Print ISSN: 2288-4637 / Online ISSN 2288-4645
doi:10.13106/jafeb.2021.vol8.no2.0309

Exploring Critical Risk Factors of Office Building Projects*

Phong Thanh NGUYEN[1], Cuong Phu PHAM[2], Phuong Thanh PHAN[3], Ngoc Bich VU[4], My Tien Ha DUONG[5], Quyen Le Hoang Thuy To NGUYEN[6]

Received: August 04, 2020 Revised: December 30, 2020 Accepted: January 08, 2021

Abstract

Risks and uncertainty are unavoidable problems in management of projects. Therefore, project managers should not only prevent risks, but also have to respond and manage them. Risk management has become a critical interest subject in the construction industry for both practitioners and researchers. This paper presents critical risk factors of office building projects in the construction phase in Ho Chi Minh City, Vietnam. Data was collected through a questionnaire survey based on the likelihood and consequence level of risk factors. These factors fell into five groups: (i) financial risk factors; (ii) management risk factors; (iii) schedule risk factors; (iv) construction risk factors; and (v) environment risk factors. The research results showed that critical factors affecting office building projects are natural (i.e., prolonged rain, storms, climate effects) and human-made issues (i.e., soil instability, safety behaviors, owner's design change) and the schedule-related risk factors contributed to the most significant risks for office buildings projects in the construction phase in Ho Chi Minh City. They give construction management and project management practitioners a new perspective on risks and risk management of office buildings projects in Ho Chi Minh City and are proactive in the awareness, response, and management of risk factors comprehensively.

Keywords: Construction Management, Office Buildings Projects, Risk Management, Project Management

JEL Classification Code: G32, L74, O18

1. Introduction

The economic growth rate of a developing country like Vietnam has been attributed in recent years to the development of many industries with good management practices in Southeast Asia (Khoa et al., 2020; Lee & Xuan, 2019; Nguyen & Bui, 2020a, 2020b; Nguyen & Ngo, 2020; Nguyen, Likhitruangsilp, & Onishi, 2020). Many industries have become more proactive in using risk analysis and management tools and techniques in their projects, including the construction industry (Dang et al., 2017; Likhitruangsilp & Ioannou, 2009; Luong, Tran, & Nguyen, 2019; Mathew, Tran, & Nguyen, 2018; Nguyen & Likhitruangsilp, 2017). Because risks are indispensable components of any civil engineering and construction projects, they have appeared in all projects irrespective of their size or scope (Nguyen & Nguyen, 2020; Ren, 1994). If risks are not appropriately analyzed, and strategies are not handled well, a project will likely fail. For example, one common risk in construction projects is the escalation in construction material prices. In real practice, new rates will usually be priced after work is done based on actual costs. Moreover, these increased costs are passed on to the contractor, including quotes for

***Acknowledgements:**
This research is funded by Ho Chi Minh City Open University under the grant number E2020.04.1. The authors would like to thank the anonymous reviewers for their helpful comments and suggestions.
[1]First Author. Lecturer, Department of Project Management, Ho Chi Minh City Open University, Vietnam. Email: phong.nt@ou.edu.vn
[2]Dean, Assistant Professor, Faculty of Transport and Economics, Campus in Ho Chi Minh City, University of Transport and Communications, Vietnam. Email: cuongpp-ph@utc.edu.vn
[3]Lecturer, Department of Project Management, Ho Chi Minh City Open University, Vietnam. Email: phuong.pthanh@ou.edu.vn
[4]Lecturer, School of Advanced Study, Ho Chi Minh City Open University, Vietnam. Email: ngoc.vb@ou.edu.vn
[5]Lecturer, Faculty of Economics and Public Management, Ho Chi Minh City Open University, Vietnam. Email: my.dth@ou.edu.vn
[6]Corresponding Author. Assistant Professor, Deputy Director, Office of Cooperation and Research Management, Ho Chi Minh City Open University, Vietnam [Postal Address: 97, Vo Van Tan Street, District 3, Ho Chi Minh City, 724000, Vietnam] Email: quyen.nlhtt@ou.edu.vn

all forecasted costs, delay, disruption, and risk. During the construction phase of an office building project, it may not be possible to avoid such risks. Still, any risks have a significant impact if not prevented in time, leading, at a minimum, to considerable delay interruption in the project. Some reasons for the risks at a construction site derive from objective reasons such as (i) inexperience of construction worker or staff; (ii) the design is not complete; (iii) lack of meticulous planning at the design stage; (iv) lack of coordination of the expert; and (v) delayed clarification of complex details activities.

Furthermore, during the construction phase, there are often many change orders due to the nature of construction projects (i.e., changes may occur due to the customer's desire to incorporate the latest technology into the project). Therefore, this paper identifies the main risk factors of office building projects in the construction phase. It is necessary and urgent to help both construction managers and contractors find ways to minimize possible risks on projects to increase efficiency, preventing losses, and speeding up the progress in the management of construction investment projects.

2. Literature Review

Office buildings project is essential contributions to the country's development (Yap, Chow, & Shavarebi, 2019). However, most construction of these office buildings has associated risks. Hence managing these risks plays a large role in the construction projects (Ke, Wang, & Chan, 2012; Likhitruangsilp & Ioannou, 2009, 2012; Do, Likhitruangsilp, Tran, & Nguyen, 2017). For example, safety management should consider the cause of accidents and plan appropriate to limit adverse safety effects on construction site (Nguyen, 2020; Nguyen & Nguyen, 2015). Hazardous waste must be disposed of to minimizing hazards for workers at the construction site. Risk management is the art and science of predicting an uncertain future and current risk events. In other words, it considers the detection and review of a number of potential consequences and then the monitoring and minimization of their adverse effects. The project goal of any construction project is to understand and minimize adverse risks. They inherent in each potential project task is vital to both controlling project costs and duration. To support site management, construction project managers need to know how to balance risks with their specific contract, financial, operational, and organizational requirements. Many construction professionals look at personal risk and fail to realize the potential negative impact that other related risks may have on their project. Therefore, using a comprehensive risk management approach allows a contractor to identify all of its risks. This reduces risks with the goal of total risk elimination.

Risk management tries to ensure that smart choices are taken at the right time and identify sources of uncertainty that can affect a project's success (Nguyen, Likhitruangsilp, & Onishi, 2017; Nguyen & Nguyen, 2020; Owolabi et al., 2020). It eliminates adverse impacts and maximizes the benefits of projects and stakeholders with opportunities and positive performance (Likhitruangsilp, Do, & Onishi, 2017). It is a systematic approach that allows risk to be accepted, avoided, reduced, or eliminated through logic, comprehensive strategy, and documentation. Risk management is a tool to help project managers maximize the probabilities and outcomes of welcome events and minimize adverse events' probabilities and consequences. It should be done at the earliest stage of project development to understand project uncertainty and design an appropriate contingency plan. As the project progresses, monitoring and control processes support cost management escalation due to the growth in a project's scope or uncertain event execution (Luong, Tran, & Nguyen, 2019). Risk management can be reduced into four processes: (i) determine which risks are likely to affect the project and document risks that have occurred in earlier projects or new risks in the potential to propose remedial solutions that correspond to each type of risk; (ii) promptly do a risk assessment and risk interaction to assess the limited scope of project results to prevent adverse effects of risks on the construction work; (iii) develop a timely response to risks and identify hidden hazards and take advanced measures and react to threats that arise from the potential risks; and (iv) control and respond risks by using corresponding measures to deal with changes during project implementation.

In minimizing losses and growing earnings, risk management is important for construction activities. Construction risks are often considered events that affect projects' cost, time, and quality (Akintoye & MacLeod, 1997). Owing to a lack of expertise and concerns about the suitability of construction industry practices, structured risk analysis and management methods were seldom used. Bing and Tiong (1999) classified risk factors and their mitigation. These most effective risk reduction measures were divided into eight groups: partner selection, agreements, employment, control, subcontracting, engineering contracts, good relationships, and renegotiation. Bing, Akintoye, Edwards, and Hardcastle (2005) identified risk factors associated with international construction joint ventures (JV) from an integrated perspective. These risk factors are grouped into three groups: (1) internal; (2) specific project; and (3) external. The study looked at the most important mitigation measures used in the management of these risks by construction professionals for their construction projects in East Asia. The most important risk factors were found to occur in the financial areas of the joint venture, government policy, economic conditions, and relationships in the project environment, based on an international survey of contractors. When entering the foreign construction market in the form of a joint venture, a foreign construction company should mitigate the risk by carefully selecting a local partner, ensuring that a good JV agreement was drawn up, choose the right subcontractors, establish good project rapport, and secure a construction contract with the client. Mulholland and Christian (1999) created a systematic model to identify and quantify risk and uncertainty in construction schedules. The study focused on those who have not learned from past projects and described the risk assessment process during a typical input and intended outcome procedure. This model combined insights gained from many experts, including project-specific information and decision analysis techniques. Based on their surveys, Shen (1997) and Shen, Wu, and Ng (2001) established a risk index and showed relative importance among risks associated with a venture in China's construction procurement practices. In their research, actual cases were examined to reveal the risky environment joint ventures faces. Based on a questionnaire survey, Kartam and Kartam (2001) illustrated that contractors showed a greater willingness to accept contractual and illegal risks than other types of risk. Their study also showed that formal risk analysis techniques in the Kuwaiti construction industry were limited. Kapila and Hendrickson (2001) described, from an integrated viewpoint, the financial factors applicable to international construction projects. They analyzed the most successful mitigation strategies adopted by building professionals and suggested means to avoid them.

3. Research Methodology

The research process was conducted in four steps:

Step 1: Review related papers and interview experts who have experience in construction risk management to identify risk factors of office building projects in the construction phase.

Step 2: Develop a questionnaire; conduct trial interviews, and finalize the official questionnaire.

Step 3: Send questionnaires to individuals related to the construction industry. The respondents should answer each question in the survey for data analysis.

Step 4: After collecting all the survey questionnaires, and analyze the data using SPSS software and risk level formula. From the analysis, conclusions were reached. Risk is often considered an undesirable event that can be identified and quantified through its consequence and probability of occurrence. In short, risk factor is calculated by:

$$RF = C + L - CL \tag{1}$$

where

RF is the risk factor or level of risk;

C is the indicator of consequence measure on a scale 0 to 1; and

L is the likelihood or probability measure on a scale 0 to 1

4. Results and Discussion

Sample characteristics showed that the positions of the various participants in the construction projects included the owners (17.4%), designers (17.4%), supervisors (29.3%), site engineers (25%), and others (10.9 %). In terms of experience, the group with 5-10 years was the largest with 45.7%, followed by the group10-15 years at 27.2%, and those with less than 5 years were 20.7%. The lowest percentage group, those with higher than 15 years experience, included only six people or 6.5% of the total (see Table 1).

The likelihood (L) and impact level (C) characteristics of the risk factors of office building projects in the construction phase are shown in Table 2. These two components of the risk factors (L and C), which is calculated as R-value, were evaluated (Table 3). Risk factors are converted to RF values and are ranked based on RF's magnitude by the formula (1). The more extensive the RF-value, the greater the risk, and vice versa. RF is also calculated for each factor and group of factors.

Based on the ranking of risk factors of office building projects in the construction phase, the research results showed that the five risk factors with the highest scores included (1) natural climatic phenomenon E1 (RF = 0.84); (2) ground problems C1 (RF = 0.83); (3) labor accident S3 (RF= 0.82); (4) owner's design change S5 (RF = 0.81); and (5) design errors in the drawings compared with the construction reality C8 (RF = 0.79).

Table 1: Sample characteristics

Description	Frequency	Percent (%)
Position		
Owner	16	17.4
Designer	16	17.4
Supervisor	27	29.3
Site engineer	23	25.0
Others	10	10.9
Experience		
< 5 years	19	20.7
5- 10 years	42	45.7
10- 15 years	25	27.2
> 15 years	6	6.5
Total	92	100.0

Table 2: The likelihood and consequence evaluation of risk factors of office building projects

Code	Risk factors of office building projects in the construction	Likelihood		Consequence	
		Mean	Standard Deviation	Mean	Standard Deviation
F	**Finance**				
F1	Inflation	2.70	0.848	1.80	0.633
F2	Bank interest rate increases suddenly	2.52	1.181	1.36	0.546
F3	A financially bankrupt owner during the construction phase	1.96	0.851	1.32	0.533
F4	Fines for contract breach (delayed schedule, design violation, etc.)	2.18	1.005	1.48	0.602
M	**Management**				
M1	Shortage of skilled workers	2.86	1.314	1.60	0.647
M2	Shortages of fuel and materials during construction	1.92	0.997	1.20	0.399
M3	Power failures during construction	2.01	0.858	1.20	0.399
M4	Low-quality materials that lead to unsecured structures	2.77	1.223	2.14	0.933
M5	Material losses	2.78	1.046	1.95	0.790
S	**Schedule**				
S1	A dispute between the parties	2.13	1.081	2.93	0.796
S2	The project estimated duration is too short to be completed on schedule	2.96	1.068	1.17	0.381
S3	Labor accident	3.76	0.965	1.27	0.537
S4	Human resources fluctuations	3.33	1.250	1.65	0.762
S5	Owner's design change	3.24	1.329	2.24	0.843
C	**Construction**				
C1	Ground problems (subsidence, landslide, etc.)	3.25	1.339	2.51	0.871
C2	Problems with groundwater ink	2.60	1.223	2.30	0.835
C3	Cutting material components that have not met the prescribed requirements	3.08	1.207	1.50	0.620
C4	Poor construction quality	2.34	1.170	1.89	0.748
C5	The machinery is damaged or has no verification stamp	2.91	1.228	1.58	0.650
C6	No experience with similar projects	2.89	1.296	1.37	0.529
C7	Arbitrarily executing new activity without the acceptance test of old activities.	2.85	1.231	1.22	0.415
C8	Design errors in the drawings compared with the construction reality	3.36	1.054	1.75	0.689
	Environment				
E1	Natural climatic phenomenon (prolonged rain, storms, etc.)	3.52	1.190	2.24	0.918
E2	Project polluting the surrounding environment	2.86	1.125	1.66	0.829
E3	The project affects the employees' health	2.62	1.047	1.59	0.649

Table 2: Risk factors of office building projects

Code	Risk factors of office building projects	Likelihood	Consequence	*Risk Factor*	*Rank*	RF_{group}
	Finance					0.62
F1	Inflation	0.54	0.36	0.71	15	
F2	Bank interest rate increases suddenly	0.50	0.27	0.64	21	
F3	A financially bankrupt owner during the construction phase	0.39	0.26	0.55	23	
F4	Fines for contract breach (delayed schedule, design violation, etc.)	0.44	0.30	0.60	22	
	Management					0.65
M1	Shortage of skilled workers	0.57	0.32	0.71	14	
M2	Shortages of fuel and materials during construction	0.38	0.24	0.53	25	
M3	Power failures during construction	0.40	0.24	0.55	24	
M4	Low-quality materials that lead to unsecured structures	0.55	0.43	0.75	8	
M5	Material losses	0.56	0.39	0.73	11	
	Schedule					0.77
S1	Dispute between the parties	0.43	0.59	0.76	7	
S2	The project estimated duration is too short to be completed on schedule	0.59	0.23	0.69	17	
S3	Labor accident	0.75	0.25	0.82	3	
S4	Human resources fluctuations	0.67	0.33	0.78	6	
S5	Owner’s design change	0.65	0.45	0.81	4	
	Construction					0.73
C1	Ground problems (subsidence, landslide, etc.)	0.65	0.50	0.83	2	
C2	Problems with groundwater ink	0.52	0.46	0.74	9	
C3	Cutting material components that have not met the prescribed requirements	0.62	0.30	0.73	10	
C4	Poor construction quality	0.47	0.38	0.67	20	
C5	The machinery is damaged or has no verification stamp	0.58	0.32	0.71	13	
C6	No experience with similar projects	0.58	0.27	0.69	16	
C7	Arbitrarily executing new activity without the acceptance test of old activities.	0.57	0.24	0.67	19	
C8	Design errors in the drawings compared with the construction reality	0.67	0.35	0.79	5	
	Environment					0.74
E1	Natural climatic phenomenon (prolonged rain, storms, etc.)	0.70	0.45	0.84	1	
E2	Project polluting the surrounding environment	0.57	0.33	0.71	12	
E3	The project affects the employees’ health	0.52	0.32	0.68	18	

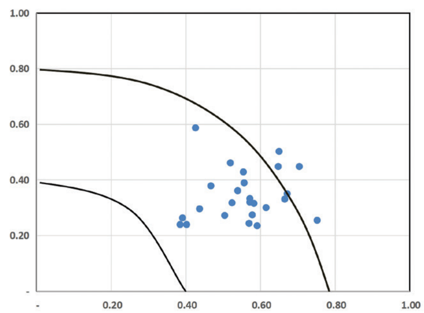

Figure 1. Risk contour diagram

Risk factors were aggregated by group: (i) the group of financial risk factors ($RF_{group-F}$ = 0.62), (ii) the group of management risk factors ($RF_{group-M}$ = 0.65), (iii) the group of schedule risk factors ($RF_{group-S}$ = 0.77), (iv) the group of construction risk factors ($RF_{group-C}$ = 0.73), and (v) the group of the environment risk factors ($RF_{group-E}$ = 0.74). In general, both individual risk factor outcomes and group outcomes are centered on schedule and construction issues, which indicates that problems have become so important that they require construction managers or project managers' attention. Next, risk level factors of office building projects in Ho Chi Minh city are represented in Figure 1. The research results showed that most of the risk factors values are concentrated in the range from 0.4 to 0.6, which is the average level of risk. Moreover, it can be seen that the group of four factors with risk factor (RF) greater than 0.8 are at high risk, including natural climatic phenomenon (prolonged rain, storms, etc.) risk (E1, *RF* = 0.84), ground problems (subsidence, landslide, etc.) risk (C1, *RF* = 0.83), labor accident risk (S3, *RF* = 0.82), and owner's design change risk (S5, *RF* = 0.81).

5. Conclusions

Risk is an unavoidable problem in construction and investment projects. The research results showed five groups of risk factors in the construction of office buildings in Ho Chi Minh City, Vietnam. The average value of the risk in the group schedule risks was the highest (0.77). Thus, project risks often appear in the construction works for reasons such as a dispute between the parties, human resource fluctuations, and owner's design change. Next, an equally important group of factors for the construction of office buildings was the group environment risks (0.74). Finally, the group of factors construction risks (0.73) assesses the degree of risk common in the construction site. The most influential factors were construction ground problems, material cutting leading to unsatisfactory components, and design errors in the drawings compared with the construction reality.

References

Akintoye, A. S., & MacLeod, M. J. (1997). Risk analysis and management in construction. *International Journal of Project Management, 15*(1), 31–38. https://doi.org/10.1016/S0263-7863(96)00035-X

Bing, L., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management, 23*(1), 25–35. https://doi.org/10.1016/j.ijproman.2004.04.006

Bing, L., & Tiong, R. L. (1999). Risk management model for international construction joint ventures. *Journal of Construction Engineering and Management, 125*(5), 377–384. https://doi.org/10.1061/(ASCE)0733-9364(1999)125:5(377)

Dang, C. N., Le-Hoai, L., Kim, S.-Y., Van Nguyen, C., Lee, Y.-D., & Lee, S.-H. (2017). Identification of risk patterns in Vietnamese road and bridge construction. *Built Environment Project and Asset Management*. https://doi.org/10.1108/BEPAM-11-2015-0065

Do, S. T., Likhitruangsilp, V., Tran, K. T., & Nguyen P. T. (2017). Risk assessment for international construction joint ventures in Vietnam. *International Journal of Advanced and Applied Sciences, 4*(6), 104–114.

Kapila, P., & Hendrickson, C. (2001). Exchange rate risk management in international construction ventures. *Journal of Management in Engineering, 17*(4), 186–191. https://doi.org/10.1061/(ASCE)0742-597X(2001)17:4(186)

Ke, Y., Wang, S., & Chan, A. P. (2012). Risk management practice in China's Public-Private Partnership projects. *Journal of Civil Engineering and Management, 18*(5), 675–684. https://doi.org/10.3846/13923730.2012.723380

Lee, J. W., & Xuan, Y. (2019). Effects of technology and innovation management and total factor productivity on the economic growth of China. *Journal of Asian Finance, Economics and Business, 6*(2), 63–73. https://doi.org/10.13106/jafeb.2019.vol6.no2.63

Likhitruangsilp, V., Do, S. T., & Onishi, M. (2017). A comparative study on the risk perceptions of the public and private sectors in public-private partnership (PPP) transportation projects in Vietnam. *Engineering Journal, 21*(7), 213–231. https://doi.org/10.4186/ej.2017.21.7.213

Likhitruangsilp, V., & Ioannou, P. G. (2009). *Risk allocation in standard forms of general conditions for tunneling contracts.* Paper presented at the Construction Research Congress 2009: Building a Sustainable Future. https://doi.org/10.1061/41020(339)127

Likhitruangsilp, V., & Ioannou, P. G. (2012). *Analysis of risk-response measures for tunneling projects.* Paper presented at the Construction Research Congress 2012: Construction Challenges in a Flat World. https://doi.org/10.1061/9780784412329.027

Luong, D. L., Tran, D. H., & Nguyen, P. T. (2019). Hybrid multiple objective evolutionary algorithms for optimising multi-mode time, cost and risk trade-off problem. *International Journal* *of Computer Applications in Technology, 60*(3), 203–214. doi:10.1504/IJCAT.2019.100299

Luong, D. L., Tran, D. H., & Nguyen, P. T. (2018). Optimizing multi-mode time-cost-quality trade-off of construction project using opposition multiple objective difference evolution. *International Journal of Construction Management*, 1–13. https://doi.org/10.1080/15623599.2018.1526630

Mathew, S., Tran, D., & Nguyen, L. D. (2018). *Examining impact of risk on cost growth in design-build projects using structural equation modeling.* Paper presented at the Construction Research Congress 2018. https://doi.org/10.1061/9780784481271.064

Mulholland, B., & Christian, J. (1999). Risk assessment in construction schedules. *Journal of Construction Engineering and Management, 125*(1), 8–15. https://doi.org/10.1061/(ASCE)0733-9364(1999)125:1(8)

Nguyen, H. M., & Bui, N. H. (2020a). Energy consumption - Economic growth nexus in Vietnam: An ARDL approach with a structural break. *Journal of Asian Finance, Economics and Business, 7*(1), 101–110. https://doi.org/10.13106/jafeb.2020.vol7.no1.101

Nguyen, H. M., & Bui, N. H. (2020b). Revisiting the relationship between energy consumption and economic growth nexus in Vietnam: new evidence by asymmetric ARDL cointegration. *Applied Economics Letters*, 1–7. https://doi.org/10.1080/13504851.2020.1789543

Nguyen, H. M., & Ngo, T. T. (2020). Psychological capital, organizational commitment and job performance: A case in Vietnam. *Journal of Asian Finance, Economics and Business, 7*(5), 269–278. https://doi.org/10.13106/JAFEB.2020.VOL7.NO5.269

Nguyen, P.T, & Nguyen, C. P. (2020). Risk Management in Engineering and Construction: A Case Study in Design-Build Projects in Vietnam. *Engineering, Technology & Applied Science Research, 10*(1), 5237–5241.

Nguyen, P. T. (2020). Attitude of construction workers toward labour safety. *International Journal of Business Continuity and Risk Management, 10*(2-3), 181–193. https://doi.org/10.1504/IJBCRM.2020.108507

Nguyen, P. T., & Nguyen, Q. L. H. T. T. (2020). Critical Factors Affecting Construction Price Index: An Integrated Fuzzy Logic and Analytical Hierarchy Process. *Journal of Asian Finance, Economics and Business, 7*(8), 197–204. https://doi.org/10.13106/jafeb.2020.vol7.no8.197

Nguyen, P. T., & Likhitruangsilp, V. (2017). Identification risk factors affecting concession period length for public-private partnership infrastructure projects. *International Journal of Civil Engineering and Technology, 8*(6), 342–348.

Nguyen, P. T., Likhitruangsilp, V., & Onishi, M. (2020). Success factors for public-private partnership infrastructure projects in Vietnam. *International Journal on Advanced Science, Engineering and Information Technology, 10*(2), 858–865. https://doi.org/10.18517/ijaseit.10.2.5839

Nguyen, T. A., & Nguyen, P. T. (2015). Explaining model for supervisor's behavior on safety action based on their perceptions. *ARPN Journal of Engineering and Applied Sciences, 10*(20), 9562-9572.

Owolabi, H. A., Oyedele, L. O., Alaka, H. A., Ajayi, S. O., Akinade, O. O., & Bilal, M. (2020). Critical success factors for ensuring bankable completion risk in PFI/PPP megaprojects. *Journal of Management in Engineering, 36*(1), 04019032. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000717

Pham, C. P., Nguyen, P. T, Phan, P. T., Nguyen, Q. L. H. T. T., N., Le, L. P., & Duong, M. T. H. Risk Factors Affecting Equipment Management in Construction Firms. *Journal of Asian Finance, Economics and Business, 7*(11), 347–356. https://doi.org/10.13106/jafeb.2020.vol7.no11.347

Phong, N. T., Likhitruangsilp, V., & Onishi, M. (2017). *Developing a stochastic traffic volume prediction model for public-private partnership projects.* Paper presented at the AIP Conference Proceedings. https://doi.org/10.1063/1.5011564

Ren, H. (1994). Risk lifecycle and risk relationships on construction projects. *International Journal of Project Management, 12*(2), 68–74. https://doi.org/10.1016/0263-7863(94)90012-4

Shen, L. Y. (1997). Project risk management in Hong Kong. *International Journal of Project Management, 15*(2), 101-105. https://doi.org/10.1016/S0263-7863(96)00045-2

Shen, L. Y., Wu, G. W., & Ng, C. S. (2001). Risk assessment for construction joint ventures in China. *Journal of Construction Engineering and Management, 127*(1), 76–81. https://doi.org/10.1061/(ASCE)0733-9364(2001)127:1(76)

Vo, K. D., Nguyen, P. T., Nguyen Q. L. H. T. T. (2020). Disputes in Managing Projects: A Case Study of Construction Industry in Vietnam. *Journal of Asian Finance, Economics and Business, 7*(8), 635–644. https://doi.org/10.13106/jafeb.2020.vol7.no8.635

Yap, J. B. H., Chow, I. N., & Shavarebi, K. (2019). Criticality of construction industry problems in developing countries: Analyzing Malaysian projects. *Journal of Management in Engineering, 35*(5), 04019020. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000709