public projects. Additionally, delay in payment attributed to the efficiency of the staff involved in the payment procedure was a major concern. There might be a close link between the disbursement procedure of each fund and the working culture of each country. Nonetheless, there was no evidence to analyze and make a conclusion. However, a shortage of staff was mentioned during interviews as causing an overload on the staff which affected their performance. The author hopes this paper is a useful reference for project teams in managing conflicts, delay, disputes, and cost overruns for future internationally funded public projects in Thailand.

References

Adnan, H. (2008). An assessment of risk management in joint venture projects (JV) in Malaysia. Asian Social Science, 4(6):99-106.Ahmad, I. (1990). Decision-support system for modelling bid/no-bid decision problem. J. Constr. Eng. M., 116(4):595-608.

Aibinu, A.A. and Odeyinka, H.A. (2006). Construction delays and their causative factors in Nigeria. J. Constr. Eng. M., 132(7):667-676.

Akinci, B. and Fischer, M. (1998). Factors affecting contractors'risk of cost overburden. J. Manage. Eng.,14(1):67-76.

Arditi, D., Gunzin, T.A., and Gurdamar, S. (1985). Cost overruns in public projects. Int. J. Proj. Manag., 3(4):218-224.

Assaf, S.A. and Al-Hejji, S. (2006). Causes of delay in large building construction projects. Int. J. Proj. Manag., 24(4):349-357.

Babbie, E. (2009). The Practice of Social Research. 12th ed. Wadsworth Publishing, Belmont, CA, USA, 530p.

Balio, D. and Price, A.D.F. (2003). Modelling global risk factors affecting construction cost performance. Int. J. Proj. Manag., 21(4):261-269.

Bing, L., Tiong, R.L.K., Fan, W.W., and Chew, D.A.S. (1999). Risk management in international construction joint ventures. J. Constr. Eng. M., 125(4):277-284.

Chan, A.P.C. (2001). Time-cost relationship of public sector projects in Malaysia. Int. J. Proj. Manag., 19(4):223-229.

Chang, A.S.T. (2002). Reasons for cost and schedule increases for engineering design projects. J. Manage. Eng., 18(1):29-36.

Cheung, S., Ng, T., Wong, S.-P., and Suen, H. (2003). Behavioral aspects in construction partnering. Int. J. Proj. Manag., 21(5):333-343.

Dikmen, I. and Birgonul, M.T. (2004). Neural network model to support international market entry decisions. J. Constr. Eng. M., 130(1):59-66.

Dikmen, I and Birgonul, M.T (2006). A review of international construction research: Ranko Bon's contribution. Construction Management And Economics, 24:725-733.

Dikmen, I. Birgonul, M.T., and Gur, A.K. (2007). A case-based decision support tool for bid mark-up estimation of international construction projects. Automat. Constr., 17:30-44.

Eriksson, P.E. and Laan, A. (2007). Procurement effects on trust and control in client-contractor relationships. Engineering, Constructionand Architectural Management, 14(4):387-399.

Eriksson, P.E. and Westerberg, M. (2010). Effects of cooperative procurement procedures on construction project performance: A conceptual framework. Int. J. Proj. Manag., (In press).

Han, S.H., Kim, D.Y., Kim, H., and Jang, W.S. (2008). A web-based integrated system for international project risk management. Automat. Constr., 17:342-356.

He, Z. (1995). Risk management for overseas construction projects. Int. J. Proj. Manag., 13(4):231-237.

Israngkura Na Ayudhya, B. (2006). Study of payment procedures of public works in Thailand, [Ph.D. thesis]. School of Civil Engineering, University of Tokyo. Tokyo, Japan, 304p.

Kangari, R. and Lucas, C.L. (1997). Managing International Operations: a Guide for Engineers, Architects and Construction Managers. American Society of Civil Engineers, ASCE Press, Reston, VA, USA, 154p.

Kapila, P. and Hendrickson, C. (2001). Exchange rate risk management in international construction ventures. J. Manage Eng., 17(4):186-191

Lim, C.S. and Mohamed, M.Z. (2000). An exploratory

study into recurring construction problems. Int. J. Proj. Manag., 18(3):267-273.

Long, N.D., Ogunlana, S., Quang, T., and Lam, K.C. (2004). Large construction projects in developing countries: a case study from Vietnam. Int. J. Proj. Manag., 20(7):553-561.

Love, P.E.D., Tse, R.Y.C., and Edwards, D.J. (2005). Time- Cost relationships in Australia building construction projects. J. Constr Eng. M., 131(2):187-194.

Matijevic, I. (2008). Construction Industry and Mediation. International Finance Corporation IFC. Belgrade, 44p.

Miller, R. and Lessard, D. (2001). Understanding and managing risks in large engineering projects. Int. J. Proj. Manag., 19:437-443.

Moura, H.M.P. (2003). As reclamações nas empreitadas de obras públicas: alterações e atrasos, (construction claims in public works: changes and delays), [Msc thesis]. Department of Civil Engineering, Minho University. Braga, Portugal, 111p.

Ogunlana, S.O., Promkuntong, K., and Jearkjiran, V. (1996). Construction delays in a fast-growing economy: comparing Thailand with other economies. Int. J. Proj. Manag., 14(1):37-45.

Pearl, R. (1994). The Effect of Market Conditions on Tendering and Forecasting. In: 2000 AACE Transactions, Association for the Advancement of Cost Engineering International. Gransberg, D.D., (ed). Morgantown, WV, USA, p 124-132.

Public Debt Management Office [PDMO]. (2011). Monthly report public debt data.Bangkok: PDMO. Avaiable from: www.pdmo.go.th. Accessed date: Mar 14, 2012.

Public Debt Management Office [PDMO]. (2005). Monthly report public debt data. Bangkok: PDMO. Avaiable from: www.pdmo.go.th. Accessed date: Mar 14, 2012.

Raftery, J., Pasadilla, B., Chiang, Y.H., Hui, E.C.M., and Tang, B.S. (1998). Globalization and construction industry development: implications of recent developments in the construction sector in Asia. Constructruction Management and Economics, 16:729-737.

Toor, S.R. and Ogunlana, S.O. (2008). Critical COMs of success in large-scale construction projects: Evidence from Thailand construction industry. Int. J. Proj. Manag., 26:420-430.

Tysseland, B. (2008). Life cycle cost based procurement decisions: a case study of Norwegian defence procurement projects. Int. J. Proj. Manag., 26(4):366-375.

Walewski, J. and Gibson, G. (2003). International project risk assessment: method, procedures and critical factors. Central construction industry studies, report no.31. The University of Texas at Austin, Austin, TX, USA, 36p.

Wang, Y. (2000). Coordination issues in Chinese large building projects. J. Manage. Eng., 16(6):54-61.

Wardani, M., Messner, J., and Horman, M. (2006). Comparing procurement methods for design-build projects. J. Constr. Eng. M., 132(3):230-238.

Will, A.N. and Levitt, R.E. (2010). Mobilizing institutional knowledge for international projects. J. Constr. Eng. M., (In press).

Woodrow Wilson Bridge Project, (2002). Bridge Superstructure Contract (BR-3): Review of the Engineer's Estimate vs the Single Bid. February 28, 2002. Available from: Virginia Department of Transport, VA, USA.

Yates, J.K. (2007). Global Engineering and Construction. John Wiley & Sons, Inc, NJ, USA,378p.