TRANSACTION COST IN PUBLIC-PRIVATE-PARTNERSHIPS

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ABSTRACT

Due to limited financial resources of governments, Public Private Partnerships (PPPs) have emerged as one of the most important ways of delivering infrastructure projects. Compared to traditional delivery approaches, PPPs bundle complex investments and service provisions with different project entities in a single long-term contract. Because of these special characteristics, many transactions happen during the life cycle of a PPP project, resulting in an increase in "transaction cost" of the project. Transaction costs are known in economics as the costs associated with executing projects such as searching, negotiating, contracting and enforcing. Earlier studies show transaction costs in other industries are significant.

This paper covers a theoretical discussion about the definition of transaction costs and different factors affecting them. It discusses the relationship between number of bidders, procurement time, complexity of the project, program maturity and size of the project with the transaction cost of the project. It develops a general PPP process flowchart for infrastructure projects in the US, and based on the mapping of PPP transaction activities to project costs, presents a cost breakdown structure (CBS) as well as a cost coding system. This accounting model is further justified with a case study about I-595 improvements project in Florida.

Key Words: Cost Breakdown Structure, Cost Coding System, Public Private Partnership, Transaction Cost

1. INTRODUCTION

Over the last decade or so, the United States has seen a rapid growth of private-sector financing through public–private-partnerships (PPPs) as a new way of procuring and maintaining public infrastructure (Yescombe, 2007). Delivering infrastructure projects using PPPs is considered an innovative delivery method that has been exercised in other countries in the world in order to fill the gap between available government funds and needed investments. Major infrastructure projects in Australia, Canada, the EU, Mexico, South Africa, and the United Kingdom has been delivered using PPPs.

Although PPP has been exercised in many countries over years, still there are some disagreements in defining PPP. The Office of Public Sector Information in the United Kingdom defines Public Private Partnerships as "arrangements typified by joint working between the public and private sectors. In their broadest sense, they can cover all types of collaboration across the private-public sector interface involving collaboratively working together and risk-sharing to deliver policies, services and infrastructure" (HM Treasury, 2008). In Australia, PPP is defined as "a long-term contract between the public and private sectors where government pays the private sector to deliver infrastructure and related services on behalf, or in support, of government's broader service responsibilities. PPPs typically make the private sector parties who build infrastructure responsible for its condition and performance on a whole-of-life basis" (Australian Government: Infrastructure Australia, 2008). The U.S.DOT's Report to Congress on Public-Private Partnerships (U.S.DOT 2004) defines a PPP as a contractual agreement formed between public and private sector partners, which allows more private-sector participation than is traditional. This agreement usually involves a government agency contracting with a private company to renovate, construct, operate, maintain, and/or manage a facility or system for a long period of time. While the public sector usually retains ownership in the facility or system, the private party will be given additional decision rights in determining how the project or task will be completed or operated (NCHRP, 2009).

It is believed that PPPs can bring cost and time-savings and efficiencies on project delivery and operations (FHWA, 2007). One recent study commissioned by Infrastructure Partnership Australia (2007) compared the efficiency of PPPs with traditional procurement, and found that PPPs were more successful in terms of cost and schedule. Although PPPs can help governments fill the gap between available public funds and needed resources, they may increase the cost of procuring, monitoring and enforcing contracts especially when compared to traditional procurement of public investment projects. The main sources of higher transaction costs in PPPs are their long-term character, ownership and financing structures, and risk-sharing features (Gerti & Timo, 2005). Due to all of these reasons, in PPPs the degree of contractual complexity is high, so attempts to reach agreements increases the costs associated with a PPP transaction. Consequently, the search (tendering and bidding), contracting, and monitoring processes become more resource-consuming—both in terms of budget and time—than in traditional methods of procuring projects. Negotiating the contract is especially costly mainly because the level of uncertainty in PPPs is high, and also risk and rewards are not very clear. Although there is a considerable amount of transaction cost embayed in PPPs, there is still not enough information about how to define, track and quantify this cost. In evaluating PPP proposals, it is very important to be able to estimate the transaction costs of the contract to make sure the higher transaction costs do not erode the cost savings achieved through a PPP structure.

This paper aims to offer a systematic way to determine transaction costs in PPPs in the United States. In order to do so, we briefly discuss the transaction cost economics in section 2, and based on this theory we define different transaction cost items in PPPs. In order to do so, a PPP process flowchart is developed and mapped to the cost items. In section 4, we suggest a cost coding system to track and record the cost items. In section 5, a case study about I-595 improvements project in Florida will be presented in accordance with conclusions and remarks.

2. TRANSACTION COST ECONOMICS

TCE first originated in 1937 by Ronanld Coase. He defines transaction costs as the costs of using price mechanism with it being associated with specifying, negotiating, and enforcing contracts (Coase, 1937). Coase introduces a hierarchy model based on internal and external transaction costs, and argues that if transacting in the market proved too costly, transactions would take place within the boundaries of the firm; otherwise, the firm will go to the market to do the transaction. Niehans (1969) defines transaction costs as the costs associated with the transfer of ownership from one individual to another. Williamson defines transaction costs as "The costs of writing and executing complex contracts across a market varied with the characteristics of the human decision makers who are involved with the transaction, on the one hand, and the objective properties of the market, on the other …" (Williamson, 1974). Later in 1985, he redefines transaction costs to include the costs of drafting, negotiating and safeguarding an agreement, and also the costs of haggling, costs of governance, bonding costs to secure commitments (Williamson, 1985).

Creating a model to estimate transaction costs is a challenging job. One of the difficulties is the confusion about the definitions, and therefore the empirical parameterizations of key variables associated with transaction costs in different industries. Another problem that happens while analyzing data is the data collection limitations. The accounting system that most of the firms use to track and record their costs is either not adopted to consider the transaction costs seperately, or it considers transaction costs as general cost item withought going into details. This problem usually creates lots of challenges for researchers regarding defining a cost-breakdown structure for transaction costs to consider different cost items within a transaction.

There have been many attempts to apply the transaction cost economics in different industries in order to quantify transaction costs. Colby's (1990) try to investigate the transaction cost in water market, Noi's (2002) attempt to estimate the Aid transaction cost in Vietnam, Antinori & Sathaye's (2007) study regarding assessing transaction costs of project-based greenhouse gas emissions trading, and the United Nations Development Programme's (2009) study regarding transaction costs in the Clean Development Mechanism (CDM) Projects are some examples of attempts that have been done to assess transaction costs in different industries. Figure 1 shows how transaction cost is defined and categorized in each one of the mentioned studies.

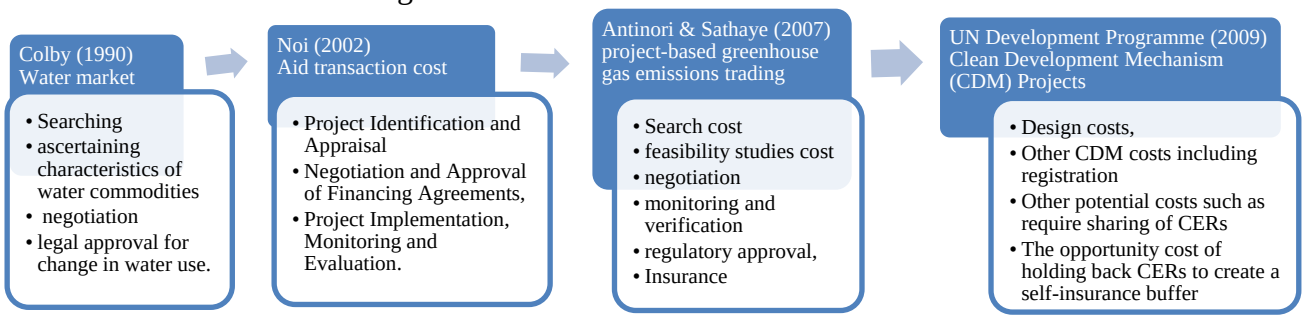

Figure 1: Early studies in transaction cost measurement

3. TRANSACTION COST IN PPPS

The specific responses that different parties in PPPs manifest depend on whether the environment is certain or uncertain. Because of the mentioned characteristics of PPPs such as the rare occurrence of contracts, the long life cycle of the agreement, and the complex revenue streams and traffic volume studies, environments associated with PPPs are relatively more uncertain than environments associated with traditional delivery methods. This environmental uncertainty increases the searching cost. Meanwhile, a PPP model is a mixture of an economic model and a political model, so the PPP model is more complex than the mentioned two models. In a PPP model, different entities have different goals; the public agency tries to maximize the social benefits and minimize the political costs and private agency tries to maximize the ROR on their investment and minimize the capital cost. Therefore, high opportunism from both sides is embedded in PPPs, which makes the negotiations between both sides more expensive. In addition, PPPs are associated with high levels of behavioral uncertainty and environmental uncertainty. As a result, transaction costs associated with procurement of PPPs is higher both in terms of feasibility studies and negotiations.

There are some parameters that affect the transaction cost of a PPP project during procurement phase. One of the most important factors is the size of the project. Usually, a transaction cost is reported as a percentage of the total capital cost of the project, however, when the size of project increases, this percentage changes. The transaction cost for smaller projects is usually higher than larger projects in terms of the percentage of the total capital cost of the project. This occurs because no matter what the size of the project, many of the transaction activities stay the same. However, since the complexity of larger projects is usually higher than smaller projects, transaction activities may cost more; but this increase in cost is not proportional to the increase in capital cost of the project. The next factor which plays a role in percentage of transaction cost is the number of bidders. In the event of a lesser amount of competition, transaction costs during the project initiation and procurement phases will be relatively low, but it is likely that total project costs will be higher due to a weaker competitive procurement process. One would expect the public-sector cost of bidding to increase with the number of bidders. This is due to more work for the public agency in terms of pre screening, and proposal evaluations, and also due to the increase in the transaction cost of losing bidders. On the other hand, transaction costs in the project initiation and procurement phases will be relatively lower, but it is likely that the total project cost will be higher due to less competitive procurement process.

Another factor that affects transaction costs in PPPs is the location of the project. The meaning of location in this context is not the actually geographic location of the project, but the country or state in which the project will be constructed. In another perspective, the location can be defined as the maturity level of the PPP program in the region in which a PPP project is going to be procured. This maturity level can be defined as having enough legal supports for PPPs, having enough resources for PPPs both in terms of manpower and knowledge, and also having enough previous experience with other projects using PPP as the delivery method. There are many factors that determine whether the maturity of a PPP: having a good legislator base, having enough experience in terms of previous PPP contracts, having enough resources in-house in terms of

experienced staff and consultants and having good partners who have already worked with them on other projects can all be determinant factors in this case.

The other issue that can increase the transaction cost in PPP projects is the level of complexity of the project. Complexity increases uncertainty or risk and, will increase the likelihood of having higher transaction costs. The specific responses that different parties in PPPs manifest depend on the certainty of the environment. Due to the mentioned characteristics of PPPs, such as the rare occurrence of contracts, the long life cycle of the agreement, and complex revenue streams and traffic volume studies, environments associated with PPPs are relatively more unstable than environments associated with traditional delivery methods. This environmental instability increases the procurement cost.

Complexity of the project also plays a great role in the transaction cost of a PPP project. A PPP model is a mixture of an economic model and a political model, thus, the PPP model is greater in complexity than the two models discussed. In a PPP model, different entities have different goals; the public agency tries to maximize the social benefits and minimize the political costs. The private agency tries to maximize the Rate of Return (ROR) on their investment and minimize the capital cost. Therefore, high opportunism from both sides is encountered in PPPs, making the negotiations more expensive for both sides. PPPs are also associated with high levels of behavioral uncertainty and environmental uncertainty. As a result, transaction costs associated with procurement of PPPs is higher in terms of feasibility studies and negotiations.

It should be noted that besides searching and negotiating transaction costs (during procurement of the project), any PPP is associated with monitoring and enforcement costs over the life cycle of the project (after procurement). To better understand the effect of environmental uncertainty on monitoring and enforcement costs in PPPs, the results of Ryu's (2006) analysis can be used to better explain the relationship between environmental uncertainty and interdependence magnitude with transaction costs. If a PPP contract is negotiated well, the risks and rewards in the PPP agreement are fairly shared between the two parties, so the interdependence magnitude of the transaction is high. In other words, a good PPP agreement should be negotiated in a way that if the project turns out to be successful, both parties enjoy the benefits, and if the project fails both parties bear the losses. In this case according to Ryu's analysis, the monitoring cost will be lower; otherwise, we will have a high-monitoring cost based on the level of uncertainty.

Figure 2 shows how uncertainty and interdependence magnitude can affect the total transaction cost, as well as transaction cost during searching and negotiation phases (N), and transaction cost during monitoring and enforcement phases (M). Cells 2 and 3 represent traditional delivery methods in which due to the characteristics of the contract, the environmental uncertainty is lower, and so the total amount transaction cost is smaller. Cells 1 and 4 represent the situations with high levels of uncertainty, such as in PPPs, with the total amount of transaction cost higher due to higher levels of uncertainty associated with the project. From another perspective, cells 1 and 2 represent the situation in which success or failure of one party is not highly related to the success or failure of the other party. For instance a lump sum contract which cost overruns is borne only by the contractor. Cells 3 and 4 represent situations in which risks and rewards are fairly divided between the two parties. In other words, they represent a high interdependence

and a perfect partnership. According to Ryu's analysis, when interdependence magnitude is high, exchange parties are each vulnerable to retaliation from the other. Thus, an attempt to control exchange partners through overt governance (monitoring) produces a high likelihood of retaliation. Cell 1 represents highly uncertain environments that lead to the development of the condition in which the information about the environment is asymmetrically distributed between exchange parties. Cell 2 represents a low-interdependence environment that allows parties to behave opportunistically (Ryo, 2006).

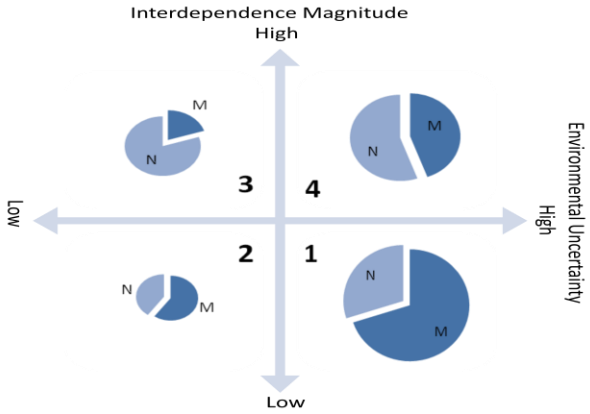

Figure 2: The Transaction cost quadrant (modified from Ryu, 2006)

4. TRANSACTION COST BREAKDOWN STRUCTURE IN PPPS

4.1. Early Studies

There have also been some attempts to estimate transaction costs in PPP projects. Ho and Tsui (2009) tried to identify some major variables such as principal-principal and renegotiation problems as well as soft budget constraints and their effects on transaction costs in PPPs. They suggest that some transaction cost sensitive variables such as specific characteristics of the project itself and certain conditions characterizing institutional environments can have a significant effect on transaction costs. In another study, Soliño & Santos (2009) try to distinguish, at every stage, between external costs (such as technical, legal and financial advice) and in-house costs such as project preparation costs. These costs considered include the Environmental Impact Assessment, feasibility study, preliminary design, and bidding costs including tender documentation preparation and costs for negotiation**.** Their study is based on data collected from different infrastructure projects in the European Union (EU) that suggests a model to estimate the transaction cost of PPPs based on some variables (i.e.: type of project, capital cost of project, procurement duration, location, and number of bidders).

Another step to identify and measure transaction costs has been taken by Gerti Dudkin and Timo Välilä (Dudkin & Välilä, 2005). According to the data collected from projects financed by the European Investment Bank, they have concluded that the level of transaction costs in the procurement phase of infrastructure projects are, on average, about 10 percent of the capital value of the project. They have divided these transaction costs into three categories consisting of public sector, winning bidders, and losing bidders as depicted in Figure 4 below. Based on their research, the overall transaction cost of the project for the public sector, is about 2-3% of the capital value of the project., the winning bidder 4-5%, and the losing bidders is about 2-5% (Dudkin & Välilä, 2005).

Although there have been some attempts to measure the transaction costs in PPP projects, those projects are either theoretical discussions, or based on data from PPP projects in other parts of the world such as EU. The concern here is that the PPP program in the US is very different than the PPP program in EU. For instance the PPP program is still in the US, and there are not enough guidelines and standards available to practice PPP. Also, the legal system in the US is different which makes the PPP process flowchart in the US different than the one in EU. We can also add the effect of different financial structure, procurement legislations and also the effect of bureaucracy to the mentioned list. Therefore; those numbers cannot be necessarily true about PPP infrastructure projects in the US. It should be also mentioned that those studies cover transaction costs in a very broad way, and report only the overall transaction cost o the project for the private section, winning bidder and loser bidders. Although those numbers are very important, but if one want to have a more accurate estimation about transaction cost during different phases of the project and for different transaction activities, there is a need for a better accounting system that can track and record transaction cost items and give a more useful reports based on different filtering options. The next section of this paper focuses on developing such accounting system in order to increase the accuracy of cost accounting system for PPP infrastructure projects, and so the accuracy of transaction cost estimation models.

4.2. Transaction Cost Breakdown Structure (CBS) for the US-PPP model

Before developing a CBS, it is necessary to have a general PPP process flowchart based on federal and local PPP legislations and regulations. It should be noted that the legislation and regulations vary among different states, which result in different PPP process flowcharts. However, in this research we have come up with a general process flowchart which can be adapted for different states with some minor changes. In order to develop this process flowchart, PPP legislature in three different states, Texas, Virginia and Florida, were reviewed, and PPP practice and experience in these states was studied by conducting interviews with each state's Department of Transportation (DOT) officials. Figure 3 shows the PPP process flowchart that is being developed based on the information obtained from interviews and legislation.

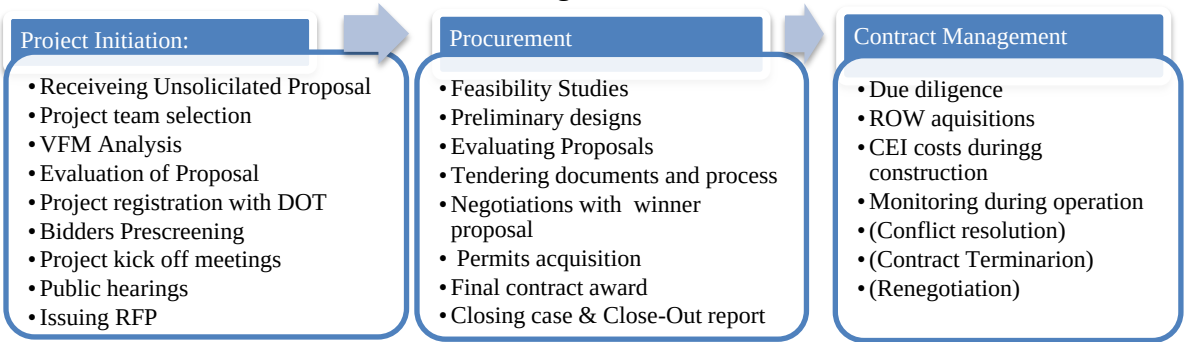

Figure 3: PPP Process transaction activities flowchart in the U.S.

Figure 4 illustrates a CBS from a public agency point of view where transaction costs are divided into two main factors: initiation / procurement costs and contract management costs. Initiation and procurement costs are related to the first two phases of the PPP process flowchart and are mainly related to the activities prior to signing the contract. Contract management costs are mainly related to the activities that occur after

closing out procurement of the contract (after signing the contract) such as O&M quality controls, contract enforcement, and dispute resolutions. Level 3 of the CBS represents whether the cost has been incurred internally by the state DOT or incurred externally due to having consultants or advisors. It should be noted that the term external refers to payments of DOT are not on the payroll system of DOTs. In other words, DOT receives bills for such services and pays the bills. This is different than when DOT pays salary to its employees. Level 4 represents different activities that can result in transaction costs. Level 5 divides the costs associated with those activities into two categories: direct costs which can be directly calculated based on resources (in terms of labor hour, equipment or material spent to accomplish those activities) or indirect costs which can be calculated based on assigning overhead and general administration costs to the project. Finally, the last level represents the cost items.

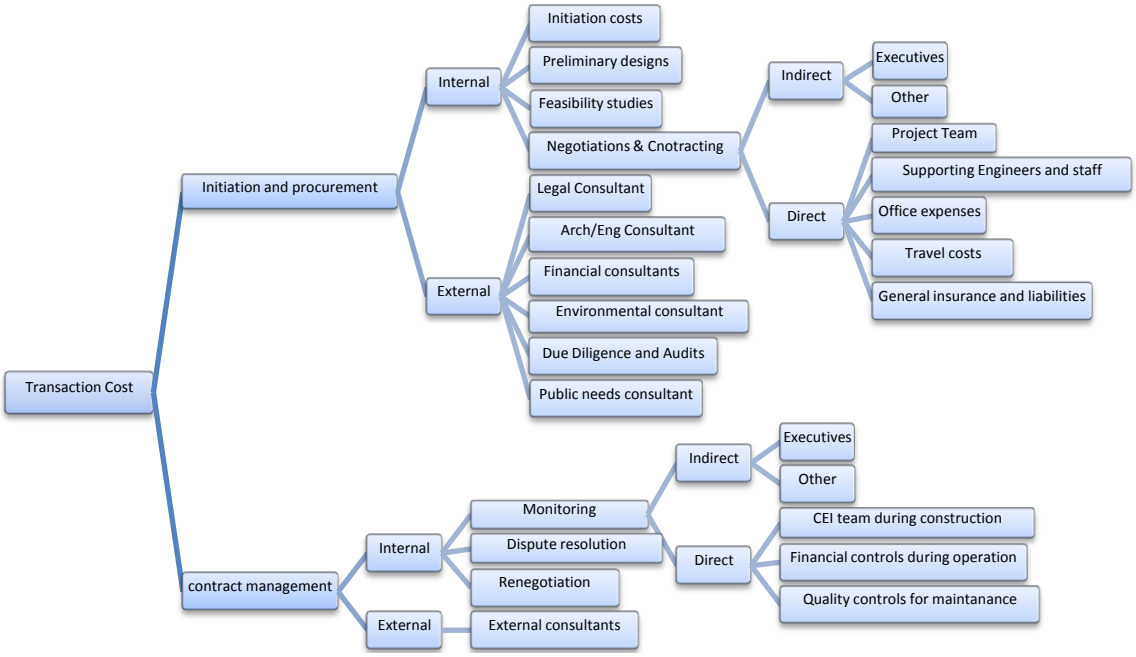

Figure 4: Transaction Cost Breakdown Structure

4.3: Cost Coding System

After extensive efforts to collect data regarding the transaction cost of infrastructure PPP projects in the US, there has only been little success in collecting data. This is mainly due to inconsistency in the way that transaction costs are defined, tracked and recorded in different states. It is apparent that there is a need for a standard accounting model which can be used in different PPP projects in order to collect and record transaction cost items. This section will describe how to develop such systems by mapping between the developed CBS in the previous section and transaction cost accounts. The accounting model that has been developed in this paper is similar to the cost accounting system which has been developed by Construction Specification Institute (CSI). However, this system is based on special characteristics of PPPs, and it is designed in a way that maximizes the accessibility to the transaction cost items. This system can generate reports based on different filters in order to detailed transaction costs. Figure 5 illustrates how the cost coding system is designed.

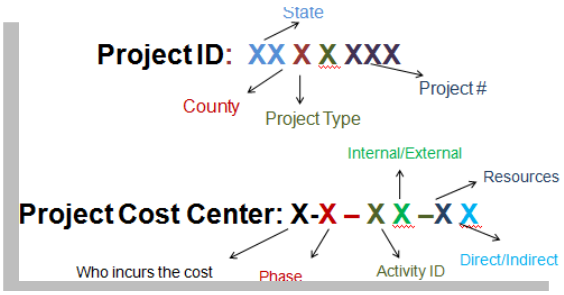

Figure 5: Cost Coding System

As illustrated in figure 5, the cost coding system consists of two separate numbers. The first number represents the projects ID, and the second number represents the project cost center. Project ID consists of 7 digits – it can be more or less depending on requirements. The first 2 digits represent the state. The third digit represents the type of project; for instance railway, roadway, tunnel, bridge, etc. The last 3 digits represent the project number. Similarly the project cost center consists of 6 digits. The first digit represents who incurs the cost; for instance public sector, winning bidder or loser bidders. The second number represents the three different phases of a PPP agreement based on the mentioned PPP process flowchart in Figure 3. The third digit represents different transaction activities in each phase again from figure 3. The fourth digit tells us whether DOT paid those costs through a bill (external) or through normal salaries to its own employees or office budget (internal). The fifth digit represents the resources which have been consumed for that activity such as manpower, equipments or material. The last digit shows whether those costs are incurred directly, or they have been calculated indirectly, for instance overhead allocation.

5. CASE STUDY: I-595 IMPROVEMENTS PROJECT IN FLORIDA

5.1 Project description

Given the high traffic demands in I-595 in Florida, its expansion had been considered since 1994. The I-595 Corridor Roadway Improvements project was initiated preliminarily to increase the traffic capacity of I-595 to meet the new demands. This project consists of the reconstruction and widening of the I-595 mainline with a total length of approximately 10.5 miles, and the total cost of approximately $1,833.6 million (in present value in 2009 dollars, given a 5% discount rate). The project is being implemented as a public-private partnership between Florida DOT (FDOT) and I-595 Express, LLC (ACS Infrastructure Development) as Concessionaire to design, build, finance, operate, and maintain the roadway for a 35-year term. FDOT will provide management oversight of the contract; will install, test, operate and maintain all tolling equipment for the express lanes; and will set the toll rates and retain the toll revenue.

5.2 Project financing

The financing package for this project is relatively unique in that the concessionaire is raising funds through different sources. The senior bank loans ($782 million) come from a 12-bank club (Spanish, French and Australian banks), and the TIFIA loans ($603 million) are exactly equal to 33% of the total eligible costs of the project. The I-595 Express, LLC, is the official borrower for the TIFIA loan. The interest

rate on the TIFIA loan on this project is 3.64 % (the current TIFIA interest rate is 4.74% for a 35-year loan as of Thursday, April 15, 2010).

The bank debt on this project has an interest rate of 6.58% and a 10-year maturity. There is an option to refinance these loans later through the life cycle of the project by new bank loans, bond issues, and/or Private Activity Bonds (PABs). If there is a gain due to refinancing the loans at a better interest rate, FDOT would take a share of the gains equal to 50% of the gain. In addition, FDOT has the option to purchase the project debt, if it is in default. (Minnesota Department of Transportation, 2009)

Table 1: Source of Funds for I-595 Improvements Project

Source	Amount	% of total cost
Bank Loans	$782 million	42.6
TIFIA	$603 million	32.9
Equity	$208 million	11.3
Revenues	$10 million	0.5
FDOT Grants	$232 Million	12.7
Total	1, 835 million	100.00

Source: Florida Department of Transportation (FDOT)

5.3 Project transaction cost

In order to received the transaction cost of I-595 Improvements project, the project manager of the project, financial management office, and the financial advisor of the project were contacted separately. Table 2 summarizes the results of the information which was obtained through different sources for this project.

Table 2: I-595 improvements project transaction costs reported by FDOT

Source	Amount ($)	% of Total
Financial Advisors	2,200,000	10%
Arch& Eng Consultants	14,850,000	70%
CEI	1,900,000	9%
Legal Consultants	2,400,000	11%
Business Consultants	N/A	- --
FDOT Internal Costs	N/A	- ---
Total TC	21,350,000	100%

Having a quick look at the above table reveals that FDOT is not recording detailed data about different transaction activities. It also shows that FDOT is not using an internal time / cost allocation system in order to track the internal transaction costs that it incurs. However, they may have accounted for those internal cost items in the Construction Engineering and Inspection (CEI) section. It should be noted that the above transaction costs are the transaction costs of the project till July 2009. In other words, those transaction costs are mainly procurement cost of I-505 project from FDOT point of view which is approximately 1.1% of the total cost of the project.

CONCULSIONS AND REMARKS

This study tries to come up with a standard accounting model based on which public agencies can track and record their transaction costs associated with a PPP project, and then use the data to estimate the transaction cost for future projects. It introduces the PPP process flowchart in the United States. It should also be admitted that it is very difficult to obtain detailed data about the internal transaction costs because each state has a

different accounting system, and they usually do not record the detailed data. Based on mapping between the PPP process and cost items, we have tried to introduce a standard cost coding system to track and record transaction costs. This system can help state DOTs record and track the detailed transaction cost items. This model is highly essential for state DOTs because according to some PPP legislations, states can calculate the transaction cost of PPP projects, and add it to the total cost of the project in order to be reimbursed for their costs. In addition, by following this model public agencies can create a good transaction cost database that can be later used in having more accurate transaction cost estimations. Besides, this transaction cost database can help researchers to have access to more detailed data, and can help them conduct further investigations about the optimal point between transaction costs before negotiations and transaction costs after negotiations, or to compare transaction costs in different phases of PPPs across different states. With better access to more reliable data, researchers may also conduct regression analysis in order to find the relationship between different variables that have an effect on transaction cost, and will enable them to come up with accurate models to estimate transaction costs based on those inputs.

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