


Chapter 6

Investigating the Risks of Time and Cost Overruns in Infrastructure Projects

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ABSTRACT

The purpose of this chapter is to investigate and quantify through real case studies the risks involved in time and cost overruns of infrastructure projects from the procurement to the delivery stage. Although the literature is very rich with a variety of analyses of the factors causing cost and time overruns, there is a gap in investigating the risks in the procurement phase to delivery of such projects. A holistic approach of risks identified in the procurement and construction phase of such projects is presented by using probabilistic analyses of time and cost overruns compared to contractual agreements. Three real case studies are presented with and without the risks identified, results are discussed, and conclusions are derived. This approach could enhance public authorities' processes for successful procurement and delivery. Furthermore, the quantification of these risks in terms of time and cost could pave the way for a more sustainable organization of the authorities in order to deliver successful projects within their time constraints and budget.

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ANALYSING THE RISKS OF TIME AND COST OVERRUNS IN INFRASTRUCTURE PROJECTS FROM THE PROCUREMENT TO THE DELIVERY PHASE

The construction sector accounts of a large share of gross domestic product (GDP) and employs many people in all developed countries. According to (Mckinsey, 2017) construction-related spending accounts for 13% of the world's GDP. The industry's size suggest that its efficiency is important to the overall performance of the economy. Thus, both public authorities and contractors should work to reduce wasteful practices and adopt sustainable approaches. In fact, the construction industry has been plagued by time delays and cost overruns reaching further than what was set out initially (Adam et al., 2017; Agyekum-Mensah & Knight, 2017; Antoniou, 2021; Baudrit et al., 2019; Çevikbaş & Işık, 2021; Derbe et al., 2020; Ghaleh et al., 2021; Koulinas et al., 2020; Welde & Dahl, 2021).

The industry lacks a systematic activity based risk factor list and the impacts of risks factors are rarely considered when allocating operational risk factors (Rasheed, Shahzad, Khalfan, & Rotimi, 2022; Jiang, Yang, Jiang, Martek, & Gao, 2022). However, beyond demonstrating poor cost and time performance, many of the studies are not investigating in activity level large and complex projects and the studies approaches the risks based on the macroeconomic environment. Furthermore, there was not found in the literature any research on investigating holistically the risks that could exist throughout the procurement and construction phase of infrastructure projects and conclude to time and cost overruns. The analyses made so far focused mainly on the construction period leaving out the lifecycle span which starts with the conception of the project and ends with the demolition or change of use.

This chapter presents a holistic approach of identified risks for the procurement and construction phase of infrastructure projects by using probabilistic analyses regarding time and cost overruns that are quantified in relation with the contractual schedule and budget of the project. Three real case studies are presented, namely a building, a redevelopment and a road infrastructure project with and without the risks identified and results are discussed and conclusions are derived. Also, a sensitivity approach is performed and through Tornado diagrams the impact of the most important risks are determined and discussed.

A Description of the Discrete Phases of a Public Works Contract

The main processes of each phase are:

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