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Critical Risk Factors of Joint Venture Projects in the Oil and Gas Industry

Fatemeh Baradari[a], Zulkifli Mohd Nopiah[b]*, Sabirin bin Ja'afar[c] & Wan Siti Adibah Wan Dahlan[d]

[a] *Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.*
[b] *Department of Engineering Education, Faculty of Engineering and Built Environment, UKM 43600, Bangi, Selangor*
[c] *Prevention of Terrorism (POTA) Board, Ministry of Home Affairs,Pusat Pentadbiran Kerajaan Persekutuan, 62546 Putrajaya, Malaysia.*
[d] *Faculty of Law, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.*

**Corresponding author: zmn@ukm.edu.my*

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ABSTRACT

The Oil and Gas (O&G) industry is one of the riskiest, most dynamic and challenging industries and plays a vital role in every nation's economy. Like any other major industry, O&G is exposed to a host of both predictable and unpredictable risks. Joint venture projects (JVP) are often regarded as a risky business as there is a high failure rate among them because of the complexities involved. This paper aims to identify the critical risk factors (CRFs) of JVPs for O&G between Malaysia and Thailand. Via systematic literature review (SLR) the risk factors for O&G and JVPs around the globe are identified and a set of questions relating to them were designed and used in a pilot study. A total of 15 respondents from different background experiences working in O&G JVPs were requested to answer the designed questionnaire during the pilot study. The questionnaire survey passed the required Cronbach Alpha value of 0.6 with a score of 0.98. The data collected involved 170 respondents currently working or have worked in O&G JVPs. The relative importance index (RII) for each risk factor's (RF) value was quantified and the RFs ranked based on the value. A RII value exceeding 60% is considered to have agreement and of importance to the respondents. The RII value can be used as an indicator to rank the RFs from the most to the least critical. The CRF categories determined in this study are environmental, cultural and social, and organisation. Under environmental, the main CRFs are losses due to fluctuations in exchange rates/interest rates. For cultural and social, the main CRFs are problems associated with cultural differences and cooperation. Organisational issues related to organisational fit, incompetent project management team, difficulty in finding and keeping skilled workers, and low worker productivity. All the listed RFs underwent a comprehensive study on their impact and probability of occurrence to determine the best processes, methods, and tools for managing the risks. It is recommended that key players in the O&G industry consider all the RFs of JVPs during the risk management evaluation stage.

Keywords: Joint Venture Project (JVP), Malaysia, Oil and Gas (O&G), Thailand.Risk Management

INTRODUCTION

The earliest recorded oil find in Malaysia was made in July 1882 by the British Resident of the Baram region in Sarawak. Actual exploitation of the oil business in Malaysia began in 1910 when the Anglo-Saxon company received the rights for petroleum exploration from Sarawak Shell in the town of Miri. Oil exploration in Miri was the beginning of the route and there are still vast land areas that remain untapped and unexploited as the focus is in the oceans and the high potential of the seas. In 1954, marine exploitation research was carried out and offshore petroleum upgraded and successfully improved. In 1962, the first oil exploration was reported in Sarawak and later in Peninsular Malaysia.

In 1974, Petroliam Nasional Bhd (PETRONAS) was officially formed and the Petroleum Development Act (PDA) announced to secure the national reserves after the oil embargo in 1973. PETRONAS is entirely possessed by

the Government to secure all the oil and gas reserves of the country and to find more resources for exploitation. O&G is the foundation of the Malaysian economy and PETRONAS plays a significant role in its development. Malaysia has the 25th largest oil reserves and the 14th largest gas reserves in the world (Jin, Kar Ong & Teh Chi-Chang 2013). One example of a JVP in oil exploitation is that between Malaysia and Thailand involving a memorandum of understanding (MOU) signed between the two governments in 1979 on the exploration of gas reserves in disputed areas. This mutual commitment was started by the agreement (Malaysia-Thailand Official Joint Authority 2019).

The number of studies on O&G JVPs is limited and there is not enough data regarding them and their risk factors. The few studies done have shown the low success rates and failures due to high costs and lack of commitment by stakeholders (Bamford et al. 2004). According to a KPMG (2011) report, even though JVPs create significant opportunities in the O&G industry to acquire their strategic goals, 80% of them ended in failure. Problems in the O&G industry also impacted several other industries due to supply needs. Therefore, this paper aims to investigate the CRFs of JVPs in the O&G industry as a means to help them achieve their goals. The findings of this research can be used to effectively and efficiently plan and establish similar cases in other regions and with other JVPs.

OIL AND GAS INDUSTRY AND THE RISK FACTORS (RFS) OF JOINT VENTURE PROJECTS (JVP)

The purpose of JVPs is to take advantage of the political, social, and economic conditions of a country in boosting the O&G industry to achieve higher income levels. Adnan (2014) found that 52% of oil companies plan to establish new JVPs in the near future. Although the number of JVPs in operation is considered high, their success rates do not exceed 55% within two decades (Bamford et al. 2004). International companies are keen to sign JVPs with Malaysian companies because of the nation's political stability, economic growth, moderately low cost of labour, and other resources (Adnan 2014). The complexities of O&G companies are all-encompassing and have various social, political, and technical ramifications. There is a strong and constant demand for the products of O&G companies worldwide. The number of JVPs in O&G has been expanding because of new potential resources and unknown reserves. The industry needs significant investments and strategies for risk identification and management.

Table 1 summarized the critical risk factors examined and discussed by 15 research conducted by (Abdulrahman 2019; Kraidi 2018; Nishimura 2018; Gue 2018; Li et al. 2018; Hwang 2017; Dehdasht 2017; Marmaya 2017; Park et al. 2016; Chileshe 2016; El-Reedy 2016; Li et al. 2916; Fazli 2015; Dehdasht 2015; Adnan 2014). The critical risk factors of joint oil and gas projects are divided into nine main categories. A total of 79 RFs are noted by 15 authors and they are placed under nine categories namely: (1) financial; (2) political; (3) management; (4) organisation; (5) cultural and social; (6) environmental; (7) health and safety; (8) technological and operational; and (9) markets. In the financial risk category, the most frequent RFs are (1) economic fluctuations; (2) losses from fluctuations in inflation rates; and (3) cost increases due to policy changes highlighted by (Abdulrahman et al. 2019; Hwang et al. 2017; Dehdasht et al. 2017; El-Reedy 2016; Fazli et al. 2015; Adnan 2014). Under the political risk category, policy changes, changes in laws and regulations, and political instability are the greatest RFs highlighted by (Abdulrahman et al. 2019; Kraidi et al. 2018; Nishimura 2018; Park et al. 2016; Chileshe et al. 2016; El-Reedy 2016; Fazli et al. 2015; Adnan 2014). The most frequent RFs noted by previous studies under the management category are (1) improper project planning and budgeting/drilling; (2) improper selection of project location; and (3) incomplete contract terms with partners. The shortage of skilled workers is the most frequently mentioned issue under the organizational RF category highlighted by (Abdulrahman et al. 2019; Kraidi et al. 2018; Dehdasht 2017; Chileshe et al. 2017; El-Reedy 2016). Furthermore, under the social and cultural risk category the most frequent issues cited are (1) different social, cultural, religious backgrounds; (2) trust; and (3) problems associated with cultural differences. Under the environmental risk category, the most issues cited are: (1) environmental protection; (2) risks of environmental regulations; (3) unforeseeable weather pollution such as dust, harmful gases, noises, and solid and liquid wastes. For example, the results of Marmaya & Mahbub (2017) study demonstrates that air pollution, resources deterioration and water pollution have been identified as the highest environmental impact risks on construction sites in Malaysia, the result presented based on the review of literature and the findings of the survey. In the health and safety category, the issues are: (1) security; and (2) safety protection facilities mostly highlighted in (Nishimura 2018; Li et al. 2017; Adnan 2014) study. Under the technological risk category problems relate to: (1) difficulty in technology transfer; (2) risk of research and development (R&D) errors in the creation of innovation; and (3) information technology. Finally, (1) market competition risk and (2) market strategy factors are mentioned in earlier studies as

TABLE 1. Risk Factors of Joint Venture Projects in the Oil & Gas Industry

Category	Risk Factors Author	Author															
		Abdul rahman et al. (2019)	Kraidi et al. (2018)	Nishimura (2018)	Guo et al. (2018)	Li et al. (2017)	Hwang et al. (2017)	Dehdasht et al. (2017)	Marmaya and Mahbub (2017)	Park êt al. (2016)	Chileshe et al. (2016)	El-Reedy (2016)	Li et al,. (2016)	Fazli et al. (2015)	Dehdasht and Keyvanfar (2015)	Adnan (2014)	Frequency
Financial Risks	1. Economic fluctuation	/	/			/		/			/	/		/		/	8
	2.Loss due to fluctuations in inflation rates	/					/	/				/		/	/	/	7
	3. Loss due to fluctuations in exchange rates / interest rates	/					/	/				/		/		/	6
	4.Cost increases due to policy changes		/		/	/		/				/					5
	5.Budgetary over-run					/	/			/					/		4
	6. Corruption	/					/							/			3
	7.Financial allocation more than cash flow balance							/						/	/		3
	8.Disagreement on accounting of profit and loss	/										/			/		3
	9.Changes in cash flows		/	/						/							3
	10.Lack of budget, financial allocation							/		/							2
	11.Financial crisis										/	/					2
	12.Foreign currency						/										1
	12. Foreign currency						/										1

Countinue ...

Countinued ...

	13.Investment risks			/												1
	14. Policy changes	/	/	/						/	/	/	/	/		8
	15.Law and regulation changes			/	/	/		/		/			/	/		7
	16.Political instability					/	/	/				/	/			5
	17.Termination of joint venture contract	/					/				/		/			4
	18. Disagreement on some conditions of contract	/										/	/			3
Political	19.Bureaucracy											/	/			2
	20. Import restrictions	/											/			2
	21. Renegotiations										/					1
	22. Insufficient government funding															
	23.Changes in government															
	24. Improper project planning and budgeting/ drilling												/			1
	25.Incomplete contract terms with partner	/						/		/	/					4
	26.Inappropriate project feasibility study						/			/		/			/	4
Management Risks	27. Improper selection of project location	/								/	/	/				4
	28.Changes in organisation within local partners									/	/				/	3

Countinue ...

Countinued ...

Org	29.Improper selection of project type						/		/				2
	30.Incompetence of project management team	/								/			2
	31.Poor relations with regulatory agencies/ supplier/supply network	/										/	2
	32. Errors in feasibility study								/				1
	33. Shortage of skilled workers	/	/				/			/	/		5
	34.Incompetence of sub-contractors/ suppliers	/	/									/	3
	35.Low worker productivity			/	/					/			3
	36. Incompetent project management team	/	/							/			3
	37. Poor relations and disputes with partner						/			/			2
	38. Difficulty in finding and keeping skilled workers				/				/				2
	39. Disagreement on allocation of work	/								/			2
	40. Organisational fit	/								/			2

Countinue ...

Countinued ...

Cultural and Social	41. Employees from each partner distrust each other					/									/	2
	42. Lack of proper training scheme		/													1
	43. Different social, cultural, religious backgrounds	/	/		/		/			/					/	7
	44. Trust	/				/			/						/	5
	45. Cooperation				/	/					/				/	4
	46. Problems associated with cultural differences	/			/										/	3
	47. Mutual Commitment				/	/									/	3
	48. Poor relations and disputes with partner				/									/		2
	49. Language barriers														/	1
	50. Cultural distance	/														1
	51. Environmental protection		/			/	/				/					4
	52. Hazards of environmental regulations	/					/								/	3
	53. Pollution such as dust, harmful gases, noises, solid and liquid wastes						/	/							/	3
	54. Unforeseeable weather		/			/							/			3

Countinue ...

Countinued ...

Environmental	55. Unusual weather and force majeure	/												/	2
	56. Floods and earthquakes	/											/		2
	57. Lack of safety observation							/		/					2
	58. Natural disasters like floods and earthquakes												/	/	2
	59. Resource deterioration							/							1
	60. Water pollution							/							1
Health and Safety Factors	61. Security problems	/	/	/		/								/	5
	62. Safety protection facility			/	/	/							/	/	5
	63. Accidents on sites	/					/			/					3
	64. Equipment failure					/	/	/							3
	65. Differences in safety and health codes		/			/		/							3
	66. Personal safety		/		/	/									3
	67. Terrorism attack and sabotage risks		/										/		2
	68. Social responsibility risk					/							/		2
	69. Human error resulting from fatigue		/												1

Countinue ...

Countinued ...

Technological/Operational Risks	70. Difficulty in technology transfer					/	/		/		/		/	6
	71. Risk of research and development error in the creation of innovation, information technology		/						/		/		/	5
	72. Outdated skills and technology					/			/		/			4
	73. Technology and knowledge transfer disputes	/		/						/	/			4
	74. Transportation (pipeline location and safety)		/	/							/	/		4
	75. Pipeline quality		/	/							/			3
	76. Leakages										/			1
Market	77. Planning of digging				/					/		/		3
	78. Market competition risk									/		/		2
	79. Market strategy									/		/		2

Source: Adopted and modified from Abdulrahman et al. (2019), Kraidi et al. (2018), Nishimura (2018), Li et al. (2017, 2016), Hwang et al. (2017), Dehdasht and Keyvanfar (2015), Marmaya and Mahbub (2017), Park et al. (2016), Chileshe et al. (2016), El-Reedy (2016), Fazli et al. (2015), and Adnan (2014).

constituting the market RFs. This shows that studies on RFs related to O&G and JVPs are important in order to identify and manage such issues properly and to achieve business success.

RESULTS AND DISCUSSION

The pilot study involved 15 SMEs in the O&G industry that have experience working in JVPs. Based on the pilot study, the Cronbach Alpha is 0.98, indicating that the designed questionnaires have high internal consistency in data set and reliable for actual data collection. A total of 183 questionnaires were distributed through a web-based survey and on-site distribution to get opinion-based feedback on the listed RFs as to whether they are suitable or not for JVPs in the O&G industry. A total of 170 completed responses were received with 20% of the respondents having more than 11 years of experience in O&G and numerous JVPs. All the listed RFs have RII values of more than 60% indicating that all are agreed upon and considered important by the respondents as mentioned earlier in subsection III.

To select the most CRFs for each of the nine categories of the JVPs in the O&G industry, only RII which recorded more than 80.0 were selected following the suggestion by Poh (2016). For the financial RF category, the main CRF is losses due to fluctuations in exchange rates/interest rates. Under the political category, two RFs are considered critical, namely bureaucracy and policy changes. For the management RF category, only one RF was defined as necessary, that is, inappropriate project feasibility study. Four RFs figured under organisation, namely, organisational fit, incompetent project management team, difficulty in finding and keeping skilled workers, and low productivity of workers.

Consequently, the average RII value for each category was quantified and ranked. The most CRF category is environmental with an average RII value of 79.72% thus supporting the results of (Cort 2014; Vallner 2015; Li 2017) and in line with current global concerns over sustainable development. The second CRF category is cultural and social followed by organisation, technological and operational, management, political, and financial categories.

TABLE 2 Critical Risk Factors (CRFs) of Joint Venture Projects in the Oil & Gas Industry

Category	No	CRF	RII	Rank	Average RII	Average rank
Financial	1	Loss due to fluctuations in exchange rates/ interest rates	81.06	1	72.55	8
	2	Loss due to fluctuations in inflation rate	77.53	2		
	3	Investment risks	76.59	3		
	4	Corruption	75.65	4		
	5	Financial crisis	75.18	5		
	6	Lack of budget, financial allocation	72.59	6		
	7	Foreign currency	72.59	6		
	8	Disagreement on accounting for profit and loss	72.59	6		
	9	Cost increase due to policy changes	72.12	7		
	10	Change in cash flow	70.94	8		

Countinue ...

Countinued ...

	11	Financial allocation more than cash flow balance	68.35	9		
	12	Economic fluctuations	66.35	10		
	13	Budget over-run	61.65	11		
	14	Bureaucracy	84.47	1		
	15	Policy changes	80.00	2		
	16	Changes in government	78.00	3		
	17	Law and regulation changes	74.12	4		
	18	Political instability	73.18	5		
	19	Termination of joint venture contract	71.29	6		
Political					72.64	7
	20	Import restrictions	71.21	7		
	21	Insufficient government funding	66.12	8		
	22	Renegotiation	64.47	9		
	23	Disagreement on some conditions of contract	63.29	10		
	24	Inappropriate project feasibility study	86.47	1		
	25	Incompetence of project management team	79.41	2		
	26	Incomplete contract terms with partner	78.23	3		
	27	Improper project planning and budgeting/ drilling	78.00	4		
Management					74.84	6
	28	Poor relations with regulatory agencies/ suppliers/supply network	75.76	5		
	29	Improper selection of project location	72.35	6		
	30	Improper selection of project type	72.12	7		
	31	Error in feasibility study	68.71	8		

Countinue ...

Countinued ...

	32	Change of organisation within local partner	62.47	9		
	33	Organisational fit	84.47	1		
	34	Incompetent project management team	84.23	2		
	35	Difficulty in finding and keeping skilled workers	80.00	3		
	36	Low worker productivity	80.00	3		
	37	Poor relations and disputes within partner	78.59	4		
Organisation	38	Incompetence of sub-contractors/ suppliers	75.53	5	76.66	3
	39	Shortage of skilled workers	75.41	6		
	40	Employees from each partner distrust each other	72.35	7		
	41	Disagreement on allocation of work	69.29	8		
	42	Lack of proper training schemes	66.70	9		
	43	Problems associated with cultural differences	83.41	1		
	44	Cooperation	81.06	2		
	45	Trust	79.17	3		
	46	Different social, cultural, religious backgrounds	79.06	4		
Cultural and Social	47	Mutual commitment	76.59	5	76.69	2
	48	Language barriers	74.35	6		
	49	Cultural distance	72.94	7		
	50	Poor relations and disputes with partner	66.94	8		
	51	Resource deterioration	84.97	1		

Countinue ...

Countinued ...

	52	Environmental protection	83.06	2		
	53	Natural disasters like floods and earthquakes	81.06	3		
	54	Water pollution	81.05	3		
	55	Hazards of environmental regulations	80.00	4		
	56	Pollution such as dust, harmful gases, noises, solid and liquid wastes	79.06	5		
Environmental					79.72	1
	57	Floods and earthquakes	78.59	6		
	58	Lack in observing safety measures and OSE by contractors	77.65	7		
	59	Unusual weather and force majeure	76.59	8		
	60	Unforeseeable weather	75.17	9		
	61	Terrorism attack and sabotage risk	77.65	1		
	62	Safety protection facility	74.24	2		
	63	Personal safety	73.79	3		
	64	Accidents on site	71.18	4		
	65	Human error resulting from fatigue	71.18	4		
Health and Safety					70.41	9
	66	Equipment failure	69.76	5		
	67	Security problems	68.71	6		
	68	Differences in safety and health codes	64.71	7		
	69	Social responsibility risk	62.47	8		
	70	Difficulty in technology transfer	86.71	1		
	71	Transportation (pipeline location and safety)	80.23	2		
	72	Pipeline quality	76.23	3		

Countinue ...

Countinued ...

Technological and Operational	73	Outdated skills and technology	74.59	4	75.06	5
	74	Leakages	73.41	5		
	75	Technology and knowledge transfer disputes	72.35	6		
	76	Planning of digging	71.18	7		
	77	Risk of research and development error in the creation of innovation, information technology	65.76	8		
Market	78	Market competition risk	78.59	1	75.88	4
	79	Market strategy	73.18	2		

CONCLUSION

To conclude, the O&G industry is unique and risky. The involvement of many parties and complexity of the industry make JVPs in the O&G sector riskier. As risk is defined as a probability of an event and its consequences, the RFs should be identified to ensure that all necessary process, methods and tools for managing CRFs are addressed as part of the risk management practice. In this paper, 79 RFs were identified via SLR and used in the development of a survey questionnaire. At a value of more than 60%, all the responses to the RFs questions in the survey agreed on the importance of the RII. The RFs were ranked from the most to the least critical based on the calculated RII value. The ranking shows that the environmental category is the highest CRF owing mainly to greater awareness of sustainable development issues. Key players interested in JVPs in the O&G industry should consider these RFs as part of their risk management activity. As for further research, the effects of these CRFs should be examined and the probability of their occurrence determined to better capture their importance and role in the overall risk management scenario.

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DECLARATION OF COMPETING INTEREST

None.

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