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International Construction Joint Ventures with Developing Countries: Singapore's Case for Risk Assessment and Allocation

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***Abstract:** It is important for Singaporean companies to manage the multifaceted risks when forming international construction joint ventures (ICJVs) with developing countries. The objectives of this study are to assess the risks associated with Singaporean ICJVs with developing countries, and investigate the risk allocation preferences in these ICJVs. To fulfill these objectives, a literature review was carried out and a questionnaire survey was performed with 38 professionals. The survey results reported "political instability" as the most critical risk, and market level risks were less critical than country and project level risks. Additionally, the results showed agreement on the risk ranking between building and infrastructure ICJVs, despite significant differences in the criticalities of five risks. Furthermore, five risks were preferably allocated to host and foreign partners, respectively, while 13 risks could be shared among partners. As few studies have explored the risk allocation preferences in ICJVs, this study expands the literature. Also, the identification of the risks allows other companies to customize their own lists of critical risks, while the preferred risk allocation provides valuable information for companies from various countries that intend to form ICJVs with developing countries. Thus, this study contributes to the global body of knowledge relating to ICJVs.*

***Keywords:** Joint venture; risk assessment; risk allocation; developing countries.*

I. Introduction

Joint ventures (JVs) can be recognized as temporary agreements or arrangements which enable two or more parties to jointly carry out projects [1]. Since 1980, JV formations have increased significantly in developing countries because these countries are trying to attract foreign direct investments and seeking international assistance in terms of financing, technology and expertise [2]. Because of the small domestic market, Singapore's Construction 21 Report [3] encouraged architectural, engineering and construction (AEC) companies to venture overseas. Thus, Singaporean AEC companies form international construction joint ventures (ICJVs) with partners in developing countries and some examples include the Bintan Beach International Resort in Indonesia [4], the Sino-Singapore Tianjin Eco-city [5] in China, and the Vista project in Vietnam [6]. However, undertaking international projects is highly risky because it involves not only the typical risks at home, but also the complex and diverse risks peculiar to international transactions [7]. Thus, risk management is crucial for ICJVs with developing countries.

As there have been rare studies on ICJVs with developing countries, the objectives of this study are to: (1) assess the risks associated with the ICJVs between Singapore and developing countries; and (2) investigate the risk allocation preferences in these ICJVs. Using the findings from this study, practitioners can gain a clear understanding of the risks associated with forming ICJVs with developing countries and the preferred risk allocation.

II. Background

A. Risks associated with ICJVs

According to the risk management process, the practitioners need to first identify potential risks before assessing and responding to the risks. As presented in Table I, risks involved in ICJVs have been identified based on previous studies and categorized into three levels: country, market and project levels [8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19]. Country level risks refer to risks arising from the political, macroeconomic, social and cultural environment of the host country while market level risks indicates those from the resource availability, market demand and competition. Project risks are the unforeseen events from project characteristics and may affect the ICJV performance. In this study, a total of 29 risks, categorized into the three levels, were identified (Table I) and assessed later.

B. Risk allocation in ICJVs

Risk allocation involves the division of responsibility associated with a possible loss or gain [20], as well as the procedure of distributing the identified risks to project participants. The risk allocation preferences are influenced by several factors, such as the willingness and risk attitude, controllability, foreseeability, and managing stability of the parties [20, 21]. A commonly accepted principle of risk allocation is to allocate risks to the party best able to manage it at the least cost [22]. In the context of ICJVs, it is difficult to clearly and fairly divide the responsibilities between parties from different countries because these parties have their own perceptions of risks, different culture background and personal interests [21]. To obtain appropriate risk allocation in ICJVs, participants in ICJVs should clearly understand their own risk allocation preferences [23].

TABLE I

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RISKS ASSOCIATED WITH ICJVS

Category	Code	Risk	Reference									
			A	B	C	D	E	F	G	H	I	J
Country Level Risk	C01	Corruption	√			√						
	C02	Political instability	√	√	√			√				
	C03	Changes in laws, regulations and policies				√			√		√	
	C04	Difficulty in getting the project approval by the host government	√	√		√		√				√
	C05	Poor relation and disputes with partner				√					√	√
	C06	Language barriers						√	√		√	√
	C07	Flood and earthquake	√	√				√				
	C08	Foreign currency fluctuation	√	√	√	√	√	√	√		√	√
	C09	Inflation and high interest rate	√		√	√	√	√	√		√	√
	C10	Different social, cultural, and religious background		√				√	√		√	√
Market Level Risk	M01	Difficulty in finding and keeping skilled workers	√			√	√			√		
	M02	Differences in safety and health codes						√				
	M03	Environmental protection	√					√	√	√	√	
	M04	Outdated skills and technology	√									
	M05	Low productivity of workers	√				√	√				
	M06	Cost fluctuation of labor, material and equipment			√			√				
	M07	Uncertain market demand				√		√				
Project Level Risk	P01	Budget overrun	√				√	√		√		
	P02	Insufficient cash flow	√					√	√		√	√
	P03	Improper design			√	√				√		
	P04	Improper quality control	√					√		√		
	P05	Lack of mutual trust					√		√		√	√
	P06	Termination of the JV contract	√									
	P07	Creditworthiness of the host partner	√			√						
	P08	Unforeseeable weather	√			√		√				
	P09	Unknown physical conditions on site	√			√		√		√		
	P10	Incompetent project management team				√			√			√
	P11	High accident rate				√						√
	P12	Difficulty in technology transfer					√		√	√	√	√

A. Wang, et al. [13]; B. Jamil, et al. [14]; C. Ling and Hoang [15]; D. Shen, et al. [9]; E. Kwok, et al. [16]; F. Zhi [17]; G. Li, et al. [8]; H. Carrillo [18]; I. Zhao, et al. [11]; J. Zhang and Zou [19]

III. RESEARCH METHOD

A questionnaire survey including the identified risks was developed and validated through a pilot study conducted with five industry experts having experiences in ICJVs with developing countries to filter out relatively insignificant risks. The finalized questionnaire included a final set of 29 risks associated with ICJVs and respondents were requested to assess the likelihood of occurrence (*LO*) and the magnitude of impact (*MI*) of each risk. Also, respondents were asked to select a party to which each risk should be allocated.

In risk assessment, five-point scales were adopted to rate the *LO* (1=rarely; 2=somewhat likely; 3=likely; 4=very likely; and 5=almost definitely) and *MI* (1=very small; 2=small; 3=medium; 4=large; and 5=very large) of each risk. In addition, this study used a risk criticality (*RC*) index to assess the criticality of each risk. *RC* can be computed as follows:

$$RC_j^i = LO_j^i \times MI_j^i \qquad (1) \qquad RC^i = \frac{1}{n}\sum_{j=1}^{n} RC_j^i \qquad (2)$$

where n = the number of the respondents; RC_j^i = the risk criticality of the risk i by respondent j; and RC^i = the risk criticality of risk i. Thus, *RC* is on a full scale of 25.

The survey population in this study comprised Singaporean companies that had participated in ICJVs with developing countries. A total of 115 questionnaires were sent to the companies and 38 completed questionnaires from 11 contractor, 21 consulting, and 6 development firms were received (33%).

IV. RESULTS AND DISCUSSIONS

A. Risk assessment

1) RC values and ranks of country level risks

As seen in Table II, among the 10 country level risks, "political instability(C02)" was rank top in terms of its overall *RC* value (*RC*=18.58). In developing countries, the forthcoming election and reform progress can act as key drivers for political instability and discontinuity [24, 25]. The unstable political environment can be frequent during the course of a ICJV project [26]. One example is the Bintan Beach International Resort (BBIR), a Singapore-Indonesia JV. This project was affected by the political and economic transformation in Indonesia after the fall of President Suharto [27].

"Corruption(C01)" received the second position (*RC*=17.16) in this category, indicating that ICJVs in developing countries tended to suffer losses incurred by corruption and bribery. According to the Transparency International [28], the developing countries were more likely to obtain low ranks in terms of the Corruption Perceptions Index. For example, Indonesia was ranked 118th out of the 176 surveyed countries in 2012. During the land acquisition process of the BBIR project in Indonesia, the corruption among Indonesian authorities caused inadequate compensation of the acquired land to the host villagers, which subsequently resulted in the demonstrations and riots [27].

The independent-sample t-test was performed to check whether there were significant differences in *RC* values between building and infrastructure ICJVs (Table II p-value). The *RC* value of "foreign currency fluctuation(C08)" in building ICJVs was higher than that in infrastructure ICJVs (p-value=0.020). As infrastructures are necessary and can assume a key role in the development of a country's economy [30], the host government bodies would still invest in infrastructures, even if there is foreign currency fluctuations. Also, "inflation and high interest rate(C09)" was perceived more critical in buildings than in infrastructure ICJVs (p-value=0.009). This was possibly because inflation and high interest rate could increase loan interest and decrease the market demand for residential and commercial buildings. In comparison, infrastructures are usually considered as requisites and are less impacted by the market demand.

Furthermore, the Spearman rank correlation coefficient (r_s) was calculated and statistically tested to measure the degree of agreement on the RC rankings between building and infrastructure ICJVs with a

significance level of 0.05 (See Table III). The intra-category r_s was 0.939 with the p-value of 0.000, indicating the significant agreement on the *RC* rankings between building and infrastructure ICJVs, despite significant differences in the two risks.

TABLE II
RC VALUES AND RANKS OF RISKS IN ICJVS WITH DEVELOPING COUNTRIES

Category	Code	Overall (N=38)			Building (N=21)			Infrastructure (N=17)			p-value
		RC	Rank I	Rank II	*RC*	Rank I	Rank II	*RC*	Rank I	Rank II	
Country Level Risk	C01	17.16	2	**3**	17.90	2	**3**	16.24	2	**3**	0.313
	C02	18.58	1	**1**	18.86	1	**1**	18.23	1	**1**	0.662
	C03	15.87	3	**6**	16.19	3	**7**	15.47	3	**5**	0.675
	C04	15.11	4	**7**	15.52	6	12	14.58	4	**7**	0.575
	C05	12.66	7	19	13.00	7	21	12.24	6	14	0.685
	C06	7.39	9	28	7.52	9	28	7.24	9	28	0.844
	C07	11.26	8	23	12.81	8	22	9.35	8	24	0.117
	C08	14.45	5	12	16.10	4	**8**	12.41	5	13	0.020[a]
	C09	13.97	6	13	15.95	5	**9**	11.53	7	18	0.009[a]
	C10	6.11	10	29	6.71	10	29	5.35	10	29	0.233
Market Level Risk	M01	13.84	3	14	13.81	5	18	13.88	1	**9**	0.97
	M02	8.53	6	26	8.62	6	26	8.41	6	26	0.906
	M03	7.95	7	27	8.00	7	27	7.76	7	27	0.835
	M04	13.63	4	15	14.90	3	14	12.06	5	17	0.037
	M05	13.53	5	16	14.62	4	16	12.18	4	16	0.177
	M06	15.08	2	**9**	16.86	2	**5**	12.89	3	12	0.015[a]
	M07	15.89	1	**4**	18.05	1	**2**	13.24	2	**10**	0.012[a]
Project Level Risk	P01	17.24	1	**2**	17.33	1	**4**	17.12	1	**2**	0.903
	P02	15.08	3	**8**	15.00	5	13	15.18	3	**6**	0.925
	P03	10.21	11	24	10.38	11	24	10.00	11	23	0.838
	P04	11.39	10	22	11.38	10	23	11.41	7	19	0.988
	P05	15.00	4	**10**	15.57	4	11	15.82	2	**4**	0.513
	P06	15.89	2	**5**	15.95	3	**9**	14.29	4	**8**	0.953
	P07	15.00	4	**10**	16.67	2	**6**	12.94	5	11	0.047[a]
	P08	12.79	7	18	13.24	8	19	12.24	6	14	0.605
	P09	12.05	9	21	13.10	9	20	10.76	9	21	0.278
	P10	12.29	8	20	14.67	6	15	10.35	10	22	0.077
	P11	12.92	6	17	14.52	7	17	10.94	8	20	0.126
	P12	8.74	12	25	9.00	12	25	8.56	12	25	0.726

[a] Independent-sample t-test results are significant at the 0.05 level.
Rank I = Intra-category rank; Rank II = Inter-category rank.

TABLE III
SPEARMAN RANK CORRELATION & RC VALUES OF RISK CATEGORIES

Category	Intra-category		Inter-category		RC values		
	r_s	p-value	r_s	p-value	Overall	Building	Infra-structure
Country level risk	0.939	0.000[a]	0.852	0.000[a]	13.26	14.06	12.26
Market level risk	0.607	0.148			12.64	13.55	11.49
Project level risk	0.832	0.001[a]			13.22	13.9	12.47

[a] Correlation is significant at the 0.05 level (two-tailed).

2) RC values and ranks of market level risks

"Uncertain market demand(M07)" was ranked first (*RC*=15.89), indicating that ICJVs with developing countries were significantly influenced by the market demand fluctuations. In some cases, it is difficult to forecast the market demand for projects and the inadequate forecast of the demand was seen as a major risk in ICJVs in China [9]. In the Singapore-Indonesia BBIR project, the market demand, namely the tourist arrivals, dropped when there were malaria scares or haze caused by forest fire [27].

"Cost fluctuation of labor, material and equipment(M06)" was perceived the second most critical market risk (*RC*=15.08). In India, the quality of host construction materials was not consistent, and the Singaporean companies needed to import materials, thus leading to higher costs [29]. In addition, once developing countries experience construction boom, the gap between the demand and supply of labor and materials would widen and the prices would go up [31]. Moreover, labor and material costs tend to be volatile when a country is experiencing economic reform [32]. This has been observed in China [33] and Vietnam [15].

According to the t-test results, for "uncertain market demand(M07)", infrastructures obtained a lower *RC* value than building ICJVs (p-value=0.012). Developing countries need infrastructure construction to accelerate their economic growth and development and there has been extensive evidence that infrastructure development can contribute to economic growth and reduce inequality [34]. Thus, the market demand for infrastructure projects would be strong. In addition, "cost fluctuation of labor, material and equipment(M06)" was perceived less critical in infrastructure ICJVs than in building ICJVs (p-value=0.015). The types of labor, material, and equipment used for building projects tend to vary much more than infrastructure projects. When building ICJV projects are performed in developing countries, the variety residing in building projects makes these projects more vulnerable to the cost fluctuation.

3) RC values and ranks of project level risks

Among the 12 project level risks, "budget overrun(P01)" was ranked top (*RC*=17.24), implying that ICJVs with developing countries were most plagued with budget overruns. Previous studies [9, 15, 33] reported that cost overrun was a common problem in construction projects in developing countries, such as Vietnam, Ghana and Indonesia. Budget overrun could be attributed to risks such as resource cost fluctuation, inflation and high interest rate, improper design, changes in laws, regulations and policies, and force majeure [35].

"Termination of the JV contract(P06)" received the second position (*RC*=15.89). Wang, et al. [13] found that this risk was among the top 10 risks experienced by foreign companies in developing countries. Termination of the contract could be attributed to the disagreement and disputes on the sharing of profit and loss or other contract conditions between JV partners, the default of partners, or force majeure.

The independent-sample t-test result indicated that "creditworthiness of the host partner(P07)" obtained a significant higher *RC* in building ICJVs than in infrastructure ICJVs (p-value=0.047). As infrastructure ICJVs were more likely to consist of government bodies that are more creditworthy, this risk was perceived less critical in infrastructure ICJVs than in building ICJVs.

4) RC values and ranks of all the risks

Risks were ranked across risk categories based on their *RC* values assigned by respondents from building and infrastructure ICJVs, respectively (see Table II). A

total of 11 risks obtained overall *RC* values above 15.00. "Political instability(C02)" was ranked top in both ICJV groups, implying that Singaporean companies should seriously consider the political stability before venturing into developing countries.

Additionally, *RC* values of the three risk categories were calculated (See Table III). The market level risks were less critical than country and project level risks. Country level risks were more critical to building ICJVs while project risks were more critical to infrastructure ICJVs. Also, three categories obtained higher *RC* values in building ICJVs than in infrastructure ICJVs. The Spearman rank correlation results indicated that the inter-category r_s was 0.852 with a p-value of 0.000. Thus, there was significant agreement on the ranking of all the risks between the two ICJV groups.

B. Risk allocation preferences

The respondents were asked to show their risk allocation preferences for the 29 risks. As indicated in Table IV, the preferred risk allocation options are presented as percentages of total counts of participant responses. Five risk allocation categories are risks to be allocated to: (1) host partners; (2) foreign partners; (3) both(shared); and (4) a third party. The analysis is based on the majority opinion (> 50%) [36].

1) Risks to be allocated to host partners

A total of five risks are preferably allocated to host partners, and three of them were country level risks. Host partners usually have a better understanding of the host political environment, thus better able to deal with these risks than foreign companies [9]. Also, "environmental protection" was retained by host partners because they were more familiar with the host regulations on environment protection and in a better position to liaise with the government.

2) Risks to be allocated to foreign partners

"Outdated skills and technology" and "difficulty in technology transfer", can be borne by foreign partners as foreign partners are the transferors [37] and in a better position to ensure that the technology is transferred smoothly. "Difficulty in finding and keeping skilled workers" could be distributed to foreign partners because they can transfer employees from their home country to the host country when faced with a lack of skilled workers in the host country [38].

3) Risks to be shared

A total of 13 risks, representing 45% of all the risks, were preferred to be shared among partners. 89% of the respondents preferred sharing of "poor relation and disputes with partner" because a good relation among partners should be maintained by the joint efforts of both host and foreign partners. Similarly, "lack of mutual trust" and "incompetent project management team" also involves both host and foreign partners and thus should be shared. As for "different social, cultural, and religious background", both partners should be concerned about the social, cultural, and religious background of each other, contributing to mutual trust [39]. In addition, both host and foreign partners cannot deal with macroeconomic risks (such as "inflation and high interest rate" and "foreign currency fluctuations") well alone and thus should handle them together.

4) Risks to be allocated to a third party

Three risks were preferred to be transferred to a third party. "Flood and earthquake" and "unforeseeable weather" are unpredictable and unforeseeable risks, and thus should be transferred to insurance companies. Insurance coverage for such risks is a phenomenon in JV projects as insurance companies would be legally responsible for any losses arising from uncontrollable events such as natural disasters [40]. Also, "high accident rate" was preferably transferred to insurance companies through safety insurance.

TABLE IV
RISK ALLOCATION IN ICJVS WITH DEVELOPING COUNTRIES

Allocation	Code	Host	Foreign	Shared	3rd party
Host partner	C01	**52%**	12%	31%	5%
	C02	**53%**	19%	21%	7%
	C03	**52%**	7%	24%	17%
	M03	**53%**	15%	15%	17%
	P07	**56%**	10%	22%	12%
Foreign partner	C06	12%	**65%**	21%	2%
	M02	22%	**51%**	12%	15%
	M01	12%	**51%**	30%	7%
	M04	10%	**54%**	31%	5%
	P12	7%	**51%**	37%	5%
Shared	C05	0%	0%	**89%**	11%
	C09	0%	9%	**74%**	17%
	C08	5%	10%	**64%**	21%
	C10	5%	10%	**83%**	2%
	M05	22%	15%	**56%**	7%
	M06	5%	2%	**67%**	26%
	M07	7%	5%	**83%**	5%
	P01	2%	17%	**74%**	7%
	P02	2%	15%	**81%**	2%
	P03	10%	10%	**63%**	17%
	P04	12%	15%	**58%**	15%
	P05	2%	10%	**86%**	2%
	P10	0%	12%	**85%**	3%
3rd party	C07	5%	0%	18%	**77%**
	P08	0%	5%	44%	**51%**
	P11	9%	5%	36%	**50%**

V. CONCLUSIONS AND RECOMMENDATIONS

This study assessed the risks associated with ICJVs between Singapore and developing countries and investigated the risk allocation preferences in these ICJVs. The analysis results reported that "political instability" was the most critical risk for Singapore-developing country ICJVs while "budget overrun", "corruption", "uncertain market demand", and "termination of the JV contract" were also among the top five risks. Also, market level risks were less critical than country and project level risks. In addition, five risks obtained significantly different *RC* values between building and infrastructure ICJVs and there was agreement on the overall ranking of all the risks between the two groups. As for the risk allocation preferences, five risks were preferably distributed to host and foreign partners, respectively. A total of 13 risks were preferred to be shared among the partners because they were difficult to be handled well by

one party alone. Another three risks were preferably covered by insurance, considering the difficulty to predicting and foreseeing them.

This study contributes to the literature and practice by providing an understanding of the criticalities of the risks in ICJVs between Singapore and developing countries. As few studies have explored the risk allocation preferences in ICJVs, this study expands the literature and provides practitioners with important information for preparing JV contracts or agreements. Additionally, the ICJVs between other developed countries and developing countries may also face similar risks and thus the identification of the risks done in this study allows them to customize their own lists of critical risks. As a result, the implications of this study are not limited and can contribute to the knowledge body of the global community.

Future research would develop a set of best practices for risk management in ICJVs with the developing countries, which can tackle the identified risks through this study.

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