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BOT application in China: Driving and impeding factors

Chuan Chen *, Hemanta Doloi

Faculty of Architecture, Building and Planning, University of Melbourne, Melbourne, Vic. 3019, Australia

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Abstract

To adapt to the specific investment environments of China, the generic Build–Operate–Transfer (BOT) process has evolved into five basic BOT types with foreign private sector participation: Cooperative Joint Venture BOT (CJV BOT), Equity Joint Venture BOT (EJV BOT), Non-official Wholly Foreign Owned BOT, Official BOT, and BOT Variant. This study identified the driving and impeding factors about BOT application in China, and a survey of experienced practitioners indicated that the most significant driving factors are Needing infrastructure development capital; the most significant general impeding factors include complex financial arrangement, complex contractual arrangement, high up-front cost, complex process, and high risk; and the most significant China-specific impeding factors are opaque and inadequate legal system, complex approval system, Regulatory constraints on market entry, and low market prices for infrastructure products and services.

Keywords: Infrastructure; Build–Operate–Transfer (BOT); Private participation in infrastructure (PPI); Infrastructure development

1. Introduction

China's demand for infrastructure projects (e.g., highways, bridges, tunnels, water supply plants, waste treatment plants, and power plants) is largely driven by urbanization, industrialization, privatization, and globalization. China's policymakers must find new ways to meet this demand in view of the limited public financial resources available and the inefficiencies experienced in modes of providing infrastructure products and services involving only the public sector. An obvious and attractive solution is to involve greater private sector participation in the development of these projects.

Throughout the on-going process of China's modernization and integration into the global economy, the Chinese authorities have experimented with different modes of foreign private participation in its infrastructure market. Modes involving foreign private sector participation can be broadly categorized as being either (1) traditional joint venture structures involving public sector entities assuming most of the design, construction and operation responsibilities and risks; or (2) BOT structures involving wholesale private risk-taking, ownership, and control with necessary public sector support. Traditional joint venture structures are by far the most extensively practiced and successfully tested approaches in comparison with BOT. However, BOT entails a higher degree of private participation and provides significant benefits to both the public and private sectors in the present circumstances compared to traditional joint venture structures. This is one reason that the BOT approach has attracted extensive attention from industry, government, and academia [6,13,12,15,19].

However, the private sector entities have had to face daunting challenges to the big infrastructure market accessible through BOT. As a matter of fact, BOT is not a panacea for the China's infrastructure development problems. To quote from UNIDO [17], "BOT projects are complex from both financial and legal points of view. They require time to develop and negotiate. They require host government involvement and support. They require a suitable political and economic climate, political stability, a defined and stable legal and regulatory environment and a freely

* Corresponding author.
E-mail addresses: chuanc@unimelb.edu.au (C. Chen), hdoloi@unimelb.edu.au (H. Doloi).

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convertible currency, as well as other elements that are appropriate for foreign investment generally.''

The internationally recognized BOT arrangement, when introduced into China, must be structurally adjusted to accommodate the existing economic, financial, legal and regulatory environment even as the existing legal and policy frameworks are in the process of being strengthened through reforms to enable the implementation of BOT. This makes BOT application in China full of confusion and pitfalls, not just to private investors but to government agencies as well. In fact project failures are very common in the history of BOT application, and in order to materialize the benefits and merits of BOT, many problems remain to be resolved.

To realize the benefits and merits of BOT whilst avoiding the pitfalls, it is necessary to: (1) comprehend the current economic, social, financial, legal, and regulatory environment, as well as the changes in connection with BOT application in China; (2) review the history, analyze the status quo, and evaluate the prospect of BOT application in China, as well as identify its driving forces; (3) understand the many types of the BOT approach in terms of the organizational arrangements and financial packaging, and their respective benefits and shortcomings; and (4) develop a basic framework and associated strategies to enhance project viability and success [3].

China is in dynamic transition, and new issues and lessons emerge every day. An objective view of the driving and impeding factors about BOT application is needed to improve the chances of project success and promote BOT application in China. The goal of this study is to identify the driving and impeding factors about BOT application in China by literature review and unstructured interviews. The significance of these factors is then evaluated by a questionnaire survey of infrastructure developers, lenders, strategic investors, contractors, lawyers, consultants, and government agencies. The findings can also help both public and private parties to improve their mutual understanding in planning and implementation of BOT projects to achieve a win–win result.

2. China's BOT taxonomy and application status

The acronym BOT stands for ''Build–Operate–Transfer'', under which the private sector enters infrastructure development, a sector that has historically been the preserve of the public sector. Typically, the government grants a concession to a private sector entity, a bidding consortium or project company, and in turn, the concessionaire puts up the necessary capital, designs and constructs the infrastructure, and operates it for a certain period of time (generally 10–30 years) in order to pay off the debt and earn a reasonable rate of return from the operational revenue. The concessionaire then transfers ownership of the infrastructure to the government free of charge or at an agreed price.

BOT is not a rigidly defined process or set of rules. In fact, BOT projects have different characteristics and structures [16]. Its key elements can be flexibly adjusted or strategically repackaged to a certain extent depending on the specifics of the project, sector, or country. For this reason, BOT has many types including Build–Own–Operate (BOO), Build–Operate–Renewal (BOR), Build–Own–Operate–Transfer (BOOT), Build–Transfer (BT), Design–Build–Finance–Operate (DBFO), among many others. ''BOT'' is often taken as the general designation of all these acronyms [8,10,17,20]. Similarly, the evolution of BOT in China results into its own unique taxonomy.

The first BOT project in China was the Guangdong Shajiao B Power Plant in 1984 and was sponsored by Hopewell Holdings, a Hong Kong based developer. It was successfully transferred to the Guangdong Provincial Government in 1997. However, it is the Guangxi Laibin B Power Plant in 1996 that is recognized as the first ''official'' BOT project. It was implemented on the basis of the ''BOT Circular'' promulgated by central government in 1995. Some other projects like the Shanghai Dachang Water Plant in 1996 and Puqi Power Plant in 1997, which were carried out under local government regulations rather than the BOT Circular, are also recognized as BOT projects. The domestic BOT has emerged and attracted increasing attention from government officials since the Asian economic crisis (interview). There seem to be more than one dimension in practice that works together to logically divide BOT approach into various types. The literature review, case studies and unstructured interviews reflecting recent developments suggest that there are at least five practical dimensions to characterize BOT projects in China. They include:

(1) *Financial source:* foreign or domestic;
(2) *Structural variance:* basic or variant;
(3) *Foreign equity sharing:* Sino-Foreign Joint Venture (SF JV) or Wholly Foreign Owned (WFO);
(4) *Contract type:* Sino-Foreign Cooperative Joint Venture (SF CJV) or Sino-Foreign Equity Joint Venture (SF EJV);
(5) *Central government recognition:* Official or Non-Official.

These dimensions do not operate on the same level but are interrelated as depicted in Fig. 1, classifying China's BOT approach with foreign private sector participation into the following five types: Cooperative Joint Venture BOT (CJV BOT), Equity Joint Venture BOT (EJV BOT), Non-official Wholly Foreign Owned BOT, Official BOT, and BOT Variant (e.g., Transfer–Operate–Transfer). The following section serves to introduce the different BOT types defined by different combinations of the five dimensions.

In a JV BOT project, equity is injected by the local party in various forms such as the right to use the land, labor force, raw materials, services, and cash, and by the foreign

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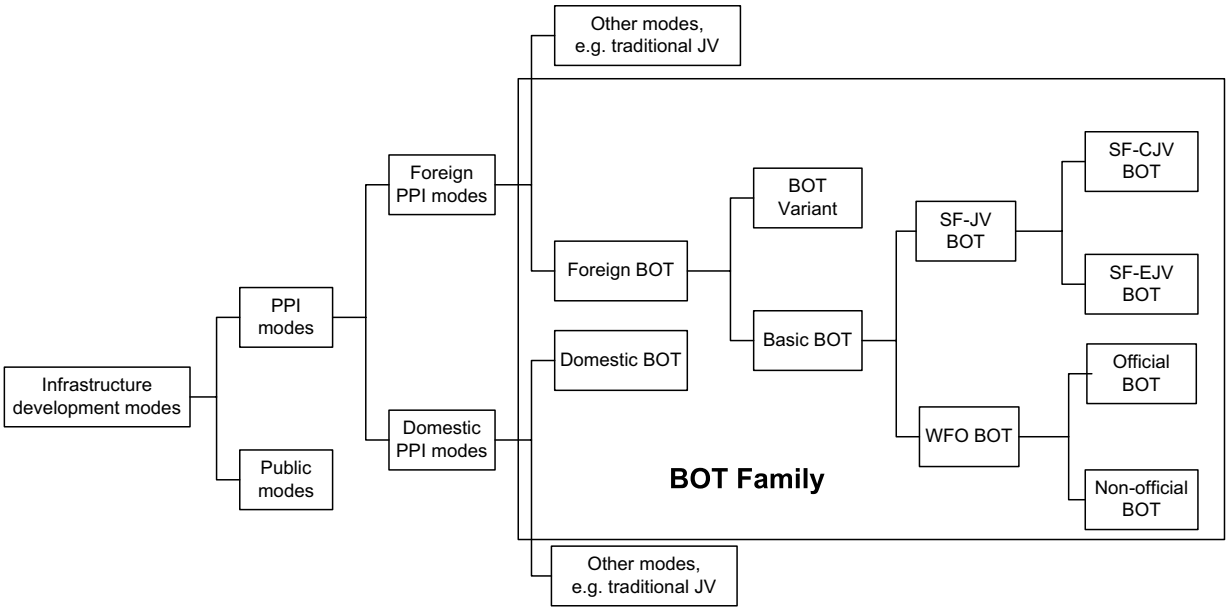

Fig. 1. China's BOT taxonomy.

party usually in cash according to their share proportion. The JV is then registered and a board of directors appointed by both parties. The JV contract specifies the provisions concerning operational authority that resides in the JV project company, the JV period, and profit sharing schemes. The foreign party will turn over its shares of the JV project unconditionally to the local party upon the completion of the JV period. There are two types of JV BOT, CJV BOT and EJV BOT. CJV BOT differ from EJV BOT in two respects. First, an EJV must be established as a limited liability company, whereas a CJV may choose not to have legal person status (on contractual basis). Second, CJV parties' profit, control, and risks are divided according to negotiated contract terms, while an EJV's profit, control, and risk are divided in proportion to the equity shares invested by the parties. CJV is generally more flexible. For example, under a CJV, the foreign party may recover its investment before the end of the cooperation period if the contract stipulates that the local partners take ownership of all tangible assets upon the completion of the JV period. One example of CJV BOT is the Zhuhai Power Plant in 1995. The Shaojiao B Power Plant in 1984 is an EJV BOT project.

Official BOT refers to a specific project institutional arrangement and legal structure being developed by the central government under a "National Experimental BOT Program". A BOT project carried out in this form includes the following features [1]: (1) a fair and transparent tendering system under State Development and Planning Committee (SDPC) supervision; (2) 100% foreign ownership; (3) off-take payments and termination compensation guaranteed by the local government; (4) "fast-track" contract negotiation and approval process; and (5) guaranteed exchange convertibility for debt service and equity returns. Till now there are three examples of this BOT type, operational or cancelled: the Guangxi Laibin B Power Plant in 1996, Hunan Changsha Power Plant A in 1998, and Chengdu No. 6 Water Plant B in 1999.

Non-Official WFO BOT is a BOT mode where the foreign parties contribute 100% of the equity investment of the project. Compared to the Official WFO BOT, this type of project is conducted according to local government regulations rather than the "BOT Circular" promulgated by the central government and is therefore believed to suffer from increased political risk [11]. An example of this BOT type includes the Dachang Water Plant in Shanghai which was implemented in accordance with Shanghai's pioneering BOT regulations.

BOT Variants include modes like Build–Transfer–Operate (BTO) and Transfer–Operate–Transfer (TOT). Unlike BOT, the TOT centers on existing infrastructure. In this mode, the government offers the operational concession of the infrastructure to a foreign private company at a price for a certain period of time. The concessionaire operates the infrastructure and earns revenue from its operation, and at the end of the concession period, the title is returned to the government or its authorized agencies. In TOT, less risks are involved than in other BOT types, making it more attractive to private investors and developers. An example of this BOT types is the Shannxi Weihe Power Plant.

Although not a focus of this study, Domestic BOT, as the name suggests, is a build operate and transfer arrangement where both equity and debt have pure domestic sources. This BOT type involves less risks than foreign BOT types. For example there are no foreign currency related risks. Domestic BOT projects are normally financed on a full recourse basis. The first domestic BOT project was the Latong Bridge located in the Quanzhou City of Fujian Province in 1994.

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Between 1984 and 2000, projects with foreign investment that were widely recognized by the industry and academic circles as BOT projects are shown in Table 1. In this short list, there are six power plants, four transportation projects and three water plants. The average project cost is US$483 million. The water plant projects are apparently cheaper (US$70.3 million for the Dachang Project and US$106.5 million for the Chengdu Project) than the others. The power and transportation projects vary in cost. The average concession term is 21 years. The transportation projects have relatively long concession terms of around 30 years. This is because the unpredictable traffic flow normally makes transportation projects exposed to significant risks and so, a longer concession term is given as a risk mitigation measure.

The key characteristics of the different BOT types are summarized in Table 2 based on a comparative analysis of the above projects.

The performance of these projects, despite a small number, is mixed. Projects with problems include the Shanghai Dachang Water Plant (expropriated by the Shanghai Government for breaking the policy of "none guarantee of a fixed rate of return"), Changsha Power Plant Project (cancelled for financial closing difficulty caused by the Aria Financial Crisis), and the Beijing No. 10 Water Plant B project (suspended for multiple reasons such as (1) demand for water has been decreasing since 2000 in Beijing; (2) raw water supply has been inadequate in the past several years; and (3) the water transition line layout plan has to be altered because of the airport expansion project.). Although studies of BOT projects in China are not rare (e.g. [10,11,13,15,18,21]), none of these previous studies specifically examined the real driving and impeding factors about BOT application in China, a fundamental issue that can explain the status quo and help improve the popularity of BOT method as well as BOT project performance.

3. Driving and impeding factors: a desk study

BOT approach has multiple merits and benefits that attract the attention of Chinese governments who suffer from the pressure to handle the infrastructure bottleneck, improve efficiency, and promote reforms in the infrastructure investment and financing sector. However, there are some inherent shortcomings of BOT that prevent its extensive application and project performance. Besides, Chinese government agencies and foreign developers/investors/contractors involved in China's BOT projects must face multiple China-specific impeding factors. These driving factors, general impeding factors, and China-specific impeding factors which were identified based on an extensive literature review (e.g. [4,5,7–21]) and unstructured interviews with BOT project participants include:

Driving factors

- needing infrastructure development capital,
- needing advanced technology,
- needing management skills,
- commercializing infrastructure services,
- promoting reform in infrastructure investment and financing;

China-specific impeding factors

- opaque and weak legal systems,
- complex approval systems,
- regulatory constraints on market entry,
- low market prices for infrastructure products and services,
- creditworthiness of local utilities,
- no direct interests to local government and its subordinates,
- foreign currency administration difficulty;

Table 1
Foreign BOT projects in China

Project name	Location	Project cost (Million US$)	Term (years)	Contract year[a]	BOT type	Status
Changsha Power Plant A	Hunan	700	20	1998	Official	Cancelled
Chengdu No. 6 Water Plant B	Sichuan	106.5	18	1999	Official	Operational
Dachang Water Plant	Shanghai	70.3	20	1996	WFO	Expropriated
Guang–Shen–Zhu Highway	Guangdong	1150	30	1987	EJV	Operational
Jingtong Highway	Beijing	193	20	1994	CJV	Operational
Laibin B Power Plant	Guangxi	616	18	1996	Official	Operational
Puqi Power Plant	Hubei	500	20	1997	WFO	Operational
Shajiao B Power Plant	Guangdong	540	10	1984	EJV	Concluded
Tangshan 1 Power Plant	Hebei	173	20	1997	N/A	Cancelled
Yan'an Donglu Tunnels	Shanghai	217	30	1993	EJV	Operational
Yichang Bridge	Hubei	600	28	1997	N/A	N/A
Zhuhai Power Plant	Guangdong	1200	20	1995	CJV	Operational
Beijing No. 10 Water Plant	Beijing	210	20	2002	WFO	Suspended
Mean	–	483	21	–	–	–

N/A: Not available.
[a] Year in which concession agreement was officially signed.

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Table 2
The key characteristics of the different BOT types in China

Characteristics	SF CJV BOT	SF EJV BOT	Non-official WFO BOT	Official BOT	Domestic BOT	Foreign TOT
Project cost	High	High	High	High	Low	Low or high
Ownership	Public and private	Public and private	100% private	100% private	100% private	100% private
Equity contribution	Public and private	Public and private	100% private	100% private	100% private	100% private
Debt financing	Limited recourse	Limited recourse	Limited recourse	Limited recourse	Full recourse	Full or limited recourse
Control	Public and private	Public and private	Private	Private	Private	Private
Sovereign financial guarantee	Yes	Yes	No	No	No	No
Bidding process	Negotiation	Negotiation	Open competition	Open competition	Negotiation	Negotiation
Host government	Provincial or municipal	Provincial or municipal	Provincial or municipal	Provincial or municipal	Municipal	Provincial or municipal
Tariff system	Cost plus	Cost plus	Fixed tariff	Fixed tariff	Fixed tariff or cost plus	Fixed tariff or coast plus
Concession term	Short or long	Long	Long	Long	Long	Short
Remittance currency	Foreign currency	Foreign currency	Foreign currency	Foreign currency	Renminbi	Foreign currency

General impeding factors

- complex financial arrangement,
- complex contractual structure,
- high up-front development cost,
- complex project process,
- high risk,
- high product/service prices,
- long term,
- high investment,
- multiple participants.

The following two sections will introduce the driving factors and China-specific impeding factors about BOT application in China, respectively. The details of the general impeding factors do not need specific introduction, but can be easily found in previous studies (e.g., [5,14]).

3.1. Driving factors for BOT application in China

The launch of a BOT project in China is either demand driven, policy driven, or efficiency driven. Depending on their sources, the driving factors for BOT application in China can be classified into three categories accordingly: demand related factors (needing infrastructure development capital), policy related factors (commercializing infrastructure services, and promoting reform in infrastructure investment and financing area), and efficiency related factors (needing advanced technology, and needing management skills).

3.1.1. Needing infrastructure development capital

To sustain the rapid economic growth and improve social welfare, China needs more and better infrastructure. Despite impressive gains, the rate and quality of infrastructure development can still be said to lag behind that needed to sustain the rapid economic growth, and is believed by the government to be the ''bottleneck''.

In China, infrastructure used to be a public regime. Due to the administrative and fiscal decentralization policy, the revenue of the central government has been falling. As a result, local governments, being the ones who carry out actual infrastructure development, have to rely more and more on their own revenues and the market mechanism to sustain local infrastructure development. Local infrastructure funding traditionally comprises local tax revenue, loans, and ''extra-budgetary revenues'' made up of user fees, ad hoc levies, asset-sales, etc. To accommodate the big demand for infrastructure, local governments have had to be creative in developing new funding sources in addition to public financing. As a result, the private sector has an increasingly important role in infrastructure development, and BOT provides a vehicle for its participation in the traditional public regime.

3.1.2. Commercializing infrastructure and promoting reform in infrastructure investment and financing

The ''government structural reform'' intended to separate the administrative and commercial functions of government created many domestic private developers and quasi-private developers. Their capabilities and resources are, however, still limited. An open market has not been realized and because of the lack of competition, efficiency is weak. The commercialization reform intended to improve the prices of infrastructure projects and services that were traditionally a public welfare. The governments intended to use BOT as a stimulus to explore new direction in the reform and experimentally improve infrastructure product and service price on a local and project by project basis, as a pilot to improve the market prices generally. To commercialize the infrastructure products and service and promote the reform in the infrastructure development area are therefore two driving factors for BOT application in China.

3.1.3. Needing advanced technology and management skills

Private sector is believed to be more efficient in providing quality infrastructure products and services than public sector organization. Li [10] identified advanced technology

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and management skills as driving forces for BOT application in China. However, according to interviews with practitioners, under BOT mode the foreign private sector entities take most control of the project than in traditional joint venture modes, and robust and reliable mature technology is believed to be a success factor [3], so the private parties' intention or pressure to transfer technology and management skills is limited. The different viewpoints were evaluated by the empirical analysis reported in a following section.

3.2. China-specific impeding factors about BOT application in China

This section introduces the seven China-specific impeding factors about BOT application in China identified based on literature review and unstructured interviews.

3.2.1. Complex approval systems

There are up to 30 agencies at the central, provincial, and sometimes, municipal levels that have approval authority in any given BOT project, and in diverse areas such as macroeconomic planning, foreign-investment policy, commercial registration, sector/industry regulation, foreign exchange, taxation, land administration, environmental protection, customs, and construction. Each regulator operates under different and sometimes conflicting policy constraints. Besides, different types of infrastructure are governed by different ministries and their respective subordinates on provincial and municipal levels. For example, urban infrastructure is governed by the Ministry of Construction, and the governance of transportation infrastructure out of urban area is within the authority scope of the Ministry of Communications. This makes the project approval procedure difficult and full of uncertainties either to the sponsoring government agency or to bidders/concessionaires.

3.2.2. No direct interests to local government and its subordinates

Under the BOT mode, sponsors have major control of the project, and in WFO BOT projects (either official or non-official) in particular, there is 100% foreign ownership and wholesale foreign control. As a result, the local government and its subordinate enterprises cannot share project revenues or get profitable peripheral contracts as they readily do in traditional joint venture projects. This, to some extent, reduces the attraction of BOT, especially WFO BOT to local governments [11]. In addition to the diminution of the direct economic interests to the local government, the BOT mode is distinctly inferior to traditional joint venture structures in terms of transfer of technology and management skills from foreign participants to local governments and enterprises (interview).

3.2.3. Opaque and weak legal and regulatory system

In China, the development of the legal system is still in its infancy. The legal and regulatory framework governing BOT remain inadequate. This results in a sponsor's greater reliance on getting the right approvals rather than the enforceability of onshore contracts [12]. This difficulty is gradually being surmounted on a sector-by-sector basis by the promulgation of the governing laws such as the Highway Law, Power Law, and Telecommunications Law [9]. This however leads to a sectoral piecemeal development of legal and regulatory system. A specific BOT law, although expected by foreign investors as well as local governments, has been shelved ever since its drafting began in 1995, because of the divergence of views within central government on the core issues of macro economic development and foreign investment.

3.2.4. Creditworthiness of local utilities

Chinese law currently prohibits foreign ownership and management of water and power distribution networks, so the success of a BOT project depends greatly on the performance of local utilities as raw material suppliers and/or product/service off-takers. The lack of financial transparency that pervades many Chinese state-owned enterprises and the subsidized, and sometimes inefficient business conditions under which they operate make issues of credit and performance acute.

3.2.5. Low market prices for infrastructure products and services

The provision of infrastructure used to be considered as public welfare and the government's responsibility, with consumers generally paying less than the real cost. To increase the low market prices involves so many social, economic, and political issues. Since the beginning of China's reform, infrastructure has been increasingly 'commercialized'. However, in general, the current market prices for infrastructure products and services are still very low in comparison to the true cost of their provision. This limits the commercial viability of many projects to be carried out under the BOT framework.

3.2.6. Regulatory constrains on market entry

The opening of China's infrastructure market is neither all-encompassing nor unconditional. Foreign participation is governed by the Temporary Regulations to Guide Foreign Investment promulgated in 1995, as well as the accompanying Catalogue for Guiding Foreign Investment in Industries (the "Catalogue"). The latter (revised in 1998 and 2002, respectively) divides Chinese industries into four categories, namely categories where foreign investment is encouraged, allowed, restricted, or prohibited. In addition, there are also numerous regulations and policies enacted by state departments or local governments governing foreign participation in different sectors and regions. Theses constraints can significantly influence the feasibility and difficulty regarding specific BOT projects. For example, some water plant projects cannot be packaged with a size large enough to attract the attention and interest of foreign developers and lenders (Chen and Messner, 2005).

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3.2.7. Foreign currency administration difficulty

The off-take agreement under BOT arrangement is normally denominated in hard currency. Although a freely convertible RMB to increase foreign investment has long been the target of foreign currency administrative reform, there is still strict foreign currency governance in China. Investors, therefore, have concerns about the availability, conversion and remittance risks of foreign currency. For central government backed Official BOT projects, risks involving foreign currency are essentially approval matters [7].

However, at the operation level, there are some difficulties including: (1) the administration of some BOT featured foreign currency accounts is not addressed by any existing regulation of China, and (2) frequent currency transfers between multiple participants under the complex contractual arrangement results in difficulty in auditing (interview).

4. Evaluation of the driving and impeding factors: an empirical study

A survey was developed to tap the knowledge and opinion of practitioners with experience in delivering BOT projects in China and gauge their perception of the degree of significance of the driving and impeding factors identified. Fifteen practitioners responded to this questionnaire survey; Table 3 summarizes the details of the survey respondents.

The following five-point scale was used: 1 – not significant, 2 – fairly significant, 3 – significant, 4 – very significant, and 5 – extremely significant. The survey responses were differentiated into two groups depending on whether they came from the private or public sector, and then plotted individually and collectively as well. The scores and ranking of the driving factors, China-specific impeding factors, and general impeding factors are shown in Table 4.

It can be seen from the table:

- The most significant driving factors are needing infrastructure development capital (3.73), which is also the only driving factor with a score over 3 (significant).
- The most significant China-specific impeding factors are opaque and inadequate legal system (3.47), complex approval system (3.40), regulatory constraints on market entry (3.13), and low market prices for infrastructure products and services.
- The most significant general impeding factors include complex financial arrangement (3.53), complex contractual arrangement (3.29), high up-front cost (3.20), complex project process (3.07), and high risk (3.07).

Two additional impeding factors, ''Local governments' unfamiliarity of BOT approach'' and ''Lack of lawyers with expertise in BOT approach'', were suggested by two respondents, respectively.

5. Discussion and policy/management implications

The scores of the five driving factors are plotted in Fig. 2.

In China, whether a project is carried out under a BOT framework is determined by the government, so correctly understanding the driving factors behind a specific project is very important to the bidders and concessionaires. To government agencies, the major value of the BOT mode is that it provides an effective way to handle the serious inadequacy of infrastructure development capital. It is therefore natural that both sides agree that the most

Table 3
The particulars of the respondents in the survey

Respondent details		Quantity	% of total
By respondents' occupation			
Private sector	Consultant (for developer)	1	6.67
	Developer	4	26.67
	Lawyer (for sponsors)	2	13.33
Public sector	Government officials	5	33.33
	Utility employees	3	20.00
By the BOT projects the respondents participated[a]			
	Shajiao B power plant	3	20.00
	Laibin B power plant	3	20.00
	Changsha power plant B	2	13.33
	Chengdu No. 6 water plant B	7	46.67
	Huanghuayuan bridge	1	6.67
By respondents' experience			
	Involvement through the entire project process	11	73.33
	Involvement before financial closing	2	13.33
	Involvement after financial closing	2	13.33

[a] Among the 15 respondents, one lawyer served on the Huanghuayuan bridge, a BOT variant project in Chongqing (developed by a Hong Kong based developer), and one consultant served in both the Laibin and Changsha projects.

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Table 4
The significance of the driving and impeding factors

Driving and impeding factors	Min	Max	Mean	SD	Rank in category	Overall rank
Needing infrastructure development capital	2	5	3.73	1.11	1	N/A
Needing advanced technology	1	3	2.27	0.65	4	N/A
Needing management skills	1	4	2.20	1.07	5	N/A
Commercializing infrastructure	1	5	2.60	1.19	3	N/A
Promoting reform in infrastructure investment/financing	2	5	2.80	0.99	2	N/A
China-specific impeding factors						
Opaque and weak legal systems	2	5	3.47	1.20	1	2
Complex approval systems	2	5	3.4	1.05	2	3
Regulatory constraints on market entry	1	5	3.13	1.32	3	6
Low market prices for infrastructure products and services	1	5	3.07	1.29	4	7
Creditworthiness of local utilities	1	4	2.93	0.87	5	10
No direct interests to local government and its subordinates	1	5	2.46	1.29	6	13
Foreign currency administration difficulty	1	4	2.31	1.21	7	16
General impeding factors						
Complex financial arrangement	2	5	3.53	1.03	1	1
Complex contractual structure	1	5	3.29	1.08	2	4
High up-front development cost	1	5	3.2	1.32	3	5
Complex project process	2	5	3.07	1.03	4	7
High risk	1	5	3.07	1.19	4	7
High product/service prices	1	5	2.93	1.38	6	10
Long term	1	4	2.57	1.02	7	12
High investment	1	5	2.38	1.33	8	14
Multiple participants	1	4	2.33	0.82	9	15
Other impeding factors the respondents added						
Local governments' unfamiliarity of BOT approach						
Lack of lawyers with expertise in BOT area						

Note: N/A stands for not applicable.

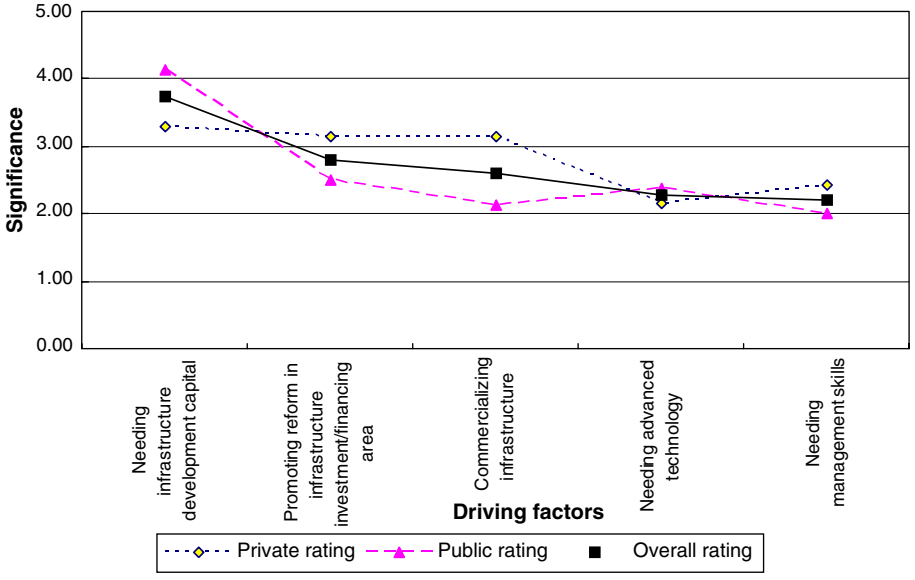

Fig. 2. The significance of the factors driving foreign BOT application in China.

significant driving factor for BOT application in China is needing infrastructure development capital. However, it is striking that all efficiency and policy related factors are below "significant" (3.0). It seems that the practitioners from the private sector overestimate the importance of the policy related factors (promoting reform in infrastructure area and commercializing infrastructure products/services). It also seems that both sides agree that BOT is not an effective vehicle for advanced technology and management skills transfer. The implication for bidders and concessionaires is that it is important to analyze the real financing gap of the government to evaluate its commit-

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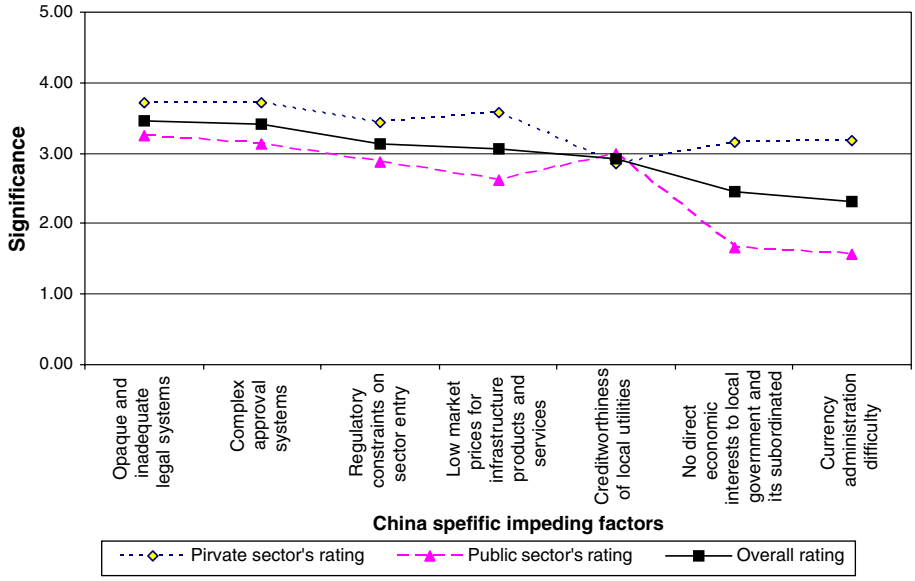

Fig. 3. The significance of the China-specific impeding factors against BOT application in China.

ment in triggering and implementing the project under a BOT framework, and it may not be a practical strategy for foreign companies to heavily rely on know-how transfer as a strategy to pursue BOT projects in China.

The scores of the China-specific impeding factors are plotted in Fig. 3.

In Fig. 3, private scores (higher than or near to 3.0) are generally higher than public scores (near to or lower than 3.0). This difference in perception of the strength of the impeding factors in BOT application is perhaps explained by the inherent differences in objectives, interests, responsibilities, and cultures between the two sectors.

The public sector gave a relatively high score to "Creditworthiness of local utilities" in comparison with the other factors, but the private sector gave a relatively low one, indicating the public sector's special concern regarding this factor. As a rule, local government supplies much credit support to local utilities, e.g., jointly undertaking the duties under off-take and raw material supply contracts so as to make the foreign sponsors feel comfortable with the low credit rating of the utilities. However, the ongoing reform to separate the administrative and commercial functions of the government may make those credit support means unsuitable to policy makers.

There is similar scoring by the two sectors regarding "High product/service prices", indicating the public sector's special concern regarding this factor because, as mentioned above, the private sector normally gave higher scores than the public sector. Although international open competitive bidding usually results in "surprisingly" low prices [2], the tariff is still higher than the subsidized market prices set by the government. Local utilities must pay more to the concessionaire for the same amount of products or services. The pressure is, however, undertaken by the government and local utilities normally under an off-taking contract.

The big difference between the two sector's perceptions of the significance of the "Currency administration difficulty" implies that this factor is ignored to some extent by the public sector but is of concern to the private sector. China has a strict foreign currency administration and cash flows of the project are closely audited by local branches of the foreign currency administration. Moreover, some routine credit support instruments like the offshore account cannot be used in China due to regulatory constraints.

There is also a particularly big difference between the two sectors' perceptions regarding the significance of "No direct economic interest to local government and its subordinates", reflecting the private sector's overestimate of the local government's intention to pursue direct economic interests for itself and its subordinates. In fact, the major motivation of local government to adopt BOT is the desire to meet the urgent need for infrastructure development capital, so they may accordingly reduce their expectation of peripheral contracts awarded to their subordinate enterprises, calming down the concern of McDonald [11].

The scores of the general impeding factors are plotted in Fig. 4.

Not surprisingly, in Fig. 4, the private sector's scores (higher than or near to 3.0) are also higher than those of the public sector (near to or lower than 3.0). As for the general BOT impeding factors, the "complexity" of the BOT approach in terms of financial arrangement (3.53), contractual structure (3.29) and process (3.07) is an apparent shortcoming. This issue has not been well addressed by research reported in the literature.

6. Summary and conclusion

A comparative analysis of representative BOT projects in China help define and characterize different types of BOT projects. China's BOT taxonomy includes five basic

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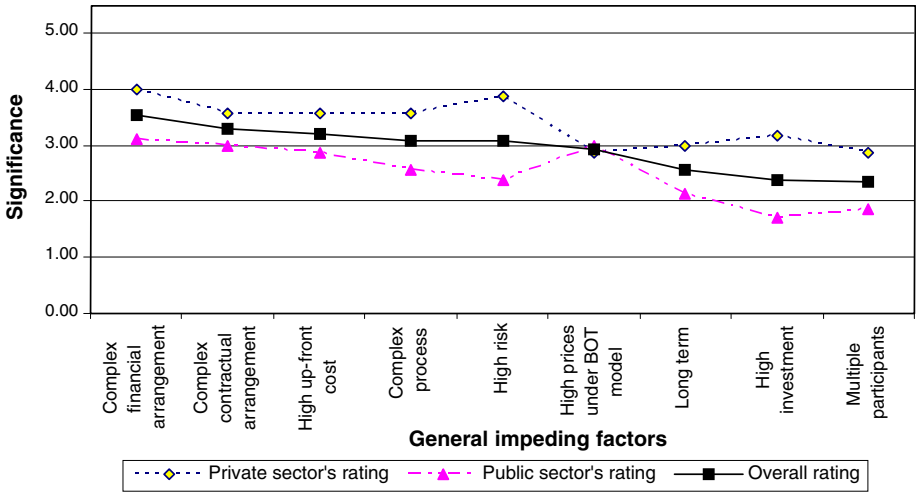

Fig. 4. The significance of the general impeding factors against BOT application in China.

BOT types with foreign investment: Cooperative Joint Venture BOT (CJV BOT), Equity Joint Venture BOT (EJV BOT), Non-official Wholly Foreign Owned BOT, Official BOT, and BOT Variant. Although new BOT types may emerge in the future, the diversity at least indicates that BOT approach is flexible in its evolution to adapt to specific project environments. The case studies also show that the performance of BOT projects in China is mixed and it is very important to review the factors that drive or impede BOT application in China, general or China-specific, to improve the popularity of BOT application and project performance.

A research process integrating extensive literature review, unstructured interview, and questionnaire survey indicated that the most significant driving factor for BOT in China is Needing infrastructure development capital; the most significant China-specific impeding factors include opaque and inadequate legal system, complex approval system, regulatory constraints on market entry, and low market prices for infrastructure products and services; the most significant general impeding factors include complex financial arrangement, complex contractual arrangement, high up-front cost, complex process, and high risk.

These rankings can help related government agencies, private developers, investors, and contractors to better understand the real opportunities and challenges about BOT application in China and make go/no-go decision and/or optimize their management attention and allocation of limited resources accordingly. For example, the private parties should evaluate the real financial gap of the sponsoring government agencies to evaluate the government commitment and the project creditworthiness. They should also recognize that policy related factors may not be that significant on specific projects and technology and know how transfer is a less attractive strategy in pursuing BOT projects. The Chinese government should further strength the BOT related legal and policy framework, and simplify BOT project approval system to increase BOT popularity and project performance in China.

Further, the difference between the scores by the survey respondents from the public sector and private sector, respectively, provides implications for the two sides with different objectives, cultures, and roles to improve their mutual understanding as a basis to improve the project performance measured by a win–win criterion. For example, it may be striking for the private sector to see the degree of significance of needing infrastructure development capital in comparison with other factors centering on policy and efficiency.

Because these impeding factors are either inherent in the BOT approach or imposed by the macro legal, political and economic environment of China, out of the control of the private sector entities or local government agencies, a comprehensive and sound set of counter-measures against these factors may not exist. The findings can, however, be used to guide future related studies to focus on the most critical issues, e.g., the complexity of BOT projects.

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