

Critical Success Factors for Transfer-Operate-Transfer Urban Water Supply Projects in China

Xianhai Meng¹; Qi Zhao²; and Qiping Shen, M.ASCE³

Abstract: Over the years, build-operate-transfer (BOT) has continuously attracted research interests. Many studies on BOT have been carried out. Variations of BOT such as build-own-operate-transfer and build-own-operate have also been reported in some relevant publications. However, few investigations thus far have been conducted for transfer-operate-transfer (TOT). Therefore, there is a knowledge gap in this particular field. TOT is a new model that is suitable for existing infrastructure and public utility projects formerly funded by the governments and currently operated by state-owned enterprises. It refers to the transfer of a running public project to a foreign business or domestic private entity. Based on four case studies carried out in the Chinese water supply industry, this paper examines why there is an increasing need for TOT projects and identifies the distinctive features of TOT practice in China. This is followed by an introduction of a framework of critical success factors (CSFs) for TOT projects. The most important factors include project profitability, asset quality, fair risk allocation, competitive tendering, internal coordination within government, employment of professional advisors, corporate governance, and government supervision. The identification of CSFs provides a useful guidance to project parties planning to participate in TOT practice. DOI: [10.1061/\(ASCE\)ME.1943-5479.0000058](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000058). © 2011 American Society of Civil Engineers.

CE Database subject headings: Build/Operate/Transfer; Water supply; China; Urban areas; Water distribution systems.

Author keywords: Transfer-operate-transfer; Critical success factor; Water supply; China.

Introduction

Following the adoption of an open door policy, China started its economic reform in the early 1980s (Lardy 1992; Shen and Liu 2004). The primary purpose of economic reform was to accelerate economic growth through improving the effectiveness and efficiency of various economic activities (Shen and Song 1998). In 1992, the Chinese government decided to deepen economic reform, and more importantly, to transform the purely planned economic system into a market-oriented economic system (Mayo and Liu 1995). Although this led to rapid development of domestic private sectors and a dramatic increase in foreign investment during the subsequent decade, urban utility projects were primarily monopolized by public sectors in the traditional manner. The term “utilities” here refers to a set of services such as water supply, heat supply, gas supply, sewage disposal, and garbage disposal. They are closely related to people’s lives and economic development. During this period of time, public sectors were not only responsible for financing, but also for building, operating, and maintaining urban utility projects. Few entries into this market were given to private sectors and foreign investors. The purely public approach

often caused problems such as a lack of competition and low efficiency and effectiveness in practice (Kwak et al. 2009).

Learning from developed countries and through domestic practice, the Chinese government has gradually realized the importance of reforming its investment and financing system. Since the end of 2001, a series of new policies and relevant regulations have been successively promulgated. In December 2001, the State Development and Planning Commission (SDPC) issued “Suggestions on Facilitating and Guiding the Investment of Private Sectors” (2001), which first mentioned the possibility of investment of private sectors in infrastructure and public utility projects. In December 2002, the Ministry of Construction (MOC) formulated “Principles of Accelerating the Marketization of Public Utility Projects” (2002), in which the government formally permitted private sectors and foreign businesses to invest in public utility projects through the introduction of concession arrangement and equity transfer of state-owned enterprises. As a result, the end of 2002 has been widely regarded as a milestone of the establishment of concession system for public utility projects. In July 2004, the China State Council (CSC) promulgated “Decisions on the Reform of Investment System,” making an extension of private investment into infrastructure projects. According to “Decisions on the Reform of Investment System” (CSC 2004), private sectors are encouraged to invest in infrastructure and public utility projects through concession arrangements. For the infrastructure and public utility projects that are financed by the governments and have been put into use, it is possible for the governments to recover their investment by transferring the equities or management authorities of state-owned enterprises to private sectors.

On the other hand, attracting foreign investment has become an important government policy since the economic reform started at the beginning of the 1980s. This can be observed from the promulgation of a series of government provisions and ordinances for guiding and regulating various foreign investment activities, e.g., “Provisions for the Encouragement of Foreign Investment”

¹Lecturer, School of Planning, Architecture and Civil Engineering, Queen’s Univ. Belfast, David Keir Building, Stranmillis Rd., Belfast BT9 5AG, UK (corresponding author). E-mail: x.meng@qub.ac.uk

²Merger and Acquisition Manager, Beijing Representative Office of SK Gas, SK Tower, Jianguomenwai St., Chaoyang District, Beijing 100022. E-mail: zhaoqi@sk.com

³Professor, Dept. of Building and Real Estate, Hong Kong Polytechnic Univ., Hung Hom, Kowloon, Hong Kong. E-mail: bsqpshe@polyu.edu.hk

Note. This manuscript was submitted on September 30, 2009; approved on February 23, 2011; published online on September 15, 2011. Discussion period open until March 1, 2012; separate discussions must be submitted for individual papers. This paper is part of the *Journal of Management in Engineering*, Vol. 27, No. 4, October 1, 2011. ©ASCE, ISSN 0742-597X/2011/4-243–251/\$25.00.

promulgated by the CSC (1986), “Provisions for the Assets Reorganization of State-owned Enterprises through the Utilization of Foreign Capitals” issued by the National Economic and Trade Commission (NETC 1998), and “Provisions for the Utilization of Foreign Capitals in Urban Utility Projects” issued by the MOC (2000). As a result of implementing this policy, foreign investment has played a very important role in economic development, and foreign businesses can enter more markets than ever before. For example, foreign investors were prohibited from gas supply, water plant, water pipe network, and sewage disposal projects in urban areas according to the first and second editions of “Guidance Catalogue of Foreign Investment,” issued by the SDPC (1995, 1997). However, foreign investment in water plant and sewage disposal projects was authorized by the third, fourth, and fifth editions of “Guidance Catalogue of Foreign Investment” issued by the SDPC (2002, 2004, 2007). Meanwhile, foreign investors were allowed to be involved in gas supply and water pipe network projects on the condition that the Chinese parties controlled the shares.

An urban water supply project consists of two major parts: the water plant and the water pipe network. As a common concession arrangement in China, build-operate-transfer (BOT) has experienced several attempts in the urban water supply projects. This is reflected in studies such as Silk and Black (2000) and Chen and Messner (2005). In recent years, transfer-operate-transfer (TOT), a variation of BOT, has been introduced into the urban water supply projects that have been built and put into use. In these projects, TOT refers to a scheme by which a foreign business or private entity invests in a completed water supply project that was financed by the government and operated by a state-owned enterprise. The government transfers a part of equity, e.g., 49% of equity of the state-owned enterprise to the foreign business or private entity, which in turn forms a joint venture with the state-owned enterprise. The joint venture receives a concession from the government to operate the project for a specified period of time. During the concession period, the foreign business or private entity can recover its investment and make profits from charging its customers appropriate fees. After the concession period ends, the ownership of the project is transferred back to the government. Fig. 1 shows the detailed relationship between key stakeholders.

Both BOT and TOT are the concession arrangements for the investment of foreign businesses or private sectors in infrastructure and public utility projects. Generally, BOT is suitable for projects that are to be financed and built, whereas TOT is appropriate for projects that have been built and put into operation. In China, many water plants have been built at the early stage of economic reform. Therefore, the demands of building new water plants are not as

strong as those of renovating existing water pipe networks and laying new water pipes. In many cities, the full potential of newly built water plants is not reached owing to the lack of matched water pipelines. Where water pipe networks are concerned, the BOT model is not an ideal choice. This is primarily because the scope of the projects should be clearly defined when BOT is used in practice, but unfortunately water pipe networks do not meet such a requirement. Following the process of industrialization and urbanization, the water pipe network in a certain city may change very quickly. The renovation of old water pipe networks and the installation of new water pipes will be undertaken during the whole concession period in a project. This makes BOT difficult to apply to relevant practice, but gives TOT an opportunity to be adopted in more water supply projects.

So far, more than 20 TOT water supply projects have been practiced in different cities such as Shanghai, Shenyang, Shenzhen, Lanzhou, Tianjin, Chongqing, and Kunming. In this research, four case studies are carried out, each of which is an example of TOT water supply projects in a region. For example, the project in Lanzhou is the representation of TOT practice in the northwest of China. The case studies are primarily carried out at the stage of project procurement, which has a major influence on TOT project success. A case study is a well-established research strategy where the focus is on a real case (Robson 2002). According to Punch (2005), properly conducted case studies make a valuable contribution to research. The contribution is primarily reflected in two ways. One is that we can learn from the study of a particular case in its own right. The other is that an in-depth case study can provide a clear understanding of the important aspects of a new research area. Four real case studies in this research provide strong evidence for examining the TOT model in practice. They help to explore the specific characteristics of TOT water supply projects and identify the critical success factors (CSFs) for these projects. These can be used as referential experience for achieving best practice in TOT infrastructure and public utility projects in both developing and developed countries.

Reasons for Applying TOT

TOT is a new concession practice in China. There are various reasons for applying TOT to water supply projects. In the following sections, they are discussed from four perspectives: increase in water demand, shortage of public funding, disrepair of water pipe network, and improvement of state-owned enterprises' efficiency.

Increase in Water Demand

China is experiencing the process of industrialization and urbanization. As a result, a large population moves from rural to urban areas. According to the *China Statistical Yearbook* issued by the National Bureau of Statistics (NBS), the urban population was 373.04 million in 1996 and reached 577.06 million in 2006 (NBS 1997, 2007). The annual growth rate of the urban population was 5.47% in this decade. The proportion of urban population to total population changed from 29.37% in 1996 to 43.90% in 2006. These figures only covered the registered permanent urban residents. If floating population was also taken into account, the people inhabiting urban areas were much more numerous than in the previously mentioned statistical results. During the same period of time, the water supply for residential use in cities increased from 16.71 billion tons in 1996 to 22.20 billion tons in 2006 (NBS 1997, 2007). The annual growth rate of water supply for residential use was 3.29%. By comparison, the increase in urban population is much faster than the increase in urban water supply for residential use. As a result, many cities face severe water shortage. Water

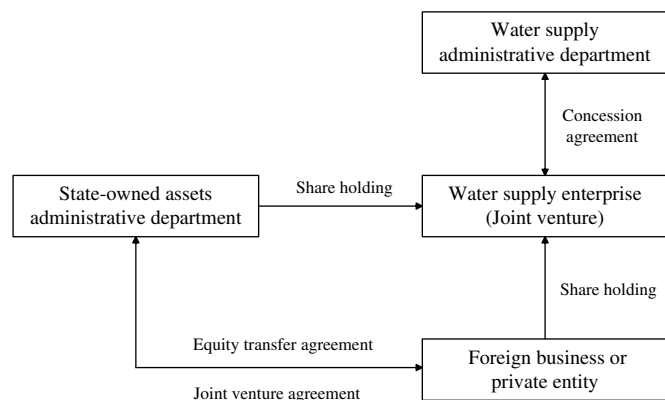


Fig. 1. Relationship between key stakeholders

supply is primarily divided into water for residential use and water for industrial use. If water for industrial use and other purposes is further considered, the problem of water shortage will become more severe. Therefore, there is a great need to develop more water supply projects and renovate existing water supply facilities.

Shortage of Public Funding

Along with the remarkable development of China's economy, local governments have more and more revenues in recent years. However, the expenditures of local governments have grown more rapidly. Fig. 2 shows that the total revenue of local governments in 1995 was 298.56 billion Renminbi (RMB, literally "the Chinese people's currency") Yuans, whereas the total expenditure was 482.83 billion RMB Yuans (NBS 1996). Consequently, there was a total deficit of 184.27 billion RMB Yuans for local governments in 1995. In the subsequent years, the total deficit of local governments has been increasing. For example, the total deficit for local governments became 396.06 billion RMB Yuans in 2000 and 1,005.35 billion RMB Yuans in 2005 (NBS 2001, 2006). Traditionally, public utilities such as water supply projects were financed by local governments and operated by state-owned water supply enterprises. Unfortunately, local governments are facing the increasing need for water supply and the great pressure of fund shortage. At the same time, local governments are not permitted to issue debentures. In this case, the investment of foreign and domestic private businesses in public utility projects becomes an inevitable choice. On the other hand, if an existing water supply project is transferred to the joint venture consisting of a foreign business or private entity and the state-owned enterprise, then the local government can recover its investment. The recovered capital can be used to pay back the bank loans and fund other new public projects. This is one of the primary reasons that the TOT model interests local governments. If an existing water supply project is transferred to a joint venture, the local government no longer needs to provide it with subsidy. This also relieves the financial pressure on the local government.

Disrepair of Pipe Network

As mentioned previously, an urban water supply project consists of two parts. One is the water plant and the other is the water pipe network. Although a number of water plants have been built in different regions following the economic reform, many of them operate far below their capacities. According to the *China Statistical Yearbook* from 1997, the production capacity of tap water in 1996 was 72.96 billion tons. However, the total annual volume of water supply in 1996 was only 46.61 billion tons (NBS 1997). This indicated that the idle rate of water plants in 1996 was 36.12%. Similarly, the idle rates of water plants in 2001 and 2006 were found to be 44.23 and 45.08%, respectively. The high idle rate

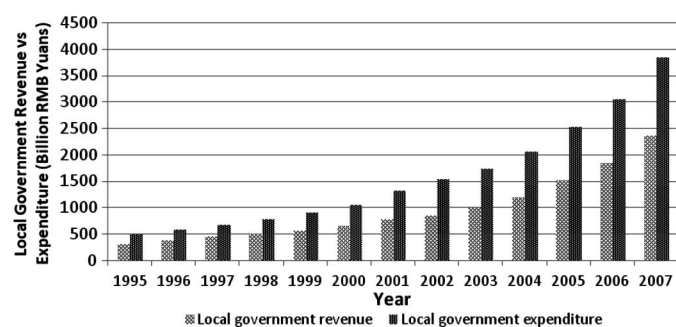


Fig. 2. Revenue versus expenditure of local governments (data from *China Statistical Yearbooks* 1996–2008)

of water plants is primarily caused by aged water pipe networks. The shortage of governmental funding aggregates the disrepair of existing water pipelines. According to the *China Water Supply Yearbook* released by the Association of Urban Water Supply (AUWS) (2004), the average leak rate of the water pipe network was 17.92%. In some cities, the leak rate was even greater than 30%. Because a foreign or private business will inject capital into a TOT project, its involvement will help to solve the problem of the dilapidation of old water pipe networks.

Need for Efficiency Improvement

Infrastructure and public utility projects in China primarily remain under state ownership. However, state-owned enterprises are beset with many problems (Chao 2000). In the water supply industry, the weaknesses of state-owned enterprises may include overstaffing, waste, low efficiency, and high cost. Most of these enterprises are running under a deficit proposition. The survival of these enterprises often relies on government subsidy. On the other hand, competition is quite limited in this field because water supply projects are monopolized by state-owned enterprises. In this situation, state-owned enterprises do not pay enough attention to the customers' concerns and interests. Therefore, they usually cannot provide their customers with satisfactory services. If an existing water supply project is transferred to a joint venture, then the foreign or private side will not only inject capital, but also introduce advanced management. As a result, the efficiency of the joint venture will be greatly improved. At the same time, the joint venture will meet the increasing requirements of the customers for better services.

Characteristics of TOT Projects

In China, TOT has a number of specific characteristics when compared with other concession models such as BOT. They are discussed as follows:

1. Because TOT is used for an existing water supply project, the foreign investor or private entity involved in the project does not face various risks during design and construction. In this sense, TOT is less risky than BOT. That is a primary reason why TOT interests foreign and domestic private businesses. On the other hand, they have to identify and evaluate whether the assets of a TOT project are good before procuring the project. They will take great risks if the identification and evaluation are inaccurate or wrong. This will be further discussed when summarizing the CSFs for TOT projects.
2. For the first transfer, the government usually transfers a part of the equity rather than the management authority of the state-owned enterprise to the foreign or private business. This helps to establish a joint venture between the state-owned enterprise and the foreign or private business. The establishment of joint venture provides the state-owned enterprise with a possibility for its restructuring. As a result, TOT practice is often accompanied by the restructure of the state-owned enterprise.
3. The second transfer is usually paid rather than voluntary. This is primarily because during the period of concession, the joint venture will further invest for renovating old water pipe networks and laying new water pipes. When the ownership is transferred back to the government, the government should pay the foreign or private business relevant costs. At the same time, depreciation needs to be considered. Therefore, it is necessary to reevaluate the value of the assets at the end of concession period.

Criteria of Project Success

Before identifying the CSFs for TOT water supply projects, the criteria of TOT project success should first be determined. Project success depends on whether the objectives of key stakeholders have been achieved (Yuan et al. 2010). The success of a TOT project can be discussed from different perspectives such as consumers, local governments, and foreign or private investors. The primary concern of consumers is better quality services. The primary expectation of the foreign or private business is high return of investment and minimization of risk. As the owner of state assets and the representative of public interests, the local government initiates and supervises a TOT project. The objectives of local government include (1) successful transfer of an existing project to a capable investor; (2) preservation and increment of the value of state assets; (3) introduction of advanced technology and management; and (4) benefits to urban residents. In this paper, project success will primarily be measured from the government perspective, with due attention to the investor's and public interests. Key factors leading to project success will be identified through real case studies.

Case Studies

As mentioned previously, more than 20 TOT water supply projects have been implemented in recent years, many of which are successful, but unfortunately some of which are not successful. In this research, four case studies have been analyzed. Among these four examples, the TOT project in Shenyang is a representative of project failure, whereas the other three TOT projects in Shanghai, Shenzhen, and Lanzhou are all successful.

Case 1: A TOT Project in Shenyang

The Shenyang No. 8 Water Plant was completed and put into operation in 1995. Its production capacity of tap water per day was 400,000 tons. The total investment was 250 million RMB Yuans. To raise funds for new infrastructure projects, in 1996, the municipal government of Shenyang decided to sell a half of equity of the Shenyang No. 8 Water Plant to a foreign investor. Without employing any investment and legal advisers, the municipal government directly negotiated with Foreign Investor A. Unlike the municipal administration, Investor A employed international leading consultants. Because the municipal government lacked relevant experience, the joint venture contract was drafted by Investor A and then agreed by both parties. When the joint venture was first established, Investor A invested 125 million RMB Yuans to buy 50% of the equity of the Shenyang No. 8 Water Plant. The contract term of the joint venture was determined to be 30 years. The municipal government promised that annual return rate in average for Investor A was 18.2% and the maximum annual return rate was 21%. According to the contract, Investor A obtained the right to use the existing water pipe network in the form of leasing. The Water Supply Corporation of Shenyang was responsible for the maintenance of existing water pipe network.

In 1999, the Shenyang Development Limited Corporation was established by the municipal government, and subsequently became a listed company in the Hong Kong Stock Exchange. Because it was difficult to ensure the annual return rate for Investor A, the municipal government expected to buy back the total equity of the Shenyang No. 8 Water Plant. Shenyang Water, a subsidiary company of the Shenyang Development Limited Corporation, was responsible for the repurchase. Based on a series of negotiations, both parties reached an agreement: (1) the price of repurchase was 150 million RMB Yuans; and (2) Investor A obtained the management contracts of all eight water plants affiliated with

the Shenyang Water for 10 years, by which A would be paid a management fee with the value of 5 million RMB Yuans per year. Owing to the breach of contract, the municipal government was required by Investor A to pay a breakup fee of 10 million RMB Yuans. This time, the municipal administration still did not employ any professional consultants. There is no doubt that the municipal government suffered from a great economic loss, and meanwhile, project setback undermines its reputation. By contrast, Investor A's profits are significant. In addition to the management fee with the total value of 50 million RMB Yuans and the breakup fee with the value of 10 million RMB Yuans, Investor A has earned three years' return and an increase in value of 25 million RMB Yuans.

Case 2: A TOT Project in Shanghai

In 2002, the municipal government of Shanghai chose the Pudong Water Company as an experimental unit for attracting foreign investment and establishing a joint venture. Fifty percent of its equity was determined to be transferred to a foreign investor. To ensure project success, the municipal government employed tendering, investment, and legal advisers. The whole procurement process was divided into four stages, including asset appraisal, competitive tendering, tender evaluation, and signing the contracts. To encourage competition, the municipal government adopted international competitive tendering. After invitation to tender was advertised, a number of international large-scale water companies from the United States, United Kingdom, France, and Italy showed their interests in the project and discussed the possibility of cooperation with the municipal government. At the end, three international companies participated in the formal tendering. Based on the evaluation of transfer price, financial management, technical solution, customer services, social services, support for the enterprise, organizational structure, and human resources, Foreign Investor B won the project, which in turn signed the equity transfer agreement and the joint venture agreement with the municipal government.

Fifty percent of the assets of the Pudong Water Company were evaluated at 760 million RMB Yuans. Through competitive tendering, Investor B won the project and invested 246 million US dollars, which was equivalent to 2.03 billion RMB Yuans in terms of the exchange rate at that time. The investment of Investor B was approximately three times as much as 50% of the evaluated value of the Pudong Water Company. A joint venture was established between Investor B and the Pudong Water Company. The contract term of the joint venture was fixed as 50 years. The municipal government did not promise any return rate for Investor B. In contrast, the parties in the joint venture agreed to share both profits and risks during the period of 50 years. According to the agreements, the value of 50% of the equity would be reevaluated when the project was transferred back. The municipal government transferred both the water plant and water pipe network to the joint venture. The businesses of the joint venture covered production, transmission, and sale of water in the Pudong area of Shanghai.

This is the first successful TOT project in a large city of China. This is also the first large-scale TOT project with the transfer of both water plant and water pipe network. It has aroused extensive attention in China because of its high premium. Unlike earlier TOT projects, there is no guaranteed rate of return in this project. As a result, the joint venture has to take on full responsibility for the success of its business, which becomes a motivator for the joint venture to reduce costs, increase efficiency, and improve service quality. This project has achieved success through international competitive tendering. The success is also attributable to the employment of professional advisers. Although no concession agreements were formed in this project, it provides a basis for the establishment of concession system in China at the end of

2002. Based on Investor B's technical capabilities and management skills, better services are provided by the joint venture for the local residents and industrial enterprises.

Case 3: A TOT Project in Shenzhen

Shenzhen is a new city in the south of China. The Shenzhen Water Corporation has fully featured water production, water supply, and sewage facilities. Its production capacity of tap water per day is 1.67 million tons. In 2003, the municipal government of Shenzhen decided to restructure the Shenzhen Water Corporation by establishing a joint venture with a foreign investor. One year ago, the third edition of "Guidance Catalogue of Foreign Investment" was issued by the SDPC, in which foreign investment in a water pipe network project was restricted to 49% of its assets' value at most. Following the regulation, the proportion of equity transfer in this project was determined to be 45%. On the other hand, the municipal government owned 55% of its equity. Before the implementation of the project, the municipal government set up a leading group. Based on a series of careful evaluations, financing consultant, legal consultant, and asset appraisal institutions were selected. With the help of these experienced professionals, the scheme of property right reform for the enterprise was finalized.

After the invitation to tender was advertised, 21 foreign businesses participated in the tender competition. The municipal government arranged a field survey for these foreign investors so that they could have a good understanding of the project. Based on the evaluation of tender price, technical capability, and previous operation experience, Foreign Investor C was selected as the best candidate. Through a series of further negotiations on transfer price, technical transfer, distribution of management authority, and employee training program, the two parties reached an agreement on the equity transfer and the joint venture. Before the project transfer, the net assets of the whole project were evaluated as 5.90 billion RMB Yuans. Investor C provided 400 million US dollars, which was equivalent to 3.31 billion RMB Yuans at that time. The investment of Investor C was divided into two parts: 2.00 billion RMB Yuans were used for the equity transfer, and 1.31 billion RMB Yuans were used for the development fund of the joint venture. Investor C was awarded a concession period of 50 years, during which the municipal government promised a return rate of 6% and the parties would share the rest of the risks.

This is the first water supply TOT project after the establishment of the concession system in China. In addition to water supply, this project also includes sewage disposal. It becomes the only project that transfers both water supply and sewage disposal to the joint venture. Unlike most TOT water supply projects in China, this project will be voluntarily transferred back to the municipal government after the concession period is expired. There are two reasons for doing this. One is that all facilities in this project are quite new. Therefore, Investor C does not need to invest much for renovation of the old facilities or installation of new facilities during the concession period. The other is that this project has a bright prospect for the investor to make enough profits. Therefore, the competition between investors is fairly strong and the municipal government plays a dominant role in the process of project procurement. This case demonstrates that not all projects need to transfer back to the local governments with payment. Whether the second transfer is paid or not depends on the specific environment of the project and the negotiation between the municipal government and the investor.

Case 4: A TOT Project in Lanzhou

Lanzhou Water Supply Corporation was first established in 1955. Up to 2005, its production capacity of tap water per day had

become 1.38 million tons, and it possessed a water pipeline with the length of 620 km. However, its equipment was quite old and its efficiency was rather low. In 2005, Lanzhou Water Supply owed the bank loans for 1.10 billion RMB Yuans and other debts for 619 million RMB Yuans. In addition, it lost 10 million RMB Yuans every month. To end the situation of successive deficit and raise funds to renovate the old water pipe network, the municipal government of Lanzhou decided to transfer 45% of its equity to a foreign or private investor. Before the equity transfer, Lanzhou Water Supply had finished the first-step reform, transforming the previous fully state-owned enterprise into a shareholding enterprise in which the municipal government held the controlling share and the employees held a small part of the share. This provided a preliminary basis for the involvement of foreign or private investment, because Lanzhou Water Supply had already stepped into a shareholding system and some problems such as deficit had been solved to a certain extent.

At the initial stage of project procurement, a leading group was established by the municipal government that was responsible for the whole procurement process. As a result of domestic open tendering, the municipal government employed a capable investment consultant and a reputable legal adviser who in turn helped the municipal government to solve a series of economic and legal problems. Invitation to tender was advertised worldwide. More than 10 foreign and domestic investors showed their interests in the project. Five investors submitted the prequalification documents and all of them passed the prequalification. Afterward, three investors offered their tenders. Tender evaluation covered many criteria such as transfer price, technical solution, management scheme, financial proposal, and legal framework. At the end, Foreign Investor D was awarded the project, and signed the equity transfer, joint venture, and concession arrangements with the municipal government. Because the MOC issued both "Administrative Measures for the Concession in Urban Utility Projects" (2004a) and "Model Concession Agreement for Urban Water Supply Projects" (2004b), the parties in this project responded to the central government's requirement and formally signed the concession agreement. A formal concession agreement is more likely to clearly define the obligations of two parties and protect their rights and benefits during the whole period of concession.

In this project, the transfer part was evaluated as 350 million RMB Yuans. Sufficient competition led to a satisfactory result for the municipal government. Consequently, Foreign Company D invested 1.71 billion RMB Yuans, in which 700 million RMB Yuans were used for the transfer of the equity held by the municipal government and employees, and 1.01 billion RMB Yuans were used for the increase in capital stock. The length of concession period was defined as 30 years. There was no guarantee for the rate of return from the municipal government. A principle of profit and risk sharing was established by the two parties in the joint venture. Investor D promised to make further investment for the renovation of the old water pipe network during the concession period. For this reason, Investor D will receive a repayment based on the reevaluation of the assets' value when transferring the project back to the municipal government. The project transfer achieved a win-win outcome. Although Investor D's investment was approximately five times as much as 45% of the evaluated value of the Lanzhou Water Supply Project, Investor D was optimistic about the project prospect. This will be further discussed later in this paper.

A summary of four case studies is provided in Table 1, which helps to explore the primary characteristics of these projects and identify the CSFs for the TOT practice.

Table 1. Summary of Four Case Studies

Project name	Shenyang No. 8 Water Plant	Shanghai Pudong Water Supply	Shenzhen Water Supply	Lanzhou Water Supply
Geographical location	Northeast of China	East of China	South of China	Northwest of China
Service population	1 million	1.71 million	2 million	1.73 million
Production capacity of tap water per day	400,000 tons	1.48 million tons	1.67 million tons	1.38 million tons
Year of signing contract	1997	2002	2003	2007
Concession period/contract term	30 years	50 years	50 years	30 years
Proportion of equity transfer	50%	50%	45%	45%
Evaluated value of transfer part	125 million Yuans	760 million Yuans	2.65 billion Yuans	350 million Yuans
Amount of investment	125 million Yuans	246 million US dollars (equal to 2.03 billion Yuans)	400 million US dollars (equal to 3.31 billion Yuans)	1.71 billion Yuans
Promise of rate of return	18.2% in average	No	6%	No
Water price	Water price is adjusted in terms of water costs and fixed rate of return	Water price is adjusted following change in market; adjustment is based on government guided price and public hearing	Water price is adjusted following change in market; adjustment is based on government guided price and public hearing	Water price is adjusted following change in market; adjustment is based on government guided price and public hearing
Service contents	Investment, operation, management and maintenance of water production	Investment, operation, management and maintenance of water production and supply	Investment, operation, management and maintenance of water production, water supply and sewage disposal	Investment, operation, management and maintenance of water production and supply
Investor selection	Direct negotiation	International open tendering	International open tendering	International and domestic open tendering
Transfer back approach	Paid	Paid	Voluntary	Paid

Critical Success Factors

CSF is widely recognized as a key element that is necessary for an organization or project to achieve its goals. They are required for ensuring the success of a business. According to Rowlinson and McDermott (1999), CSFs are those fundamental issues inherent in the project that must be maintained for teamwork to take place in an efficient and effective manner. The CSF methodology has been used as a management measure in the BOT-related research field since the 1990s. For example, Tiong (1996) explored the CSFs for private contractors to participate in competitive tendering and negotiation of BOT projects based on the empirical data collected from ten countries and areas; Askar and Gab-Allah (2002) determined what CSFs identified by Tiong (1996) are missed in Egyptian BOT projects; Jefferies et al. (2002) developed a CSF framework to analyze how public clients can successfully manage build-own-operate-transfer (BOOT) project procurement in Australia; and Li et al. (2005) examined and categorized 18 CSFs for the United Kingdom public-private-partnership (PPP) and private-finance-initiative (PFI) projects. However, there is no research to date on the CSFs for TOT projects. In the following, this paper attempts to fill in the knowledge gap based on currently available cases studies.

Project Profitability

The right project selection is a prerequisite for BOT project success (Tiong 1996; Qiao et al. 2002). The same principle applies to TOT projects. In this research, profitability is identified as the most important factor in TOT projects for both local governments and investors. From the perspective of local government, only a project

with good profitability will attract foreign and domestic private investors, even if it may currently face some difficulties. On this basis, it is possible for the local government to transfer the project successfully. On the other hand, the investor needs to recover its investment from the operation of the project. The revenues of the joint venture primarily come from charging its customers appropriate fees, and its expenditures consist of operation cost, maintenance cost, depreciation cost, financial charge, and taxation. To ensure the return of investment, the investor must analyze the project prospect carefully before making an investment decision. For example, predictable profitability is the primary reason Foreign Investor D decided to invest in the Lanzhou Water Supply Project with a high premium. Based on the investigation and assessment, D had full confidence of making profits in the project. This is primarily because water is collected from the upper Yellow River. Therefore, the collected water is free of pollution and the treatment costs are much less than the industry average. The local government's guarantee of no competitor for water supply is another reason for D to invest in this project. In addition, D believed that waste such as water leakage and inaccurate charge will be reduced to maximum extent through renovating the existing pipe network and installing a water meter based on the Integrated Circuit (IC) card in every household.

Asset Quality

In addition to project profitability, asset quality is crucial to project success. On one hand, only the assets with good quality will attract investors. On the other hand, it is necessary for an investor to identify whether the assets are good, because the project is not built by itself. To ensure appropriate identification, the investor has to take

into account a series of key issues such as the conditions of existing facilities, the quality of existing employees, and the placement of existing employees. For the conditions of existing facilities, the investor can review various technical documents such as completion documents. The investor should also pay attention to the quality of existing employees and the placement of existing employees. Generally speaking, defective assets should be stripped off, and redundant staff should be diverted and reemployed appropriately before the establishment of the joint venture. These pave the way for the joint venture, and meanwhile reduce the burden on local government when it repurchases the project at the end of the concession period. In the Lanzhou project, for example, the problems of nonproductive assets and overstaffing had been solved to some extent when implementing the first-step reform and transforming from a fully state-owned enterprise into a share-holding enterprise. As a result, Foreign Investor D had reason to believe that the assets were good enough, although the project was facing some financial difficulties.

Fair Risk Allocation

An essential part of the agreement is the definition and allocation of risk in the project (Zayed and Chang 2002). Project success depends on clear risk definition and fair risk allocation between the parties. The concession period of 30–50 years is quite long. A lack of clear definition and fair allocation of risk will easily lead to uncertainty about the project's prospects and eventually result in conflicts between the parties. In theory, it is appropriate to allocate each risk to the party best able to manage it, because this will reduce individual and overall costs of the project (Li et al. 2005). Although design and construction risks are not involved in a TOT project, there are still many other risks for the investor. In practice, the greatest risk for the investor is the overestimation of project profitability and asset quality. If the investor takes too much risk, it will inevitably affect the services for the customers.

On the other hand, if the local government takes too much risk, it is more likely to increase financial pressure on the local government. For example, to ensure the high rate of return for Foreign Investor A in the Shenyang No. 8 Water Plant, the municipal government of Shenyang faced two difficult choices: one was to raise water prices and the other was to provide fiscal subsidy. When both choices were found to be unacceptable, the municipal government had no choice but to terminate the agreement and repurchase the project. This example illustrates the danger of high rate of return for the local government. When a high rate of return is fixed in the concession agreement, the investor does not take any risk. As a result, the investor will lose its motivation for efficiency improvement, and meanwhile, transfer of state-owned enterprise is no longer meaningful to the local government, because there is nearly no difference between the joint venture and the previous enterprise.

Competitive Tendering

International competitive tendering has become the normal method of concessionaire selection in China's BOT projects (Chen and Messner 2005). At the early stage of TOT practice in China, however, some local governments such as the municipal government of Shenyang preferred direct negotiation to competitive tendering, because they thought direct negotiation with investors was simple and economical. After they suffered from heavy losses, they began to investigate the cause of failure. Eventually, they found an asymmetry of the experiences and abilities between them and investors. If direct negotiation is adopted in a project, the investor usually asks for the fixed rate of return on a pretext of project uncertainty and potential risks. Then the local government is vulnerable to

manipulation. Owing to the lack of competition, it is also impossible for the local government to select a competent investor.

The award of the concession through tendering competition, as opposed to direct negotiation, increases the government's bargaining power in relation to the investor pursuing the project (Rintala et al. 2008). At the same time, competitive tendering allows the local government to select the most capable investor with adequate investment funding, strong technical strength, enough operation experience, and advanced management skills. This is partly because a normal procurement process in accordance with international practice increases the project's attractiveness and heightens the investors' confidence, partly because many more investors participate in project competition, and partly because fair and transparent competition contributes to the establishment of "the best wins" mechanism and the optimum allocation of various resources.

Internal Coordination within Government

Effective project management requires system thinking (Walker 2007). For a local government, a TOT project is a complex system. Many governmental departments are involved in a TOT water supply project that are responsible for state assets management, water supply administration, fiscal taxation, price control, and land administration, respectively. Before the invitation to tender, these administrative departments verify and approve the appropriateness of relative matters, based on which project conditions can be substantially defined. To achieve the strategic goals, there is a great need for effective coordination among different departments within the local government. Internal coordination calls for strong leadership. In general, a leading group is established that coordinates different departments and provides the leadership for overall management. This makes the whole procurement process effective and efficient. The leading group is under the guidance of a top municipal official. This group is also responsible for making the final decision. All decisions should be made in terms of government strategies and market rules.

Employment of Professional Advisers

The local governments usually lack of experience in TOT practice. Employment of professionals with relevant expertise is crucial to TOT project success, although they must be paid. Professionals may include investment and financing consultants, legal advisers, and asset appraisal experts. Some previous studies such as Carrillo et al. (2008) have paid attention to the involvement of these experts in similar types of projects such as PFI or BOT. In China's TOT practice, appraisal experts can help the local government value the state assets accurately. Without their help, it is easy for the local government to make a wrong estimation. If the value is overestimated, the project cannot attract investors. If the value is underestimated, the state assets will suffer losses. Therefore, an appropriate assessment is very important for both introduction of foreign and domestic private investment, and preservation and increment of the state assets.

Investment and financing consultants and legal advisers also play an important role in the procurement process. Investment and financing consultants can help the local government implement the project procurement in accordance with international practice, and legal advisers can contribute to clear definition of rights and responsibilities between the parties and to effectively avoid contractual loopholes. Owing to the failure to recognize the importance of professional employment, the municipal government of Shenyang learned painful lessons in the Shenyang No. 8 Water Plant. Learning from this project, all subsequent projects have employed professionals. In fact, employment of professional advisers is not only essential to local governments, but also necessary for

investors. By comparison, foreign and domestic private businesses have paid more attention to this important issue.

Corporate Governance

During the concession period, a BOT project is operated by a single venture with foreign or domestic private investment. On the contrary, a joint venture between the state-owned enterprise and the investor is responsible for the operation and maintenance of a TOT project. This distinguishes a TOT project from a BOT project. Establishing a good corporate governance structure is a challenge to the success of a TOT project. If the corporate governance structure is well established, the two parties involved in a joint venture will trust each other and cooperate during the concession period, which helps to increase operation efficiency and achieve win-win results. If the corporate governance structure is not established appropriately, however, the two parties involved in the joint venture may fall into dispute and conflict during the concession period, or even early termination of the concession. In a TOT joint venture between a state-owned enterprise and a foreign investor, the Chinese party is required to control the shares. Generally speaking, the chairman of the board is appointed by the Chinese party. On the other hand, an expert from the foreign investor holds the post of general manager so that the foreign investor can bring its technical and managerial abilities into full play. In addition, both parties will share other important positions such as deputy general managers and financial controllers. Clear definition of roles and responsibilities is advantageous to the creation of a collaborative working environment in the project.

Governmental Supervision

Proper investor selection and successful project transfer is only the first step for the local government. During the concession period, the local government should take responsibility for the supervision of the joint venture. The primary purpose of supervision is to protect public interests and maintain social stability. Therefore, it can be regarded as an important indicator of TOT project success. According to "Administrative Measures for the Concession in Urban Utility Projects" issued by the MOC in 2004, the supervision of local governments primarily focuses on the following four aspects:

1. Supervision of the business performance of the concessionaire;
2. Supervision of the quality of products and services;
3. Supervision of the tariff/price; and
4. Supervision of the safety in production.

Obviously, the second and third aspects are more significantly associated with urban residents' daily life. For a water supply project, the quality of products means clean and safe water reaching the required standard, whereas the services of the joint venture refer to the availability of water, adequacy of water, appropriateness of water pressure, and timeliness of various repair activities. If urban residents are not satisfied with the quality, they can reflect their opinions to the complaint center organized by the local government. If evidence of complaints is proved, the local government has the authority to order the joint venture to rectify and improve.

On the other hand, water price is a social concern. In general, a water supply enterprise cannot set the price by itself. The tariff/price adjustment is usually guided and supervised by the water supply administration department of the local government. Meanwhile, a public hearing is necessary for tariff adjustment. As discussed by Qiao et al. (2002), tariff levels need to be reasonable from the viewpoint of consumers so that they are not burdensome, and from the viewpoint of investors so that the revenues are enough to compensate them. To achieve this, the local government needs to balance the consumers' affordability and the investors' profitability.

Reasonable tariff levels should reflect the average income of the whole society and the water cost of the joint venture. It is more appropriate to maintain the tariff level if there is no significant change in the market. When an adjustment is inevitable following a significant change in the market, a tariff level acceptable to both sides is considered to be the best choice.

Conclusions

The appearance of TOT provides a new concession scheme in China for existing infrastructure and public utility projects. Unlike BOT, TOT does not cover build as one of its essential phases, and therefore many risks can be excluded from consideration. This characteristic is so attractive to foreign and domestic private investors that they express strong interests in TOT projects. On the other hand, successful implementation of TOT projects helps local governments out of the predicament of financial strain and the low efficiency of state-owned enterprises. This paper introduces the application of TOT systems to urban water supply projects in China through evolution review and case studies. Four case studies have been carried out in different regions such as Shenyang, Shanghai, Shenzhen, and Lanzhou that show typical examples of TOT projects with both successes and failures. On this basis, experiences are summarized and lessons are learned.

A project involves many parties with different goals and objectives. Their interests often contradict each other. For this reason, it is difficult to find a uniform standard for the measurement of project success. This study attempts to look at the key to TOT project success from a balanced point of view. This means that, focusing on the local government's strategy, attention is also given to the investor's concern and public welfare. Following this principle, CSFs for TOT projects are identified from well-developed case studies. The eight CSFs identified include project profitability, asset quality, fair risk allocation, competitive tendering, internal coordination within government, employment of professional advisers, corporate governance, and government supervision. The identification of CSFs defines a framework for the creation of competitive advantages and the achievement of multiwin results in TOT projects. Only with a balance of all parties' interests is it possible to ensure the real success of a TOT project and sustain further development of the TOT system.

So far, the vast majority of TOT projects in China have been transferred to international leading water companies. Although domestic private businesses have participated in the competition of some TOT projects, none of them has won any large project. This illustrates that domestic private businesses are still some way from being able to compete with international leading companies in terms of technology, management, and experience. On the other hand, domestic private sectors have grown very quickly in recent years. They are more familiar with domestic circumstances, and they do not need to face such problems as fluctuation of exchange rate. For these reasons, it is expected that involvement of domestic private investors in large-scale TOT projects will increase in the near future. Further research will be carried out to keep track of the latest developments of domestic private sectors' involvement to investigate whether additional CSFs are needed for the new situations.

References

- Askar, M. M., and Gab-Allah, A. A. (2002). "Problems facing parties involved in build, operate, and transport projects in Egypt." *J. Manage. Eng.*, 18(4), 173–178.

- Association of Urban Water Supply. (2004). *China water supply yearbook 2004*, AUWS, Beijing.
- Carrillo, P., Robinson, H., Foale, P., Anumba, C., and Bouchlaghem, D. (2008). "Participation, barriers, and opportunities in PFI: The United Kingdom experience." *J. Manage. Eng.*, 24(3), 138–145.
- Chao, S. C. (2000). "The reform of state-owned enterprises in mainland China: A re-examination of state-society relations." *China Rep.*, 36(2), 221–238.
- Chen, C., and Messner, J. I. (2005). "An investigation of Chinese BOT projects in water supply: A comparative perspective." *Constr. Manage. Econ.*, 23(9), 913–925.
- China State Council. (1986). *Provisions for the encouragement of foreign investment*, CSC, Beijing.
- China State Council. (2004). *Decisions on the reform of investment system*, CSC, Beijing.
- Jefferies, M., Gameson, R., and Rowlinson, S. (2002). "Critical success factors of the BOT procurement system: Reflections from the Stadium Australia case study." *Eng., Constr., Archit. Manage.*, 9(4), 352–361.
- Kwak, Y. H., Chih, Y. Y., and Ibbs, C. W. (2009). "Towards a comprehensive understanding of public private partnerships for infrastructure development." *Calif. Manage. Rev.*, 51(2), 51–78.
- Lardy, N. R. (1992). *Foreign trade and economic reform in China 1978–1990*, Cambridge University Press, Cambridge, UK.
- Li, B., Akintoye, A., Edwards, P. J., and Hardcastle, C. (2005). "Critical success factors for PPP/PFI projects in the UK construction industry." *Constr. Manage. Econ.*, 23(5), 459–471.
- Mayo, R. E., and Liu, G. (1995). "Reform agenda of Chinese construction industry." *J. Constr. Eng. Manage.*, 121(1), 80–85.
- Ministry of Construction. (2000). *Provisions for the utilization of foreign capitals in urban utility projects*, MOC, Beijing.
- Ministry of Construction. (2002). *Principles of accelerating the marketization of public utility projects*, MOC, Beijing.
- Ministry of Construction. (2004a). *Administrative measures for the concession in urban utility projects*, MOC, Beijing.
- Ministry of Construction. (2004b). *Model concession agreement for urban water supply projects*, MOC, Beijing.
- National Bureau of Statistics. (1996). *China statistical yearbook 1996*, NBS, Beijing.
- National Bureau of Statistics. (1997). *China statistical yearbook 1997*, NBS, Beijing.
- National Bureau of Statistics. (2001). *China statistical yearbook 2001*, NBS, Beijing.
- National Bureau of Statistics. (2006). *China statistical yearbook 2006*, NBS, Beijing.
- National Bureau of Statistics. (2007). *China statistical yearbook 2007*, NBS, Beijing.
- National Economic and Trade Commission. (1998). *Provisions for the assets reorganization of state-owned enterprises through the utilization of foreign capitals*, NETC, Beijing.
- Punch, K. F. (2005). *Introduction to social research: Quantitative and qualitative approaches*, 2nd Ed., SAGE, London.
- Qiao, L., Wang, S. Q., Tiong, R. L. K., and Chan, T. S. (2002). "Critical success factors for tendering BOT infrastructure projects in China." *J. Structured Finance*, 8(1), 40–52.
- Rintala, K., Root, D., Ive, G., and Bowen, P. (2008). "Organizing a bidding competition for a toll road concession in South Africa: The case of Chapman's peak drive." *J. Manage. Eng.*, 24(3), 146–155.
- Robson, C. (2002). *Real world research*, 2nd Ed., Blackwell, Oxford, UK.
- Rowlinson, S., and McDermott, P. (1999). *Procurement systems: A guide to best practice*, E & FN Spon, London.
- Shen, L., and Song, W. (1998). "Competitive tendering practice in Chinese construction." *J. Constr. Eng. Manage.*, 124(2), 155–161.
- Shen, Q., and Liu, G. (2004). "Application of value management in the construction industry in China." *Eng., Constr., Archit. Manage.*, 11(1), 9–19.
- Silk, M. A., and Black, S. (2000). "Financing options for PRC water projects." *China Bus. Rev.*, 27(4), 28–32.
- State Development and Planning Commission. (1995). *Guidance catalogue of foreign investment*, 1st Ed., SDPC, Beijing.
- State Development and Planning Commission. (1997). *Guidance catalogue of foreign investment*, 2nd Ed., SDPC, Beijing.
- State Development and Planning Commission. (2001). *Suggestions on facilitating and guiding the investment of private sectors*, SDPC, Beijing.
- State Development and Planning Commission. (2002). *Guidance catalogue of foreign investment*, 3rd Ed., SDPC, Beijing.
- State Development and Planning Commission. (2004). *Guidance catalogue of foreign investment*, 4th Ed., SDPC, Beijing.
- State Development and Planning Commission. (2007). *Guidance catalogue of foreign investment*, 5th Ed., SDPC, Beijing.
- Tiong, R. L. K. (1996). "CSFs in competitive tendering and negotiation model for BOT projects." *J. Constr. Eng. Manage.*, 122(3), 205–211.
- Walker, A. (2007). *Project management in construction*, 5th Ed., Blackwell, Oxford, UK.
- Yuan, J., Skibniewski, M. J., Li, Q., and Zheng, L. (2010). "Performance objectives selection model in public-private partnership projects based on the perspective of stakeholders." *J. Manage. Eng.*, 26(2), 89–104.
- Zayed, T. M., and Chang, L. M. (2002). "Prototype model for build-operate-transfer risk assessment." *J. Manage. Eng.*, 18(1), 7–16.