

Review on The Risk Management Highway of BOT + EPC Project

Xiaobo HE¹, Zhen LEI², Ya LI²

¹School of Economics and Management, Chongqing Jiaotong University, Chongqing, 400074, CHINA

²China First Highway Engineering Co., LTD, Beijing, 100024, CHINA

Abstract: With BOT + EPC in the promotion of the use of the highway, And this new model are many uncertainties. From this perspective, It is necessary to BOT + EPC highway project risk research. After looking up a large amount of related literature, this paper analysis the risk of BOT + EPC highway projects. Through literature and relevant empirical, obtain the impact of highway BOT+EPC two main risks: project completion risk, construction and operational risk. Besides, the article provides the strategy and suggestions for the prevention of the two main risks, so as to offer a theoretical reference for future similar projects.

Keywords: Highway; BOT+EPC; Risk management

1. Introduction

In recent years, with the growth of the economy, state of transport infrastructure projects investment rose sharply, highway as an important part of traffic infrastructure, on account of the investment funds, construction difficulty, period length, construction difficulty, which greatly hindered the highway construction. Because of this new mode of BOT + EPC, government can introduce social capital to solve the problem of insufficient funds for large public projects and enterprises can play the advantages of capital, technology and management, the pursuit of more profit space. Therefore, it is subject to the government's attention, also some areas of the introduction of the construction of the highway, and achieved very good results. Such as ,in 2007 the "Investment + Design + Construction" BOT + EPC of Wuyishan to Shaowu highway construction, it avoided the owners and construction unit of conflict of interest, and effectively reduced the project cost, also improved the return on investment for the project. But the application of BOT+EPC in highway is a new model, which is still in the initial stage, so the risk of BOT+EPC highway project is relatively less. However, The BOT+EPC highway project usually need to investment amount, long implementation cycle, the number of parti YUAN cipants, the interests of complex relationship. Because of its high risk, once the project failed, it will cause immeasurable loss. Therefore, the management and control of the risk of BOT+EPC highway has become the key problem to be solved urgently.

2. The Application of BOT+EPC in Highway Construction

"BOT + EPC" means the government to Enterprises promulgated franchise, in a certain period of time allow

enterprises to infrastructure construction, operation, and enterprises in the process of project construction using EPC general contracting model construction, after the end of the concession period, enterprises will the facility turned over to the government. BOT+EPC schematic diagram as shown in Figure 1.

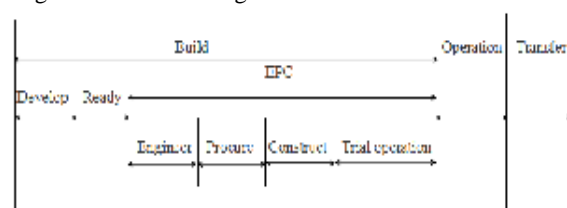


Figure 1. BOT + EPC schematic

"BOT + EPC" as a new way in highway project of investment and financing, which included financing, design, procurement, operation and transfer, management at all stages, and achieved the extension of industry value chain front-end and back-end. Through the capital market, company improved the overall profitability of the project. Chen, Chuan analyzed the BOT investment in China's infrastructure investment situation, and believed that the introduction of BOT infrastructure can provide better opportunities for development, improve social employment rate, also promote the improvement of the host country's legal system[1]. Yeo, K T studied the EPC application in highway, and pointed out that EPC make the design, construction and procurement organically integrated together. In addition EPC let the project cost, quality, progress has been effectively controlled[2]. Some scholars take Guiyang to Tuyun expressway as an example, it is considered that the introduction of BOT+EPC to effectively control the construction schedule and cost, what's more, reducing the

cost of the project. HU Xu-hui think BOT+EPC as a new way of financing, it is a good way to solve the problem of highway construction funds. FEN Yan-yang established a working fusion, time integration and participation of people converged BOT + EPC, effectively raising the income of the project. CAO Xue-juan took DEA analysis of the safety benefits BOT + EPC projects, and considered that the BOT + EPC can significantly improve the safety benefits of the project. From the above research literature, we can be learned that BOT + EPC Construction Model as a new type, which achieving a major breakthrough in the construction of highway. What's more, this model let the financing, resource integration and construction and management keep the advantages of integration to maximize.

3. Risk of highway BOT + EPC

BOT+EPC makes the entire engineering industry value chain front-end, back-end have been extended and Achieves financing, design, construction, business integration. Because the construction period of the highway project is long and the interests of all parties are complex, so there are various risks in the whole construction period. BOT+EPC highway risk has been widely discussed by the academia and the industry. Zayed, Tarek M.etal based on the prototype evaluation model and appraised the highway BOT project risk, identified the key risks of the project[3]. Shen, L Y [4]use BOTCcM model to determine the BOT+EPC highway project a reasonable concession period, which avoiding the risk of both sides. As a result, the government and social investors can be a win-win situation. Some scholars have analyzed the highway BOT + EPC financing risk, mainly including financing risk, investment and investment attraction, tightness of finance budget, interest rate and exchange rate risk, and provide the corresponding countermeasures for risk prevention. FENG Yan-yang has constructed highway BOT + EPC risk evaluation system, combined with the instance, using analytic hierarchy process (AHP) to evaluate the risk, and puts forward some measures of risk control. YUAN Xi-man using a "risk map" approach to identify the main risks BOT + EPC highway the whole life cycle. she pointed that direct sources of risk should be taken seriously enough.

The domestic and foreign scholars have conducted beneficial research from different aspects of the risk BOT+EPC highway. However most existing literature research from the aspects of qualitative research, combining qualitative and quantitative research is less. Highway "BOT + EPC" have complex project finance structure, long construction period, construction technical difficulties, many stakeholders. Therefore, all phases of the life cycle need to be fully considered. Combining with the characteristics of highway projects, it can be constructed

the index system of the highway BOT + EPC risk in the following Table 1.

Table 1 . BOT + EPC highway Risk Index

Highway risk of the BOT + EPC	Bidding	Quantities missing
		Failed Bid
	Design	Biography understand mistake
		Improper design coordination
		Design nonstandard
	Procurement	Low quality of material
		Procurement schedule delay
		Purchasing cost overrun
	Construction	Subcontractor Management
		HSE Management
	Operate	Cost overrun
		Operator management
		Capital transfer
	Reliance	default of employer
		Default of Contractor
		Supplier default
	Market	Floating interest rate
		Inflation

4. BOT+EPC Highway Risk Management Suggestion

Through some case studies on the BOT+EPC project, it is recommended that the construction of the project and the risk of construction operation are the main risk of the highway. Based on these two risks, the proprietor can make efforts from three aspects of the sub contractor management, design management and operation cost of the project.

(1) The proprietor should choose the Contractor from the multiple dimensions. what's more ,they also supervise and control the sub contractors of the works properly. There is no direct contractual relationship between the proprietor and the subcontractor, which is seldom concerned with the management of sub contractors and sub contractors. If the proprietor of the subcontractors proper control, may well coordinated sub-contractors and suppliers relations, and reduce the loss of the interests of owners; Therefore, where appropriate, given the subcontractor support necessary to avoid "escrow".

(2) It should establish a new design management system for BOT + EPC project, giving full play to its core design and advantage, and make the design a better service for BOT + EPC project. Also, we should attach importance to the highway project feasibility study report, preliminary design and construction drawing design work, moreover, increasing the depth of the two-stage design documents. To ensure that the design meets the requirements of progress BOT + EPC project equipment and materials procurement schedule, on-site construction schedule and the project master plan.

(3) Furthermore, proprietor must pay attention to the highway BOT + EPC cost control, making full use of the advantages of building the custody comprehensive management. Firstly, in the early design phase of the project, project companies give full consideration to the construction, operation, maintenance needs, avoiding duplication of investment or investment cast disused. Secondly, the operating departments carried out meticulous management, and enforced preventive maintenance. Additionally, according to the operating comprehensive evaluation on the quality of road test data, design of formulation of preventive maintenance.

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