

Analysis of Construction-phase Risk Factors for SMEs' Advance into the Overseas Plant Construction Projects

Moonsun, Park ^{1*}, Kyosun, Lee ²

¹ Korea Institute of Civil engineering and building Technology, Researcher, Korea

² Korea Institute of Civil engineering and building Technology, Senior Researcher Fellow, Korea

E-mail address: parkmoonsun@kict.re.kr

Abstract: The purpose of this study is to derive construction-phase risk factors in SMEs' advance into overseas plant construction projects. For this, construction-phase risk factors were investigated on the basis of the analysis of Korean construction companies, overseas plant industry-related research institutes, and overseas data. In addition, major risk factors were derived from the investigated construction-phase risk factors, and quantitative risk factors and qualitative risk factors were analyzed and derived from these major risk factors, by the use of three rounds of the Delphi analysis.

Key words: Small and Mum-sized Eterprises, Overseas Plant, Construction-phase Risk

1. INTRODUCTION

Recently, overseas construction markets continued to shrink due to the decrease in international oil prices resulting from shale gas development, and a slowdown in the Middle East construction business. The US is promoting a large-scale investment of approximate USD 100 million in its infrastructure as part of the America First-based Trumponomics that advocates the stimulating of the economy and the strengthening of protectionism; however, it is deemed that Korean construction businesses' entry into the US market will be an uphill task. While overseas construction requires the capability of front end engineering and design (FEED) package that can create high value-added, Korean construction companies lack basic design abilities. As a result, they receive only construction, failing to receive FEED packages. In addition, even in case of receiving construction in overseas plant construction projects, they sometimes suffer heavy losses because they fail to consider risk factors. Therefore, it is necessary to develop infrastructure technologies for quantitatively analyzing and identifying risk factors that may arise during the phase of construction, and being ready to cope with losses.

Hence, this study intends to analyze and derive construction-phase risk factors in SMEs' (small and medium-sized enterprises') entry into the area of overseas plant construction projects.

The above purpose of this study may be elaborated further as follows:

1) To investigate and analyze construction-phase risk factors related to overseas plant construction projects

2) Based on the above 1), to conduct Delphi analysis relying on experts' opinions, thereby deriving and presenting quantitative and qualitative risk factors in the construction phase of overseas plant construction projects

2. INVESTIGATION OF CONSTRUCTION-PHASE RISK FACTORS AND THE PRESENTATION OF ANALYSIS CONCEPT

2.1. Investigation of construction-phase risk factors

The purpose of this study is to analyze and derive construction-phase risk factors in SMEs' advance into overseas plant construction projects. For this, data of Korean construction companies with the experience of overseas plant construction projects were analyzed, from which 16 construction-phase risk factors were investigated and derived. And data of overseas plant-related research institutions were analyzed, from which 16 construction-phase risk factors were investigated and derived. In addition, overseas data were analyzed, from which 16 construction-phase risk factors were investigated and derived. From the above investigation, a total of 48 construction-phase risk factors were identified.

2.2. Presentation of the concept of construction-phase risk factors analysis

Based on the results of investigation under 2.1, construction-phase risk factors were analyzed by the use of the Delphi method that extracted and synthesized the opinions and judgments of an expert group (seven experts in construction project risk analysis, five experts in overseas plant construction project-related businesses, and three senior researchers/doctors related to research on overseas plants). That is, major risk factors were identified from overseas construction-phase risk factor investigation, and quantitative risk factors and qualitative risk factors were analyzed and derived from three rounds of Delphi analysis. The concept thereof can be depicted as in Figure 1 below.

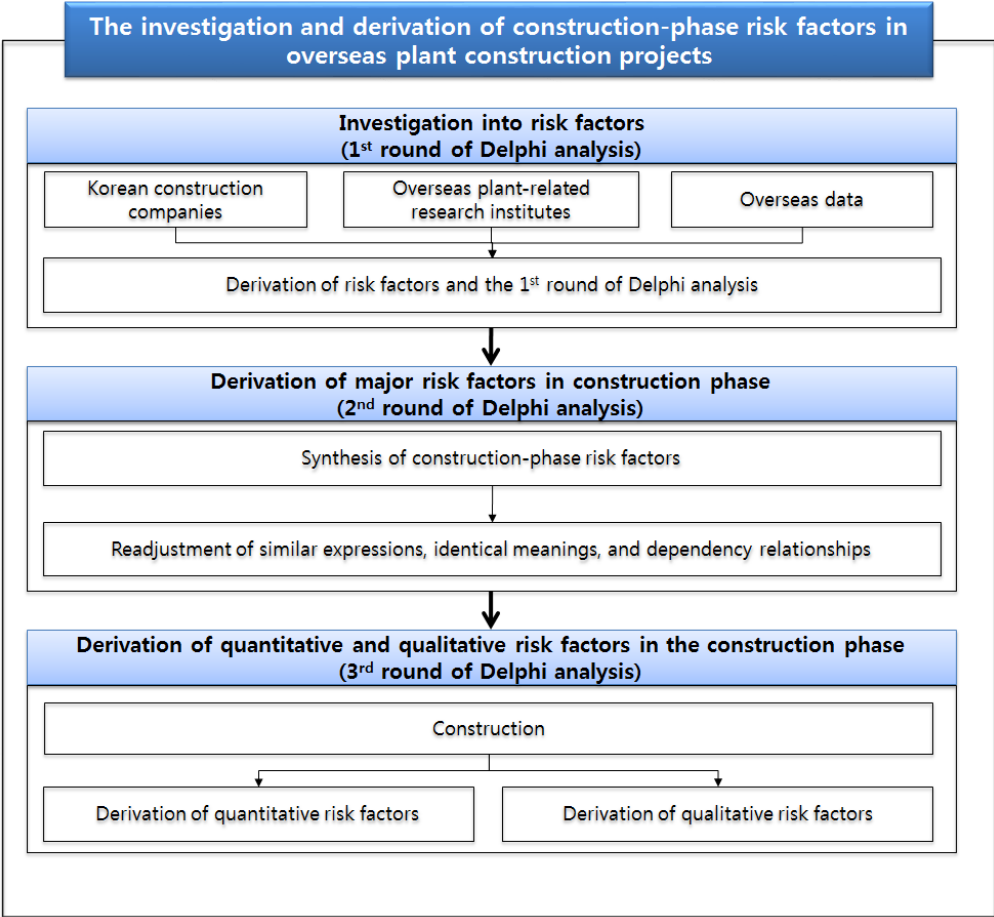


Figure 1. The investigation and analysis of construction-phase risk factors

3. DERIVATION OF CONSTRUCTION-PHASE QUANTITATIVE AND QUALITATIVE RISK FACTORS

In this chapter, construction-phase risk factors, which should be considered in case SMEs intend to enter the area of overseas plant construction projects, were derived from Delphi analysis based on the results of the investigation and analysis of construction-phase risk factors under the above Chapter 2. In the first round of the Delphi analysis, risk factors investigation and a questionnaire survey were conducted with an expert group, on the basis of the analysis of Korean construction companies, overseas plant industry-related research institutions, and overseas data; and as a result, a total of 35 risk factors were derived from the 48 construction-phase risk factors. Further, in the second round of the Delphi analysis with the expert group based on the results from the first round of the Delphi analysis, investigation for correction and complementation was conducted with respect to items of similar expressions, identical meanings, and dependency relationships; and as a result, 28 items were derived from the 35 construction-phase risk factors. The third round of the Delphi analysis was conducted with the expert group in order to derive quantitative risk factors and qualitative risk factors from the 28 risk factors identified from the first and second rounds of the Delphi analysis. For this, the risk factors were analyzed using a five-point scale of importance (1: Strongly qualitative, 2: Qualitative, 3: Neutral, 4: Quantitative, 5: Strongly quantitative); and as a result, 13 quantitative risk factors and 15 qualitative risk

Tale 1. Derivation of construction-phase quantitative and qualitative risk factors

Division	Risk factor	Mean score of 5-point importance scale	Remarks
Construction-phase	·Foreign exchange fluctuation	4.58	Quantitative
	·Price fluctuation	4.53	Quantitative
	·Error in equipment operation plan	1.68	Qualitative
	·Increase in laborer's wages	4.32	Quantitative
	·JV's lack of technological skills	4.32	Quantitative
	·Foreign exchange fluctuation	4.58	Quantitative
	·Price fluctuation	4.53	Quantitative
	·Error in equipment operation plan	1.68	Qualitative
	·Increase in laborer's wages	4.32	Quantitative
	·JV's lack of technological skills	4.32	Quantitative
	·Error in manpower mobilization plan	1.79	Qualitative
	·Delayed payment of construction expenses	4.84	Quantitative
	·Unsuitable contractor nominated by owner	1.47	Qualitative
	·Changes in the conditions of license and permission	1.79	Qualitative
	·Nonconformity to criteria applied to specification	1.53	Qualitative
	·Occurrence of re-construction	4.84	Quantitative
	·Fluctuation in the quantity of construction materials	4.42	Quantitative
	·Unsuitable conditions of contract with subcontractor	1.37	Qualitative
	·Unsuitable accident evacuation plan	1.58	Qualitative
	·Incurrence of compensation for arrears	4.84	Quantitative
	·Occurrence of force majeure during construction	4.11	Quantitative
·Unstable security situation	1.16	Qualitative	

· Occurrence of workers' strike	1.84	Qualitative
· Appropriateness of organization structure	1.74	Qualitative
· Shortages in water and electric power	1.53	Qualitative
· Occurrence of climate problem	1.68	Qualitative
· Occurrence of neighborhood civil complaint	1.74	Qualitative
· Delay in construction schedule and the occurrence of speedy construction work	4.84	Quantitative
· Review of construction contract	4.32	Quantitative
· Review of accessibility to site	1.32	Qualitative
· Review of risk sharing	4.58	Quantitative
· Review of construction implementation plan	1.37	Qualitative
· Occurrence of design changes during construction	4.58	Quantitative

4. CONCLUSION

This study was carried out to derive construction-phase risk factors in SMEs' advance into overseas plant construction projects. For this, an investigation into construction-phase risk factors were conducted with Korean construction companies having the experience of overseas plant construction projects, overseas plant-related research institutes, and overseas data. In addition, based on the results of the above investigation, the Delphi analysis was conducted with experts' opinions, and quantitative risk factors and qualitative risk factors were derived and presented from the construction-phase risk factors of overseas plant construction projects. The results of this study carried out according to the above process can be summarized as follows:

First, a total of 48 risk factors were investigated and extracted from the investigation into construction-phase risk factors based on the analysis of Korean construction companies, overseas plant industry-related research institutes, and overseas data.

Second, a total of 28 risk factors were derived from the above 48 construction-phase risk factors, through three rounds of the Delphi analysis; and further, 13 quantitative risk factors and 18 qualitative risk factors were analyzed and derived from them.

ACKNOWLEDGEMENTS

This study was carried out with the support of Koren Institute of Civil engineering and building Technology major project 2017-0457.

REFERENCES

1. Abel Pinto, "Occupational Risk Assessment in Construction industry - Overview and Reflection", Safety Science, 2011.
2. Dogan, S., Arditi, D., and Günaydn, H. at.. (2006). "Determining Attribute Weights in a CBR Model for Early Cost Prediction of Structural Systems", Journal of Construction Engineering and Management. 2006.
3. Moonsun Park, "The Research on Conceptual Model of LNG Plant Project Planning Expert System", ICCEM/ICCPM, 2009.
4. Moonsun Park, "A Presentation of a Cost Classification System for Gas Plant Construction Projects", ICCEPM, 2015