BANGKOK, THAILAND, RAPID TRANSIT SYSTEM

Case Study (Transportation)

Project Summary:

Bangkok, Thailand covers about 606 square miles and is a densely populated area with about 1,300 people per square kilometer. Although the official population for 2007 in Bangkok was listed as 8.2 million, the actual population in the city is much higher. Like many major cities, the 1980s and 1990s saw an increase in the number of unregistered migrants who are not included in the official count (the actual city’s population could be as high as double the official level). Personal car registration in Bangkok is also very high. By the early 1990s, 82 percent of journeys into and through the city were by bus, car, motorbike and taxi, causing heavy traffic volume and an average speed of traffic to drop to only 10 kilometers per hour (6 miles per hour) in the city’s center. This was a major factor in making Bangkok one of the worst cities in the world for air pollution caused by vehicles. To combat traffic congestion, the government initially focused on expanding roads and expressways, but this did not achieve the desired affect because the number of cars continued to increase, which further increased congestion.

City planners, along with planners from the Massachusetts Institute of Technology (MIT), the European Commission and the Japan International Cooperation Agency conducted several studies, which recommended developing Bangkok’s outlying centers, following a pattern similar to that in Tokyo. The recommendation was for a rail transit system to help develop the outer areas and to help mitigate the congestion problems in Bangkok’s city center. However, the cost of the system - estimated at over US$1 billion – was more than the government was unable to fund on its own. Other options, including the use of a public-private partnership, were explored. The government settled on a 30-year, Build-Operate-Transfer (BOT) scheme for the elevated rail transit system for Bangkok. The first rail system of Bangkok, which was the first privately funded system in the world, began operations in December of 1999.

The BTS is comprised of two lines, the Sukhumvit and Silom, which run for 23.1 kilometers through the downtown area of Bangkok. The Sukhumvit line runs from On Nut to the Mo Chit bus terminal and is 16.8 km long, while the Silom line runs from the National Stadium to Sathorn Bridge at Saphan Taskin station and is 6.3 km long. The lines intersect at Siam Chit station in the middle of the downtown area.
The transit system sits 12 meters above the Silom and Sukhumvit Roads, which are major throughways in the center of Bangkok. The trains run on dual tracks, which are fixed directly to concrete plinths located between the lanes of the traffic below. To support the weight of the stations and system, the plinths go to a depth of 50 meters underground.

Although the ridership forecast predicted 650,000 riders per day for the opening of the system, the actual initial ridership was 180,000, only 28 percent of the forecast. By 2007 ridership increased to 380,000 riders per day, still significantly below predicted levels (just 58 percent of the 2000 projection). This inaccurate forecast has led to several major financial problems for the elevated transit system and the near collapse of the private company which was created for the project.

While the Bangkok Transit System (BTS) cannot be deemed a success because of all the financial difficulties which have occurred, it has been more successful in meeting another goal of the project. The air quality in Bangkok has improved significantly and in 2007 the city met United States air quality standards and nearly met the tougher European Union standards. While the government has also worked in other areas to help reduce air pollution, rail transit usage is responsible for part of the drop in pollution. While the secondary goal of decreasing the number of vehicles on the roads was not achieved because the city still continues to see an annual increase in the number of new vehicles registered, the BTS has contributed to the city’s ability to better control pollution.

Overall, the management of this PPP for a rapid transit system could be modified to improve the project’s finances and operations, but this case study offers some insights for what might be avoided to ensure greater success for similar projects (see Commentary below).

**Project Objectives:**

There were several objectives of the rapid transit system, the ‘Skytrain.’ The government sought to reduce congestion in the capital city. Prior to the BTS, the city had few public transportation options, which bred a culture of personal vehicle use. In the downtown areas, the average speed of traffic was about ten kilometers per hour (about six miles per hour) – sitting in standing traffic was a typical occurrence. A related problem from congestion is the economic impact of the inefficiency of moving goods and customers. Bangkok accounts for almost 50 percent of the country’s GDP and traffic congestion therefore affects the entire country’s GDP. The government wanted to address the congestion problem before the economy was seriously impacted.
A second goal of the PPP was to reduce pollution from truck, bus, and car traffic. Bangkok suffers from a high level of air pollution caused by traffic and airborne dust, which is the result of an aggressive building program. In Bangkok, surgical masks are worn by many residents to mitigate these air quality problems. Creating a rail transit system was seen as a way to move people out of their cars, thereby helping to reduce pollution.

**Project Description:**

1. **Partners**

The Bangkok Transit System Corporation (BTSC) was formed in 1992 to implement the public-private partnership for the elevated transit system. BTSC is made up of several private companies. A Thai project management company is the principal private company of BTSC with a 69.3 percent stake. An international infrastructure development company owns another 8.7 percent. Several Thai companies each own less than 3 percent of shares. BTSC originally planned to offer the remaining shares as a public offering, but the Asian Financial Crisis postponed this action.

The overall public partner was the Bangkok Metropolitan Administration (BMA), which is the local government of the city. One complicating factor of this project was that several agencies of BMA were involved in the PPP (see Implementation Environment below).

A second consortium of private companies was contracted by BTSC to build and operate the transit system. Tender documents for the turnkey project were issued to five consortia in March 1993 and a contract was signed in July of 1995. Maintenance was also added to this contract. The winning consortium which contracted to build, operate and maintain the system included two international development companies. One of the companies in this consortium is also the rolling stock manufacturer.

2. **Implementation Environment - Legislative and Administrative**

In 1992, the national legislature passed the Act on Private Participation in State Undertaking B.E. 2535, which provides the framework for PPPs in Thailand. The law is intended to ensure that large projects—those over 1 billion baht—are viable and that contracts are carried out under proper procedures. The law aims to prevent corruption in granting rights to private companies for the operation of state-owned property. PPPs covered by this legislation include both Build-
Operate-Transfer (BOT) and Build-Transfer-Operate (BTO) partnerships. The law allows PPPs in many sectors including electricity, telecom, ports, water and sanitation, and transportation.

Although the law does allow PPPs, its focus is on preventing corruption, not creating an environment that is PPP friendly. The law does not outline project valuation or procurement methods, and importantly also does not provide a means of sharing risks with the private sector when projects are not commercially viable. This makes it more difficult, and often impossible, to enter into a PPP.

Equally a problem is that the administration of PPPs in Thailand is not streamlined and efficient. Agencies proposing projects must submit feasibility studies to two different agencies depending on the classification of the assets, causing confusion for many project developers. Although most projects are in only one sector, many different agencies have authority, which can lead to confusion over which bodies should be involved and how to gain approval from all necessary parties. For example, there are sixteen different agencies for surface and marine transportation.

3. Financial Agreement

The total cost of the BTS is between US$1.3 billion and US$2 billion. Financing for the PPP came from both equity and debt funding. Approximately US$650 million in equity was raised in cash and through shareholder loans. Debt for the project came from a European development bank, the International Finance Corporation (a member of the World Bank Group) and Thai banks. The long-term debt for the project was agreed to in August of 1996, with a Debt Service Coverage Ratio that reflected the ridership forecast for the project.

To recoup costs, BTSC receives all revenue; this financial arrangement was established because the BTS is financed solely by the private sector. Fares for the system are based on a formula of domestic Consumer Price Index (CPI), exchange rate fluctuations and variations in U.S. interest rates. This translates into a seven percent increase in fares for a five percent increase in inflation.


A 30 year, Build-Operate-Transfer concession agreement was signed in 1992 between the BMA and the newly-formed BTSC. The concession contract had a fixed price, a specified delivery date, and performance standards. The contract also required the main private sector partner to maintain at least a 51 percent stake in BTSC.
The contract contained several provisions which affect the private sector partners’ ability to recoup their investment. Under the contract, the revenue stream for BTSC is based completely on fares; the government does not provide any funds to BTSC for operating the transit system. Fare increases are tied to inflation; fares are raised seven percent for each five percent increase in inflation. BTSC also retains all advertising revenue and revenues from right-of-ways. Given these provisions and projected ridership, it was estimated that BTSC would recover its costs within the first ten years with at least a 16 percent rate of return.

According to the contract, BMA is responsible for paying the cost of utility diversion when the costs are above 500 million baht. BTSC also does not have to pay a licensing fee to BMA for the first ten years of the contract. One area not specified under the contract was technology; the choice of technology was left up to the concessionaire.

5. Implementation Metrics

Construction of the BTS took over six years from the initial groundbreaking ceremony where the Crown Prince laid the foundation stone to the completion of the system. Due to land acquisition and other problems, the completion date was postponed from 1997 to late 1999. Following the groundbreaking ceremony in 1994, construction commenced on seven different sites in February 1995, due mainly to political pressure to begin construction; however, the turnkey construction contract was not signed until five months later. The construction contractor completed the project one month ahead of the second deadline in December 1999.

Opening day ridership was forecasted to be 650,000 riders per day; however, ridership for the system opening was only 180,000, just over 25 percent of the forecast. Ridership increased over the years and was up to 380,000 riders per day in 2007, a figure that is still less than 60 percent of the forecast for 2000. On December 9, 2005, ridership hit an all-time high of 500,000 single rides, but has not hit this total since. Ridership steadily increased throughout 2005 to well over 400,000 riders per day, due mainly to high oil prices, which encouraged people to switch from personal vehicles and taxis. As oil prices decreased, ridership on BTS also decreased. When ridership for the underground system, which is owned by another company and opened in 2004, is included, ridership only increases to 630,000 riders per day, still below the 2000 projection. Despite the utilization of transit by some people, the annual number of registered new cars is still increasing. Many people must travel by car from the outer neighborhoods in the city to transit stations before they are able to use the system, which means cars are still important in the city. Even though some people have left the road, and air quality has improved significantly, congestion is still a major concern in the city.
Commentary:

1. Methods for Overcoming Impediments

Several problems occurred with this project, which negatively affected the PPP. First BMA did not gain stakeholder support for its routes and station stops beforehand, resulting in the need to make some location changes after the contract was signed and construction had begun. For example, the original site of the major depot for the system was Lumpini Park, but large public protests in late 1994 forced the BMA to change the site to one located along Phahonyothin Road (near the Mo Chit Station) in early 1995. The Thai Cabinet also forced BTSC to significantly change the routes in two places. BTSC had to absorb the costs of these changes without compensation.

The Asian Financial Crisis, which hit in 1997, severely hurt BTS and limited BTSC’s ability to service its debt. With low ridership, revenues covered operating expenses, but were not high enough to make debt payments, especially after changes in the exchange rate between US dollars and the Thai Baht. When the contract was signed the exchange rate was 25 Baht per US dollar, but in 2000 the exchange rate was 40 Baht per US dollar and today the exchange rate is 34.6 baht per US dollar. This devaluation of the Baht, coupled with an inaccurate ridership forecast, has led to a debt service coverage ratio that is inadequate for the project.

2. Keys to Success or Failure

One of the key points of success of BTS was the interconnectivity between the various aspects of the project. The company which manufactured the rolling stock was also one of the builders of the system. By integrating these functions, the system was built, and can be maintained, more efficiently.

Another success is that air pollution in Bangkok is on the decline – in 2007 air quality in the city came within limits set by the United States and fell just shy of meeting European Union standards. Since 1997, there has been a 47 percent decrease in the amount of harmful small dust particles. Although cuts in air pollution cannot be attributed solely to increased use of mass transit—emission standards are now stricter, the government is promoting the use of natural gas and construction sites are monitored to minimize dust—some of the decrease in pollution is due to mass transit. Bangkok witnesses about 630,000 passengers a day between the two rail transit
systems and even though ridership is low for BTS, causing many problems, the switch to transit by some residents has helped reduce air pollution.

One of the major problems with this PPP was an inaccurate ridership forecast. On opening day, ridership was only 28 percent of the forecast and in 2007, it was only 58 percent of the 2000 projection. The ridership numbers were projected by one of the private companies involved in BTSC and no other projections were considered. Impartial due diligence should have taken place with regard to ridership because many aspects of the project relied on the forecast. As the first wholly privately financed transit system in the world, the PPP had high levels of risk, meaning the forecast was used in part to help reduce the apparent risk. Revenue and cost recovery for the private company are based on ridership as well as the debt structure. With an inaccurate starting point, these pieces of the PPP were incorrect and caused trouble for BTSC from the start.

The Asian Financial Crisis also damaged this project. In 2000, the exchange rate was 40 Baht per US$, but the contract was signed with an exchange rate of 25 Baht per US$. As a result, the debt service coverage ratio was drastically inadequate for the project. Currency exchange instruments which could have limited this damage were not employed in the project financing.

Neither the public nor the private sector partners gained stakeholder support for the project before construction began. Major, large-scale protests forced BTSC to change the location of the depot. The Thai Cabinet also forced costly changes to the system. Project sponsors must gain stakeholder support and input before construction begins to avoid problems, like the ones in Bangkok, that can severely cripple a project. The Thai government and BMA failed to acknowledge their role in this failure, and forced BTSC to absorb all of the resulting cost impacts.

The PPP legislation was insufficient because it focused on regulating government agencies instead of creating an environment that encourages the use of PPPs. It did not cover all types of PPPs and did not outline rules with respect to risk allocation and risk sharing. The Asian Development Bank is working with the Thai government to help them amend their PPP law. In 2007, the Cabinet did approve amendments to the PPP legislation, which should help make the law more efficient and easy to use.

Equally troublesome was the lack of a single, centralized public authority to oversee the entire process. The existence of multiple authorities, as witnessed in this project, led to delays, decision reversal and costs delays in implementation.
The entire transit system of Bangkok has several flaws which exacerbated the low ridership on the BTS. The BTS only covers 24 kilometers along two main routes; many would be customers chose to forgo the system because it did not meet their needs. More commuter channels are needed to be covered by the system. Compounding this, the bus rapid transit system in Bangkok does not function as a feeder system for BTS, but as competition. Since the bus system is one third the cost of the elevated system, more people choose to ride the bus system. BMA also has commissioned a second transit system, an underground system. While this system, built by Metropolitan Rail Transit Authority, covers other routes than the two covered by BTS, the two systems are not connected effectively and many people elect not to utilize public transit because they cannot easily use both. Even with the second system, the stations are located in the downtown area and many passengers must drive in from the suburbs to use the systems.

In May 2008, a decision was made in a Committee for the Development of Mass and Rail Transit meeting to endorse a government buyout of the BTS. The committee budgeted Baht 50 million (US$1.4 million) for a feasibility study and asset assessment. The move is viewed as a way to more effectively manage the greater Bangkok transit system and integrate the two systems. The Public Debt Management Office of the Finance Ministry estimated that the takeover will cost about Baht 56 billion (about US$1.6 billion), with the majority of the funds going to purchase BTSC’s debts. While the integration of the two systems is needed to make public transit in Bangkok efficient and user-friendly, a government buyout might be a possible solution to Bangkok’s transit problems. Another possible solution is to utilize transit oriented development around some of the stations. The majority of stations are three levels, with the upper train level, the ticketing level and a lower level of shops. BTSC could take advantage of the stations’ locations in the busy downtown area to increase revenue to improve the system.