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Risk Exposure of the Parties to Build-Operate-Transfer (BOT) Methods of Procurement

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Abstract. The Build-Operate-Transfer (BOT) array of methods are extremely complex arrangements. They pose risks not experienced previously in the construction industry. They unveil several new parallel approaches to public-private partnership. The different faces of BOT (such as BOOT, BOO, ... *etc*.) mainly differ in the precise mechanisms of ownership, usage rights, and obligations. Each host country, each infrastructural sector, and indeed each specific project has its own risk profile. Challenges arise from the markedly increased project variables, much longer time horizons, greater vulnerability to external risks, and multiple project participants (including specialist financiers and operators), with multi-attribute success criteria. The private sector pursues the financial benefit generated from the project, while the government is concerned with the socio-economic benefit. At the same time, all the project risks are allocated between them. This paper found that political risks were the most difficult to handle in comparison with financial risks. Promoters, lenders and government risk exposures are discussed. This paper concludes that the most important barrier or limitation faced by central and local agencies is “lack of knowledge of and experience in the BOT concept”. Expert knowledge is scattered in papers by researchers, it is useful to solicit this expert knowledge, consolidate it, and code it into a knowledge base within an appropriate framework to improve future BOT procurement process. An important recommendation is to increase transparency in the selection process.

Keywords: BOT-Risk-Procurement.

Introductory and Historical Background of BOT

Jefferies and Gameson[1] said that the concepts of BOOT are without doubt extremely complex arrangements, which bring to the construction sector risks not experienced previously.

According to Walker *et al.*[2] private investment in public infrastructure can be traced back to 18th century examples of concession contracts to supply drinking water to Paris, and 19th century examples such as the Suez Canal and Trans-Siberian Railway, as well as canals, turnpikes, and railroads in Europe followed by the Americas, China, and Japan.

The term Build-Operate-Transfer (BOT) was itself reputedly coined in Turkey in the early 1980s, it has since spawned an alphabet soup of acronyms (such as BOOT, BOO, BTO, BRT, BLT BOOM, and DBOM) that reflects variations of the concept and emphasis, as well as parallel approaches to public-private partnership (PPP) projects, for example, in the U.S.[3] and the Private Finance Initiative (PFI) in the United Kingdom (Merna and Smith 1999) [An explanation of the above abbreviations will follow later in this paper].

The BOT method is an answer to the increasing populations and their even faster growing expectations. The new method was coupled with realignment of risks between project participants through imaginative financial engineering.

It also enabled the mobilization of vast resources of private capital for public projects. Because of the more pressing socio-economic and/or political priorities of cash-strapped governments the BOT method enabled them to direct their scarce resources to less capital intensive projects or to those with quicker economic and/or political returns. Excess construction capacities or surplus funds from one region could easily flow into another to redress shortages and meet sudden needs. The method provides an excellent vehicle to reverse the over fragmentation of functions that has previously led to divergent (if not confrontational) agendas of the multiple participants. Construction dispute levels rose to an alarming level, and researchers attributed such shortcomings to a failure to deal with the "structure" of the construction industry (and the consequential procurement arrangements), which they saw as the root cause of its major problems.

A proper risk allocation must consider the ability to absorb risk and the incentive to manage the risk. Moreover a successful project should properly allocate risk and return among the participants in order to achieve suitable risk-return trade-offs for all three parties. When governments put in place good policies, investors are willing to invest without special government support. The government should also relieve the private sector's worry through risk sharing.

Reasons to Choose the BOT Method

Kumaraswamy[4] said that this was largely fueled by the fast growing needs of increasing populations and their even faster growing expectations, particularly in Asia. Dwindling governmental coffers, surplus private resources, and a search for efficiencies in providing infrastructure encouraged this shift.

Garvey[5] said that an important facet of the new procurement paradigm of BOT is the radical realignment of risks between project participants. Construction project risks may be broadly classified into: "project risks," comprising development, design, construction, operation, finance, and revenue generation risks; and "global risks," comprising political, legal, commercial, and environmental risks. The shifting to the franchisee of many such risks previously borne by "owners" (clients) may accommodate enhanced rewards or, in the alternative, incorporate some minimal safeguards/guarantees of minimal returns. The paradigm shift in project financing for BOT-type projects was also crucial in that it envisaged "nonrecourse" funding, where lenders would treat the cashflows of the project as the only source from which loans would be repaid and the project assets as the only available collateral; *i.e.*, lenders would not have recourse to any other cashflows or assets of participant organizations within the franchisee consortium.

This reconceptualization of project finance through imaginative financial engineering[6] enabled the mobilization of vast resources of private capital for public projects. This in turn facilitated creative financing packages for megaprojects that would hardly have attracted traditional financing. Furthermore, this mechanism also effectively mobilized a "user pays" scenario, whereas, on the other hand, more pressing socio-economic and/or political priorities of cash-strapped governments may have directed their scarce resources to less capital intensive projects or to those with quicker economic and/or political returns.

Kumaraswamy[4] sees that enhanced mobilities and instantaneous communications have enabled rapid movements of both physical and financial resources to areas where they are needed, or could reap more benefits. For example, excess construction capacities or surplus funds from one region could easily flow into another to redress shortages and meet sudden needs. The phenomenal demands to upgrade basic infrastructure in most developing countries can thus be fed by BOT-type arrangements that facilitate mutually beneficial flows. The megascale of such demands is boosted by tremendous pressures for both new infrastructure and infrastructure renewal in developed countries themselves.

He adds that BOT-type arrangements, while neither possible nor advisable on all civil engineering megaprojects, provide an excellent vehicle to reverse the overfragmentation of functions that has previously led to divergent (if not confrontational) agendas of the multiple participants. In essence, a private sector consortium finances, designs, constructs, and operates an asset for an agreed franchise period in the BOT mode. While superficially an extension of the design-build/turnkey mode, *i.e.*, enhanced by the addition of two functions (of finance and operation), BOT in reality leaps ahead in terms of philosophy (and potential benefits), spelling out a significant shift in the procurement paradigm. Of course, like Turnkey, it is only suitable for certain types of projects.

Problems with Traditional Procurement Methods

Egan[7] said that failures to achieve substantial increases in productivity and to control burgeoning construction dispute levels have raised arguments against the adversarial scenarios perpetuated in most traditional procurement paths. These often position the constructor against the architects/engineer/client, rather than encouraging teamwork toward common targets. Increasing awareness of these shortcomings has led to wide experimentation and a proliferation of procurement options, such as with various types of turnkey or project/construction management-based arrangements[8]. Even such initiatives have failed to achieve significant breakthroughs, and the search for appropriate procurement systems thus continues[9]. Furthermore, even previously welcomed industry reviews and recommendations such as by Latham[10] in the U.K. fell short of expectations. Cox and Townsend[11] attributed such short comings to a failure to deal with the "structure" of the construction industry (and the consequential procurement arrangements), which they saw as the root cause of its major problems.

Various Versions of Build-Operate-Transfer

While BOT in Turkey has been legitimized by a specific law (Law 3465) based on the original BOT concept, diverse variations have evolved in many countries. These mainly differ in the precise mechanisms of ownership, usage rights, and obligations. These variations include the following, with the terms indicating basic arrangements and/or essential emphasis:

- BOO = build-own-operate,
- BLT = build-lease-transfer,
- BOOM = build-own-operate-maintain,
- BOOTT = build-own-operate-train-transfer,
- BTO = build-transfer-operate,
- DBFO = design-build-finance-operate,
- DBO = design-build-operate,
- DBOM = design-build-operate-maintain,
- DOT = design-operate-transfer,
- ROO = rehabilitate-own-operate, and
- ROT = rehabilitate-operate-transfer.

The Difference in Use of the Various Versions

In the Philippines, for example, the "BOT law" embodied in Republic Act 7718 of 1993 recognizes a range of procurement protocols from BLT, BOO, BOT, BT, and BTO to DOT, along with any other approved variants. BTO was preferred in the Cal-trans project in California[3] primarily to reduce tort liabilities that may have overburdened private entities. Meanwhile, it has been observed that maintenance and life cycle costs may be optimized through DBO. This mechanism has therefore also been used in procuring utilities, for example, in the 120 mgd Tolt water treatment facility in Seattle. This also enables continued public ownership of the facility. DBOM has been used in North American transportation projects, whereas BOO has been employed for power production under the Public Utility Regulatory Policies Act in the U.S, and also for power projects in India and Sri Lanka and buildings such as prisons in Australia.

New airports such as Terminal 3 at Toronto have been procured on a finance, design, build, and operate basis, while airport redevelopment and expansion such as at Terminals 1 and 2 at Toronto have been approached in the same way[2]. Further variations are introducable when risk sharing formulas do not yield viable scenarios for either party. For example, a franchisee may be offered the rights to use, operate, and recover revenue from an existing facility to supplement low cashflows from the new asset. This was provided, for example, in the Dartford River crossing project in the U.K., and the North-South highway in Malaysia. Merna and Smith (1999) documented an alternative mechanism at the new Athens Airport at Sparta, where a tax on airline tickets had to be imposed to raise the bridging equity needed before the new project could even commence.

Another variation is the use of a "shadow toll" mechanism, as in the U.K. on DBFO road projects, where the franchisee receives revenue from the government/sponsor rather than directly from the motorists. This of course negates the user-pays principle in that version. While DBFO has been used on many trunk road projects in the U.K., it may soon be superseded by (or absorbed in) the PFI (Private Finance Initiative) program, which has spanned a series of sectors, particularly health, energy, telecommunications, and government buildings, including prisons[6]. The PFI was launched in the U.K. in 1992, following the privatization of a large number of public utilities in the 1980s, as well as after the commencement of the Channel Tunnel and the Dartford River Crossing on BOT-type terms.

BOT has been successfully used on five tunnels, including three harbor crossings in Hong Kong, one of which (the Eastern Harbor Crossing) incorporates a virtual shadow toll mechanism for the rail component only – since it is paid an agreed fixed revenue stream by the relevant railway corporation. BOT has also been used in road and power projects in Mainland China, in the Philippines, and in Thailand. A form of BRT was used on an office building in Hong Kong, while BOOT has been used in the new Olympic Stadium in Sydney and the new Docklands sports stadium in Melbourne.

The main difference between BOT and BOOT is that the additional "O" (for ownership) in the latter would imply that property development rights were also conferred on the franchisee. Walker *et al.*[2] illustrated this with an example of a BOT franchisee who may only build and collect tolls from a motorway, whereas a BOOT franchise may confer additional rights to construct and derive rents/revenue from buildings at specific locations along the route. This may compensate for less certain traffic levels or lower toll rates that may be socio-economically desirable. BOO, on the other hand, eliminates the transfer element and the corresponding uncertainty of the state of the facility at transfer, while providing an incentive for a longer life cycle focus by the franchisee and enabling longer term investment recovery.

Risk Associated with the BOT Method

Riberio[12] ranked fourteen risk factors associated with the BOT method in a study in Portugal. The ranking was done according to the relative importance index. These factors are shown in Table 1.

Table 1. Risk factors associated with BOT method.

Rank	Risk factors
1	Construction completion delays
2	Construction cost overruns
3	Operation and maintenance failure
4	Project performance/servicing
5	Technical solution
6	Operation cost overruns
7	Financing
8	Feasibility studies
9	Environmental concern/least impact
10	Residual value
11	Complicated negotiations
12	Revenue toll/tariff/demand change
13	Consortium strength
14	Toll/tariff structure during concession

Source: Riberio (2001).

Risk identification is an important step prior to risk analysis. In order to correctly manage risks through analysis, comprehensive identification at the preliminary stage is required[13]. Managing risk is an integral part of the procurement process[14].

Jefferies and Gameson[1] stated that it is difficult to generalise about the risk characteristics of BOT infrastructure projects, given that each host country, each infrastructure sector, and indeed each specific project has it's own risk profile. Notwithstanding this, the development of a broad based framework listing all relevant general issues, is seen to have good application at the planning and conceptual stages of such projects.

Ma *et al.*[15] identified five main risk categories under the headings of political, construction and completion, market and revenue, operating and financial risks. They suggest that the identification, management and allocation of these risks is best served by the undertaking of comprehensive feasibility studies.

UNIDO[16] (United Nations Industrial Development Organisation) attempted the development of a 'risk checklist', after dividing risks generally into two broad categories for the purposes of identification, namely general (or country) risks and specific project risks. Table 2 summarises the outcome.

Table 2. Risk check list.

General (or Country) Risks		
Political risks	Country commercial risks	Country legal risks
Political support risks	Currency inconvertibility risks	Changes in laws and regulations
Taxation risks	Foreign exchange risks	Law enforcement risk
Nationalisation risks	Devaluation risks	Calculating compensation delay
Forced buy-out risks	Inflation risks	
Cancellation of concession	Interest rate risks	
Import/export restrictions		
Failure to obtain approvals		
Specific Project Risks		
Development risks	Construction/completion risks	Operating risks
Bidding risks	Delay risk	Associated infrastructure risks
Planning delay risks	Cost overrun risks	Technical risks

Table 2. Contd.

Approval risks	Re-performance risk	Demand risk (volume and price)
Transnational risks	Completion risk	Supply risk (volume and price)
	Force Majeure risk	Cost escalation risks
	Loss or damage to work	Management risks
	Liability risk	Force majeure risk
		Loss/damage to project facilities
		Liability risk

Source: UNIDO (1996)

Zhang *et al*.[17] said that tendering costs for BOT projects can be much higher than those for traditional projects. He quoted Kumaraswamy and Zhang[18] as saying that tender costs for PFI (private finance initiative, a government framework that also uses the concept of BOT in the procurement of public works and services) projects in the United Kingdom range from 0.48 to 0.62% of the total project costs, as compared with 0.18 to 0.32% for design and build projects, and 0.04 to 0.15% for traditional DBB projects.

Kumaraswamy and Morris[4] see that while the primary function of contracts has been said to be a clear allocation of risks, and whereas the appropriateness of risk distribution in traditional construction contracts has been questioned, BOT scenarios provide both opportunities and challenges for a reappraisal of risk management. Challenges arise from the markedly increased project variables, much longer time horizons, greater vulnerability to external risks, and multiple project participants (including specialist financiers and operators), with multi-attribute success criteria. Kumaraswamy and Morris[4] added that while the growing literature on identifying and analyzing construction project risks provides useful background, it is worth focusing on risk classifications. Identification, and/or analyses specific to the BOT or PPP scenario, as discussed below:

Tam and Leung[19], who found that political risks were the most difficult to handle in comparison with financial risks, while technical risks were the easiest to handle, even on projects incorporating innovative technologies, in Southeast Asia.

Merna and Smith[6], who classified risks first into two broad categories of global and elemental – the first being those deemed to be generally outside the control of the project parties (including political, legal, commercial, and environmental factors), and the second including project risks (such as construction, design, technology, operation, finance, and revenue risks). However, it may be argued that some of the above global risks may be even to some degree within the control of the project sponsor, particularly if it is the government; hence, the following classifications are preferred, also because of their greater detail in breaking down risks.

Charoenpornpattana and Minato[20], who presented a detailed identification of privatization-induced risks in transportation projects in Thailand. Their analyses extended to characterizing risks as static/dynamic, fundamental/particular, government/private/other source, speculative/pure, financial/nonfinancial, and measurable/immeasurable. Their risk classification itself grouped risks under five broad headings of political, economic, legal, transaction, and operation.

Salzmann and Mohamed[13], who identified families of risks (containing factors and subfactors) found to need addressing in BOOT projects. They presented these in two separate frameworks corresponding to the development phase and the operations phase, respectively. Their identification of 12 risk factors (such as project characteristics) together with 58 risk subfactors in the development phase and 11 risk factors with 39 risk subfactors in the operations phase was based on a detailed survey of available literature.

Ye and Tiong (2000) see that a BOT infrastructure project can generate financial incomes and is conducive to national economic development as well. This leads to a public-private partnership, in which the private sector pursues the financial benefit generated from the project, while the government is concerned with the socio-economic benefit. At the same time, all the project risks are allocated between them.

Ye and Tiong[21] add that many researchers share the common view that a proper risk allocation must consider the ability to absorb risk and the incentive to manage the risk so as to reduce the overall cost. They see that because promoters have to recoup their investment costs from the operation of the projects, they are concerned not only with expected future earnings but also the risk factors influencing the earnings over time. Return should reflect the compensation required for bearing the risk. The higher the uncertainty of the earnings, the higher the return that will be required. In other words, their decisions depend on the trade-off between the expected return and the risk exposure. For example, the returns required for BOT projects in developing countries are higher than those in developed countries because of inherent higher risk.

Ye and Tiong[21] quote Lang[22] as saying that in general, lenders are conservative and not willing to lend unless most of the risks involved in the project are addressed. Ye and Tiong[21] continue to say that it should be obvious that their decision-making is to strike a balance between the degree of debt security and the rates of interest. They add that the governments' risk-return trade-off is evident in the decision criteria of the British 'Private Finance Initiative' programme: value for money and risk transfer. Ye and Tiong[21] address the topic of risk-trade off by saying that as both their risks and returns are from the project, the risk-return trade-offs of promoter, lenders, and governments are interrelated. Therefore, a successful project should properly allocate risk and return among the participants in order to achieve suitable risk-return trade-offs for all three parties simultaneously because each participant must content itself with its risk-return trade-off. This raises the question of what the government should do to help the other participants reach their trade-offs.

Ye and Tiong[21] continue by saying that one category of risks receiving considerable attention is the investment environment, including political stability, legal systems, and economic stability. This kind of risk is not simply a matter of pricing. It mainly influences the confidence of investors. When governments put in place good policies, investors are willing to invest without special government support[23]. Take independent power projects in Pakistan for an example, Ye and Tiong[21] add that there was not a single deal that was concluded before the Government of Pakistan issued a policy framework and incentive package for private participation in power generation in 1993. The negotiation for the Hub power project, which started in 1985, dragged on for nearly 10 years, whereas AES Lal Pir and Pat Gen projects were approved in 1993 and 1994, respectively (note: the Hub power project has been in trouble). To increase the confidence of investors, the government should improve the investment environment in the following areas: favourable investment policies, transparent legislative framework, enforceable business legislation, and BOT laws. The government should also relieve the private sector's worry about expropriation, nationalization, enforcement of contracts, private ownership, etc.

Another category of risks comprises factors that will reduce or impair the cash flows. In this ever-changing world, cash flows are exposed to uncertainty in demand, fluctuation in sale price, mismatch of revenue currency and debt currencies, force majeure, and so on. Serious private sponsors will normally be reluctant to take general risks beyond their control[16]. Thus, various types of government support are often required, such as guaranteed revenues, the protection of foreign exchange risk, debt security arrangement, and the compensation for force majeure events. In addition, government support may be required to enhance the attractiveness of a project through various types of financial support. This kind of support aims to increase financial return. They include direct financial contributions (*e.g.* grants, loans and equity) reduction of front-end cost, free use of project site and associated facilities, and tax incentives.

Forms of BOT in Practice

Ribeiro[12] says that the most common form of BOT is the Concession with 100% private funding. However the concession projects differ considerably in their nature, some are real toll whereas others are shadow toll projects. Under a shadow tolling system the user of the facility does not pay the toll. Instead the host agency pays the concessionaire tolls based on the relative number of users using the facility. The shadow toll system enables government agencies to implement their programmes even for less viable projects with a high public importance.

He added that in his research on the Portuguese market he found that the criteria for selecting BOT projects in descending order were as follows:

1 – Public need.
2 – Project economically and technically feasible.
3 – Need to reduce time.
4 – Proven demand.

Factors Determining the Use of BOT Model for Infrastructure Projects

Ribeiro added that the recent increase of concession projects in Portugal is due to a number of factors. In a publication of the AECOPS (2000), six relevant factors leading to the selection of procurement systems were identified: sharing risks with contractor; delivery speed; cost effectiveness; innovation in design/construction/operation; integration of design and construction; and partnership with private sector.

In his research he identified nine factors that determine the use of the BOT model. He ranked them as follows;

1 – Getting private financing.
2 – Risk transfer.
3 – Speeding delivery of the facility.
4 – Saving operation cost.
5 – Integration of design/construction/operation.
6 – Improving serving and safety.
7 – Promoting innovation in design/construction/operation.
8 – Saving capital costs.
9 – Reducing toll/tariff.

He added that for government agencies the most important factors leading to the use of the BOT are those that meet their budget restrictions and avoid risks.

Risk-Return Trade-off of Promoters

When discussing a power project in China, Ye and Tiong[21] say that project cash flows are affected by many factors. The main factors include market demand, electricity tariff, fuel supply, and currency risk. The promoters wanted to be comfortable with these factors. Thus, the Chinese Government was required to provide support directly or indirectly. Ye and Tiong[21] add that the mechanism of determining tariffs is a key factor influencing cash flows. The operating tariff for (MNEO) Minimum Net Electric Output, comprises a fixed portion and a floating portion indexing to foreign exchange rate. This indexing mechanism reduces the promoter’s foreign exchange risk. Fuel supply is another key factor influencing project’s cash flows. Although China is rich in coal deposits, the reliability of coal supply may be damaged by transportation. Both the project companies were contractually insulated from fuel supply risk through coal supply agreements. Ye and Tiong[21] add that this difference in returns reflects the risk-return trade-off of promoters at different times and in different investment environments and that different projects had different rates of return. They see that although the power purchase agreements remove some currency risk, promoters want to be comfortable with risks relating to convertibility, availability, and transferability.

Risk-Return Trade-off of Lenders

Ye and Tiong[21] continue to say that the major risks associated with independent power projects in China are risks related to legal and regulatory transparency, currency, demand, tariff, fuel supply, and credit transparency of offtakers. Ye and Tiong[21] add that the power sector has been progressing from a system of centrally planned, subsidized pricing towards market tariffs.

Risk-Return Trade-off of the Government

Ye and Tiong[21] comment on the government support to the promoters of power projects in China. The promoters were protected from force majeure risk to some extent. The government backed the promoter's obligation to make subordinated loan (up to US$500 million) in case of insufficient revenue resulting from events of force majeure. The project company was also allowed to extend construction and operation periods correspondingly if completion delay and/or operation stoppages resulting from events of force majeure. In the case of delay in operation resulting from certain uninsurable force majeure events, the government is obliged to provide funds to meet debt service. Any suspension resulting from events of force majeure entitles the project company to extend the concession period correspondingly. If termination results from force majeure, the lenders will be repaid and the promoters will receive compensation corresponding to their equity investment. If an event of insurable force majeure occurs, the government shall pay the equivalent of debt service plus 50% of the insurance and maintenance cost less any insurance proceeds received by the project company.

Both power projects enjoyed preferential tax policies. Project (1) enjoyed the preferential policies of Shenzhen Special Economic Zone; while project (2) enjoyed the preferential policies as a fully foreign owned company though they are not so good as those in 1980s. Furthermore, project (1) obtained RMB250 million loan at preferential interest rate (<7.5% per year) from the government. These financial supports further improved the rate of return.

Government Support of the Two BOT Power Projects in China

Ye and Tiong[21] mentioned various types of support from the government to the promoters. These were as follows:

Off-take guarantee
Coal-supply guarantee
Payment guarantee
Foreign exchange protection
Tax holiday
Direct loans
Force majeure protection
Improvement of investment environment
Land use rights to the site
Early completion bonus

Lessons Learned from China's BOT Power Projects

Ye and Tiong[21] said that there are many lessons to be learned from the comparison of the two China's BOT power projects. First, there should be a strong need for a proposed project so that it can generate sufficient revenues to repay debt and earn a profit. For independent power projects in a country that has not deregulated its power market, it is too risky for the private sector to carry out a BOT power project without a power purchase agreement. If revenues are dependent on offtake agreements, what matters is the creditworthiness of offtakers. Thus, governments are usually required to purchase a guaranteed minimum electric output directly or to provide guarantees for obligations of the offtakers. For example, similar to China's BOT power projects, BOT/BOO power projects in Indonesia, Pakistan, Philippines, and Thailand have all relied on a power-purchase agreement with a single offtaker that is directly or indirectly backed by the government.

Second, the tariff structure and its adjustment mechanism play a very important role in a BOT scheme. In general, a tariff may be divided into various components such as payments for installed capacity, generated energy, fixed O&M (operation and maintenance) costs, and variable

O&M costs, and adjusted with, or indexed to, inflation, foreign exchange, fuel prices, *etc.* The choice of tariff structure and its adjustment directly affect the risk exposure and financial return of the private sector. For example, the mismatch of the currency of revenues and the currencies of debt repayment can be solved through tariff design. In developing countries, the local currencies are not freely convertible and usually experience depreciation. The promoters and lenders usually require tariffs to be totally or partially denominated in, or indexed to, the currency of debt repayment or in US dollars. Tariff structures can be used to remove fuel-cost risk through a pass-through mechanism. In Paiton power project (Indonesia), fuel costs are directly passed to the offtaker by incorporating fuel cost component into the tariff. Tariffs may also be indexed to general inflation rates or consumer price indexes to mitigate inflation risk. Usually a tariff is designed to address risks of inflation, exchange, fuel costs together.

Third, concession period structures have an influence on risk-return of both the public and private sectors. Combined with incentive schemes (early completion bonus), the two-period structure (construction period plus operation period) benefits both parties. If a project is completed ahead of the schedule, the public sector's demand can be met earlier, while the private sector's return will be increased. If a project is completed behind the schedule, the operation period is the same so that the private sector suffers less loss than it does in a single-period structure. As the incentive scheme stimulates the private sector to complete the project earlier, the possibility of delay in completion will be reduced.

Fourth, credit enhancement is necessary for certain projects. A power purchase agreement can effectively insulate the private sector from demand risk. Similarly, fuel supply agreements can effectively insulate the private sector from fuel market risk. However, they may lead to secondary risk, that is, the offtaker's/supplier's inability to honour the agreements. In this case, the government's guarantees or support letter for the performance of a contracting party can enhance its credit. This credit enhancement would meet lenders' security requirements and allow the promoter to raise the required capital at lower interest rates.

Fifth, force majeure may result in delay in completion, halt in operation, or termination of the project. This leads to the reduction of cash flows. Besides buying insurance, promoters usually require governments to extend concession periods or make compensation for certain force majeure events. Moreover, lenders usually require the right to step in if the project company is defaulting and to arrange an escrow account.

Sixth, flexibility in contract strategies would create a 'win-win' solution. Taking the then situation in China into consideration, the joint-venture BOT structure for Shajiao B project brought a 'win-win' solution: it solved the shortage of power urgently required by the economic development, and at the same time, provided investors with a profitable project. Similarly, the fully foreign-owned BOT structure for Laibin B brought a 'win-win' solution: China obtained its badly needed finance for economic development in the Asian financial crisis, and at the same time, investors got investment opportunities when some Asian countries postponed, or cancelled, their BOT projects.

Finally, investment environment has a significant impact on participants' confidence in investment. If other things being equal, a favourable investment environment can make the private sector's risk-return trade-offs more attractive so that more projects would be developed by the private sector. Take Philippine BOT power projects for example, the new private power capacity installed in 1993-1994 is six times more than developed by the public sector in the previous 6 years. This was partly a result of the improved political stability and partly the enforcement of its BOT legislation (the first BOT law in Asia) in 1990.

Examples from Hong Kong

Hong Kong has a commendable track record of procuring tolled tunnels on a BOT basis. This has evolved over more than 30 years, starting with the decision to BOT the first cross-harbor tunnel in the late l960s. The latter was transferred at the designated end of the franchise period in 1999 providing a good example of the completed BOT cycle 'and an opportune time for review of the Hong Kong experience. Each of the five BOT tunnels was procured under an enabling ordinance (specific legislative enactment) that provided the required legal framework. Meanwhile, the body of knowledge in managing these BOT projects has developed notably in both the public and private sectors. Experienced companies have returned to bid for new projects whether as franchisees or parts of franchisee consortia, *e.g.*, in construction or operation. High performance levels have been recorded in the construction components (*i.e.*, the "B in BOT), for example, in terms of quality, early completion. and few (if any) disputes in genera1. Sharply defined common goals, with early completion enabling earlier and longer revenue flows, for example, no doubt contributed to better teamwork, hence minimizing some of the problems of traditional procurement systems. For example, adversarial posturing between different functions / organizations was reduced, despite the addition of new players in the Hong Kong BOT scenario, such as the independent checking engineer organization that is charged with checking designs.

Ingenious engineering solutions were developed by such integrated teams in tunneling and immersed tube construction. For example, considerably reduced construction periods on the Tate Cairn Tunnel project were achieved by the introduction of two sloping adit tunnels initially used for construction traffic (and replacing the originally planned single vertical shaft adit). This enabled the opening up of more tunnel excavation faces, facilitating simultaneous operations.

While the operational revenue levels in the first cross-harbor tunnel were considered to justify further BOT road tunnels, concerns arose on the adequacy of returns in the Tate's Cairn Tunnel and the Eastern Harbor Crossing. In the latter, a toll increase was agreed after arbitration[19]. This led to the incorporation of "toll adjustment mechanisms" in the recent projects. These would, of course, also safeguard public interest in providing for reasonable but not excessive returns. Having agreed on maximum and minimum levels of estimated net revenue (ENR) and a defined number and level of anticipated toll increases (ATI), the franchisee may implement an ATI on a designated date provided the actual net revenue (ANR) is below the maximum ENR. The franchisee may also advance an ATI should the ANR fall below the minimum ENR. If the ANR exceeds the maximum ENR, excess revenues are siphoned into a toll stability fund that the government may choose to use to defer specified ATIs by subsidizing the toll if deemed useful.

However, it has been suggested that the inability to attract enough potential franchisees to bid for the Western Harbor Tunnel project (eventually leaving only one bidder in the field to negotiate with) may reflect some possible shortfalls in the governmental guarantees and safeguards. This aspect may need to be revisited in future projects, for example, to provide greater comfort to prospective franchisees that anticipated revenue streams will not diminish due to low usage or parallel infrastructure development.

Tam and Leung[19] concluded that political risks were the most difficult to handle, in comparison with the relatively easy technical risks and the harder but often manageable financial risks in such BOT projects.

Barriers or Limitations

Ribeiro[12] states that in his research in Portugal he found that the most important barrier or limitation faced by central and local agencies is "lack of knowledge of and experience in the BOT concept" (62% of the respondents). This is followed by lack of a comprehensive legal framework (26% of the respondents). Twelve percent (12%) of the respondents were of the opinion that the existing tax system does not favour BOT projects. Kumaraswamy and Morris[24] stated some lessons derived from examples of Build-Operate-Transfer projects in Asia. They said that they will scan a small sample of recent BOT projects and developments in Asia, since it has provided a fertile testing ground for such initiatives, given the greater gaps between higher infrastructure demands and lower supplies of public funds. However, the transition of governments from funders to facilitators has involved uncertainties and some virtual (although unintended) trial-and-error exercises, for example, on the extent of government guarantees and/or support required. This suggests the usefulness of learning from the successful "trials" so as to minimize any further "errors" in framing future BOT scenarios.

Conclusions

1 – The concessionaire of a BOT project undertakes far more responsibilities and deeper risks than a contractor in a traditional project.

2 – The selection of an appropriate concessionaire is absolutely crucial to the success of any BOT project. Therefore, it is necessary to formulate a workable and efficient selection framework.

3 – At present, many countries lack such experience and expertise. Even the relatively limited experience and knowledge on BOT projects are scattered among some clients, concessionaires, consultants, and individual professionals. It is useful to solicit this expert knowledge, consolidate it, and code it into a knowledge base within an appropriate framework to improve future BOT procurement process.

4 – Increase transparency in the selection process in order to boost the confidence of the concessionaires and investors as well. The less transparency the government or the government agency will show, the more suspision the financial business communities will have towards its BOT projects. These communities usually associate weak transparaency with corruption which might backfire on the government by keeping reputable investors away .

5 – It is recognized that it is forever impossible to determine empirically whether the selection made was better than the one not made, because the project can only be done once.

6 – Careful evaluation of the suitability of a project for BOT type procurement appears critical at the outset, for example, with stable political and legal regimes and suitable socioeconomic conditions with the project being clearly in the public interest, capable of sustaining steady cash flows, and being provided with adequate safeguards against the various risk factors.

7 – A reasonable but not excessive rate of return is needed, again with any useful safeguards such as sensible toll adjustment mechanisms to achieve the desired balance.

8 – A proactive, stable, and reasonable (including noncorrupt) sponsor (*e.g.*, government/public sector body) is needed.

9 – A financially strong, technically competent, and managerially outstanding consortium is required as a franchisee, who should hopefully be attracted by the foregoing conditions.

10 – Innovative procurement and creative financial engineering strategies have thus opened up more opportunities, while providing fresh challenges to project managers.

11 – Government support is a necessary component of privately financed infrastructure projects in striking tradeoffs between risk and return. Host governments must recognize the need to provide incentives and direct or indirect support in almost all BOT projects and should adopt appropriate forms of support according to the projects' viability to stimulate the private sector's involvement in the supply of infrastructure.

12 – Country related risks of a political, legal and commercial nature are identified as the most significant as they are all issues that the project company has little or no control over. In developed countries, where legal systems are well tested and proven to be very reliable, concession companies can undertake to carry most risks while receiving very little guarantees in return.

13 – Competitive edge is achievable through a cost-effective solution and a financial package that surpasses others in meeting government priorities such as construction costs and concession periods.

14 – There is a need to introduce BOT concepts to the public sector especially to decision makers and to familiarise public servants with the necessary procedures.

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حجم المخاطر على أطراف التعاقد في طريقة الإسناد BOT (البناء - التشغيل - التحويل / نقل الملكية)

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المستخلص. إن الطرق المختلفة لنظام البناء - التشغيل والتحويل ونقل الملكية (BOT) هي طرق فائقة التعقيد، وقد أظهرت مخاطر جديدة لم تكن معروفة سابقًا في صناعة التشييد. ولقد كشفت هذه الطريقة في التعاقد والإسناد لمشاريع البنية الأساسية طرقًا جديدة عديدة لعلاقة المشاركة بين القطاعين العام والخاص. إن الأوجه المختلفة لنظام الـ BOT مثل BOOT و BOO ... إلخ تختلف أساسًا في آلية الملكية وحق الاستخدام والمسؤوليات. إن المخاطر تختلف من مشروع لآخر، ومن قطاع خدمات لآخر، ومن بلد مضيف لآخر. إن التحدي ينبت من المتغيرات المتعددة في المشروع والمدة الطويلة وتعرض المشروع للمخاطر الخارجية وتعدد أطراف المشروع بما فيهم الممولين والمشغلين. إن الدولة المضيفة للمشروع تركز على المنافع الاقتصادية والاجتماعية بينما يركز القطاع الخاص على الفوائد المالية وبين هذين الطرفين تقع كل مخاطر المشروع . لقد وجدت هذه الورقة أن المخاطر السياسية هي أصعب المخاطر تناولاً مقارنة بالمخاطر المالية . ستبحث هذه الورقة حجم المخاطر التي يتعرض لها الأطراف الثلاثة وهم المستثمرون والممولون والحكومات. وتخلص الورقة إلى أن من أهم المعوقات في طريق استخدام هذا الأسلوب التمويلي هو ضعف المعرفة والخبرة فيه. كما تصل إلى أن الخبرات في هذا المجال متناثرة في أبحاث الباحثين ومن المفيد تجميع هذه الخبرات في قاعدة معرفية بهدف تحسين أداء المشروعات المستقبلية . وهناك توصية بزيادة الشفافية في طرق الاختيار للمستثمرين في نظام الـ BOT مما سينعكس إيجابيًا على ثقة المستثمرين والممولين في الجهة المتعاقدة على مشروعات البنية الأساسية.

الكلمات المفتاحية: (BOT) نظام البناء - التشغيل والتمويل ونقل الملكية ، المخاطر - طرق الإسناد.