Evaluation of the Functions of Public Sector Partners in Transportation Public-Private Partnerships Failures

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Abstract: Public-private partnerships (PPPs) are institutional arrangements that facilitate private business activities in the public sector. The adoption of transportation PPPs is based upon governmental efforts to achieve extended efficiency, economy, and effectiveness in comparison to conventional infrastructure procurement systems. Transportation PPPs have shown remarkable contributions in achieving infrastructure development goals. However, introducing long-term profit oriented activities for public infrastructures, which basically run on the principles of social welfare, has brought numerous new management issues and risks that were never observed before in conventional infrastructures' procurement systems. New to such risks, public sector personnel have become prone to make mistakes that could cause loss of value to the public and even partnership failure. Along with a long list of successful transportation PPP projects, there also are a notable number of failed transportation PPP projects. This study is motivated by such failed transportation PPPs, in which public sector partners played key roles leading to partnership failure. First, a set of failure drivers has been established based on the evaluation of 35 case studies of failed transportation PPP projects. The identified failure drivers include improper actions and decisions by the project partners, socio-economic factors, factors associated with political and national situations, and other associated events responsible for transportation PPP failures. Second, the causal relationships among the failure drivers have been identified and the functions of the public sector personnel are evaluated. Third, the causal relationships are discussed in detail in terms of failure mechanisms, with examples extracted from case studies. The identified failure mechanisms have revealed the fact that failure drivers associated with public sector partners transmit their impacts over the entire project life cycle, thereby triggering new failure drivers and creating problems for other project partners. The findings of this paper will help public sector personnel to safeguard partnerships more effectively and provide private sector PPP practitioners with a better understanding of their counterparts' actions and decisions, and their influence on the project success. **DOI: 10.1061/(ASCE)ME.1943-5479.0000387.**

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Introduction

Public-private partnerships (PPPs) have been accepted worldwide as alternative forms of public infrastructure delivery. The development of infrastructure PPPs has emerged as a viable alternative, especially when public sector agencies are unable to achieve infrastructure development and management targets due to budgetary and technical constraints. The budget constraints also appear as a political driver for PPPs, particularly in circumstances when borrowing limitations restrict the governing politicians in fulfilling infrastructure development promises to their voting constituencies (Gawel 2011). Nevertheless, the PPP has been recognized as an effective way of achieving value for money (VFM) in procuring public infrastructures (Chan et al. 2010). The efficiency and value offered by PPP models have attracted many researchers from academia and industry to evaluate the rules of conduct for private activities in public infrastructures. In the contexts of the PPP framework, researchers are challenged to evaluate new organizational protocols to safeguard the partnerships and the embedded value for the public, as typical PPP projects carry higher than the traditional levels of risks of conventional procurement systems (Zayed and Chang 2001).

Consequently, numerous research studies have been done in the past to identify the factors necessary to bring success and benefits for both the public and the private partners in a typical PPP arrangement. Tiong (1996) identified six critical success factors (CSFs) in winning build-operate-transfer (BOT) contracts: (1) entrepreneurship and leadership, (2) right project identification, (3) strength of the consortium, (4) technical solution advantage, (5) financial package differentiation, and (6) differentiation in guarantees. Zhang (2005) identified five CSFs, with sets of sub-success factors (secondary success factors), for infrastructure development PPPs. The five CSFs are (1) favorable investment environment, (2) economic viability, (3) reliable concessionaire with strong technical strength, (4) sound financial package, and (5) appropriate risk allocation via reliable contractual arrangements. Li et al. (2005) identified CSFs for private finance initiated (PFI) projects in the United Kingdom. Besides the CSF approach, massive research has been conducted on other PPP issues. For example, Zhang (2004) worked out methods and criteria for selection of the concessionaire, El-Gohary et al. (2006) presented a knowledge-based approach for PPP stakeholder management, and Clifton and Duffield (2006) applied alliance principles for better outputs of PPP projects. All these studies focused on identifying and developing domains of "to-do" tasks necessary to bring success in infrastructure PPPs; however, they failed to highlight "not-to-do" tasks or the factors that bring

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vulnerability to the PPPs. Irrespective of the availability of massive research, practical experience has shown problems with infrastructure PPPs that left both project partners with huge losses.

Dismayed by the number of failed PPPs in almost every country, the authors (2011) undertook a case study analysis of failed transportation PPPs to comprehend the underlying failure phenomena. The study mainly focused on failed transportation PPPs in different geographic regions. The study yielded PPP adoption and failure trends in different countries and geographical regions. The study also indicated the existence of failure drives in transportation PPPs which systematically led to failure. This paper takes the findings of the case study analysis (Soomro and Zhang 2011) and attempts to identify the critical failure domains in the context of transportation PPPs.

The open literature on transportation PPPs collected for the case studies has shown examples where public sector officials have lapsed in developing firm partnerships. Among many reasons, the most notable is that PPPs were considered as a panacea for financial and technical deficits to develop and manage transportation infrastructures. Public sector personnel were unable to comprehend the PPP framework and issues like improper tendering practices, improper risk allocation between project partners, continued roguish attitudes towards private partners and other problems associated with PPP projects were observed. The improper actions arising from the public sector have led to more complex problems which have ultimately caused partnership failures. Such phenomena of improper public sector management in transportation PPPs have been witnessed not only in less developed and developing countries, but also in developed countries like the U.K., U.S., and Canada, which have a bitter history of bad PPP deals. Therefore, this paper specifically attempts to identify failure trends induced by the public sector partners in transportation PPP failures.

Research Methodology

This research takes a "grounded theory" approach, in which theory is generated through systematic analysis and data processing; rather than beginning with a hypothesis and testing it against facts to prove its authenticity (Yancey and Turner 1986). The open literature on failed transportation PPPs is used as root source data to develop theoretical constructs on public sector partners' part in transportation PPP failures. Nevertheless, this research is determined in three parts: (1) selection of failed transportation PPP cases, (2) event sequence mapping (ESM), and (3) identification of failure drivers and failure mechanisms. The Following paragraphs explain each part of the research methodology in detail.

Selection of Failure Cases

The first set of failed transportation PPP projects is derived from the World Bank's database for "Private Participation in Infrastructure (PPI)." Nevertheless, the PPI database has certain limitations in that it only keeps records for PPPs in developing countries and does not have any records for the projects not yielding VFM to the public. Therefore, the search for failed transportation PPP cases is then extended to all available literature on the Internet tagged as "transportation public-private partnerships," which returned thousands of documents citing a variety of failed transportation PPP projects in both developed and developing countries. Among the thousands of documents found are research papers and evaluation studies made by public sector organizations and other international financial institutes, audit reports, and reports by nonprofit organizations.

All failure cases identified through the PPI database and Internet search are then assessed systematically in three consecutive phases to assure the failure status of particular projects and to assess their suitability for case studies. The very first phase is that the project must satisfy the failure criteria established to mark a PPP project as failure. Table 1 illustrates the established failure criteria. The second phase is to locate the reliable documents supporting the identified projects. The reliability of the documents is discussed later on under the section of event sequence mapping. Therefore, failed projects for which not enough supporting documents are found are ignored. The third phase is to assess the validity of the available documents, citing events in failed transportation PPP projects. The third phase is applied only to the failure cases categorized as not delivering VFM. The reason is that numerous documents prepared by nongovernment organizations, especially some antiprivatization organizations, describe many projects as not delivering VFM at all; however, the concerned public sector officials of these projects were satisfied that VFM was achieved. Therefore, cases illustrating the failure type "did not deliver VFM" are not considered for further analysis unless supported by more reliable evidence like audit reports or official project evaluation reports and articles published by reputable research journals.

All failed transportation PPP cases not fulfilling the requirements of the three consecutive phases in assessing the failure status are ignored, and finally 35 projects are selected for further case study analysis. These 35 projects selected include projects in both developed and developing countries. A variety of PPP models are being used in the transportation sector, which are characterized based on the contractual arrangements defining the different roles and responsibilities of the public and private sector partners. However, irrespective of any specific PPP model, a typical PPP arrangement must comply with following conventions (Curz and Marques 2012; European Commission 2004):

1. The private partner must contribute the equity or investment needed to construct and/or run the infrastructure.
2. The PPP must offer a long-term relationship between public and private sector agencies, considering infrastructure lifetime approaches.

Table 1. Types of Failure

Number	Type of failure	Definition
1.	Value for money not achieved	The public sector is unable to achieve value for money and tax payers suffer losses, or the public sector partner fails to achieve targeted goals
2.	Concession canceled	The concession contract is canceled by the government and a new tendering process is launched
3.	Concession tender canceled	The concession tender is called off at initial stages (i.e., before signing agreement) due to poor financial viability of project or some other reason
4.	Project nationalization	The government nationalizes the project; i.e., the project comes under public ownership
5.	Project halted	The project halts for a long time due to conflicts, legal proceedings, or technical faults
6.	Contract suspension	The government temporary suspends the concession rights of the concessionaire

Table 2. Projects Considered for Case Studies

Type of failure	Project Name and Country of origin
Concession canceled	Bangkok Elevated Road and Track System, Thailand Belgrade Novisad Motorway, Czech Republic D47 Motorway, Czech Republic Horgos-Pozega Highway, Serbia M9 Motorway, Pakistan Mexico Toll Road Program, Mexico Mumbasa container terminal, Kenya Trakia Motorway Project, Bulgaria Transgabonais, Gabon
Concession canceled + Project nationalization	Jakarta Outer Ring Road, Indonesia
Concession tender canceled	D5 Motorway, Czech Republic M3/M30 Toll Road, Hungary M7 Toll Road, Hungary M9 Danube Toll Bridge at SzekszÆrd, Hungary Pitesti-Bucharest-Lehliu (140 km) First Phase, Romania
Contract suspension/project halted	Argentina toll road program (first generation), Argentina Beiras Litoral /Alta Shadow Toll Road, Portugal
Project nationalization	91 Express Lanes, California, Unites States of America Camino Colombia Toll Road, Unites States of America London Underground—Metronet, United Kingdom London Underground—Tubelines, United Kingdom M1/M15 Toll Road, Hungary Railtrack, United Kingdom Siza Rail, Democratic Republic of Congo Skye Bridge, United Kingdom Tha Ngone bridge project, Lao PDR Zagreb-Gorican Motorway, Croatia Channel Tunnel, United Kingdom
Value for money not achieved	Channel Tunnel Rail Link (CTRL), United Kingdom Confederation Bridge, Canada Highway 407, Canada Railfreight Distribution, United Kingdom Rolling Stock Leasing Companies (ROSCO), United Kingdom Royal Dockyards (at Davenport and Rosyth), United Kingdom Wijker Tunnel, Randstad, Netherlands

3. The effective risk transfer must take place between the public and private sector partners.

All 35 sampled projects complied with the above fundamentals. This research is a very first attempt to unveil the underlying failure phenomena in transportation PPPs; therefore, mostly concession-based transportation PPPs (cPPPs) are included in the sampled projects. Nevertheless, some divestitures from early PFI attempts in the U.K. are also sampled to comprehend VFM and economic assessment issues. Table 2 shows a list of the failed transportation PPP projects considered in this research.

Event Sequence Mapping

It is rare that a single document can provide complete information on the events in a failed transportation PPP project. Therefore to collect complete information on a project, reliance is placed upon multiple documents. The utilization of multiple documents from different authors and agencies raises issues like combining the information from the different documents, identifying missing information on and between events that had a negative impact on project progress, identifying the missing information defining the relationship between two independent project events, choosing between contradictory information about the same event, etc.

To overcome these issues, event sequence mapping (ESM) (Soomro and Zhang 2013) is performed for each of the 35 projects. ESM is a structured methodology to assimilate multiple sources of information and produce a complete description of failure events. The following procedure briefly elaborates the ESM methodology:

1. Define the project list.
2. Define document reliability hierarchy. This study has an established reliability hierarchy as follows: first, research papers published by renowned journals and reports prepared by government bodies and international financial institutes; second, newspaper and magazine articles; third, articles and information produced by independent NGOs.
3. Segregate information in terms of project events and identify events having negative impact on project progress.
4. Identify relative timing of all events. The timing of an event is used for indexing the event while placing it in a timeline sequence with other events in a project.
5. Arrange all negative events in a timeline sequence. The arrangement of events refers to the placement of all identified information with respect to the time of their occurrence.
6. Check for missing and contradictory information. In order to complete the missing information, reference is made to the information collected on non-negative events, and in such a way, non-negative events are reevaluated to confirm their status regarding any negative impact on project progress. If missing information is not found, a web search is performed. The new documents found are also assigned a document reliability hierarchy.

To reconcile any contradictions, reference is made towards the document reliability hierarchy and the document having the higher ranking is given priority.

Identification of Failure Drivers in Transportation PPPs

The negative events identified by the ESM are reassessed. The availability of more structured information now allows assessment of project events in the context of other surrounding events; i.e., previous, simultaneous, and consequent events. Reassessment of identified negative events has helped in refining and consolidating them to represent specific failure domains. For example, "no competition rights (unconditional) of bidder" and "concessionaire's right to collect tolls from existing facilities prior to performing improvement works" are consolidated under the domain of "unfair rights and privileges to the bidder." The finalized negative events are then named "failure drivers." The failure drivers include improper actions and decisions by the project partners, socioeconomic factors, factors associated with internal political and local situations, and other associated events responsible for transportation PPP project failures. Table 3 shows identified failure drivers with respect to the parties responsible.

This study shows that failure drivers are spread all over the PPP project life cycle, and this leads to the notion that transportation PPP projects entail failure risk throughout their lifetimes. It is also

Table 3. Failure Drivers in Transportation PPPs

Responsible party	Failure drivers
Public sector establishment	Delayed approvals and actions by public sector officials Improper public sector benchmarking Inadequate technical feasibility assessment Ineffective project monitoring Negative attitude of public sector officials in solving project problems Noncompetitive tendering Poor economic and financial feasibility assessment Privatizing low traffic demand corridors Selection of an unsuitable concessionaire Shifting pricing control to the concessionaire Unfair privileges/rights to concessionaire Vague contract document descriptions Weak scrutiny/concessionaire selection procedures
Private sector partners	Concessionaire's insolvency
Public and private sector partners (mutual responsibility)	Slow and hindered project construction progress Conflicts between public and private partners Delayed acquisition of land Demand of higher subsidies/guarantees by the concessionaire at early stages of project Legal proceedings due to conflicts between partners Less revenue generation Improper risk allocation between partners Unfair toll pricing/strategy
Facility users/general public	Public protests against infrastructure privatization Users' unwillingness to pay

seen that failure drivers have a tendency to lead to other failure drivers that may create new problems for the other project partners. Based on the tendency of setting off new failure drivers, failure drivers in transportation PPPs can be categorized as primary or initiating failure drivers and secondary failure drivers. The secondary failure drivers are the consequences of the primary failure drivers. The secondary failure drivers also tend to lead to new failure drivers, if not dealt with in a timely manner. Therefore, primary failure drivers have great potential to trigger a chain of failure drivers which may not only cause problems in the current and simultaneous project stages, but may continue to impact a transportation PPP project up to the final stage.

Identification of Failure Mechanisms in Transportation PPPs

Through the analysis of the case studies of failed transportation PPPs, it is seen that a single driver does not drive any PPP project toward failure or success. Instead, it is always a series of simultaneous and/or consequential failure drivers that causes a PPP failure, and such a series of failure drivers is then termed as a "failure mechanism." In a failure mechanism, failure drivers transmit their impacts across the whole project life, and in consequence, new failure drivers emerge in simultaneous and later project stages. Therefore, a failure mechanism defines a failure path that is initiated with the occurrence of a single failure driver, which further causes other multiple failure drivers in simultaneous and later project stages, and ultimately leads to a PPP failure.

After evaluating the failure drivers, the next task is to identify the cause and effect relationships. The transportation PPP failure stories prepared through ESM provide descriptive indicators of the causal relationships that include both implicit and explicit indicators. The main reason for implicit indication of the cause and effect relationship among failure drivers is the reliance on multiple documents, as two events of a project cited from two different documents lack an explicit indication of any cause and effect relationship. Therefore, to draw a clearer picture of the causal relationships among failure drivers, a "cause and effect diagram" is prepared for each failed project, in which both implicit and explicit indicators of causal relationships are taken into account.

A cause and effect diagram is a tool that helps to identify, sort, and display possible causes of a specific problem. It graphically illustrates the cause and effect relationship between two or more factors or variables. There are multiple types of cause and effect diagrams and the type adopted in this study is known as the "path diagram." The path diagram depicts the cause and effect linkages among multiple factors and illustrates the chain of events/factors caused by initiating event/factors. Therefore it is a perfect tool to illustrate failure mechanisms. The path diagram for each failed project is then developed. In a typical path diagram approach, a horizontal line is drawn between two variables, i.e., failure drivers in this case, to show a causal relationship between them. Similarly, the causal relationships are defined for all failure drivers in a failed project. Failure drivers are then categorized in vertical columns with respect to the project stages to illustrate the flow of the failure mechanism across the project stages. The path diagram clearly portrays the impacts of failure drivers, and the complete failure scenarios in each failed project are revealed. Later, all individual failure mechanisms are consolidated to show the overall trend of failure mechanisms emerging from public sector partners (Soomro and Zhang 2013). In a path diagram representing the consolidated failure model, the nodes are modified to illustrate the party responsible for the failure driver and to show the flow of the failure mechanism across project partners.

Failure mechanisms explained in this paper illustrate the possible outcomes of inappropriate decisions and actions of public sector partners in typical transportation PPPs. Therefore, secondary failure drivers, illustrated in failure mechanisms initiated by the public sector partners, may be cocaused by other factors associated with the project partners or socioeconomic issues. For example, this study identifies less revenue generation as a result of users' unwillingness to pay; nevertheless, less revenue generation may also be caused by lower traffic demand, a factor possibly associated with the socioeconomic situation of the project territory. However, the scope of this paper is limited to the failure mechanisms initiated by the public sector partners and therefore such intervening factors caused by other project partners and socioeconomic issues are not discussed here.

Validating Identified Failure Mechanisms

The "constant comparison method (CCM)" is an approach to validate qualitative research (Silverman 2006), in which a researcher utilizes existing findings, data, and cases to develop and validate the hypothesized concepts (Parry 2004). The validation method used by this research is similar to the CCM. Glaser (1965) defined four stages in the constant comparison method: (1) comparing events applicable to each category, (2) integrating categories and their properties, (3) delimiting the theory, and (4) writing the theory. The first stage instructs in identifying events from data and codes them to a category representing their characteristics. The process of adding events continues for new cases/data, but new events are now compared with previously coded events in each category in order to assess their nature and characteristics; and, therefore, new events and categories keep building up. In this research, the first stage of CCM is performed as a subtask of the ESM when project events are identified and categorized as negative and non-negative events. The identified project events are also categorized with respect to the project stage and the project partner responsible. The second CCM stage is to integrate categories based on improved understanding of their characteristics or based on new evidence, or both. The ESM in this research has similarly aided understanding by integrating events from the non-negative to negative category. However, other categories of project stages and responsible partners are not integrated due to their distinct and evident nature. Nevertheless, events having similar characteristics are integrated to represent specific failure domains. Examples of negative events' integration are elaborated in the previous paragraphs. The third CCM stage, as Glaser (1965) explained, is adding and integrating events and categories that naturally yield theoretical constructs and the delimiting features begin to develop. Identifying failure mechanisms through the ESM and then integrating negative events to develop failure drivers represents the third stage in CCM. The final stage is to write up the developed theory, as described later.

All identified failure mechanisms are then shared with the PPP experts from academia and industry to validate the research findings. All consulted PPP experts in general agreed upon the identified failure drivers and their causal behavior in forming failure mechanisms.

Failure Mechanism Analysis, Results, and Discussions

A total of 27 failure mechanisms are found to have been initiated by the public sector establishment, i.e., public sector partners and public sector personnel in associated public offices. The identified failure mechanisms are further categorized with respect to the project stage; i.e., feasibility study, procurement, project construction, project operation, and status. The project status illustrates the final situation of a project that is caused by a failure mechanism, and it mostly includes the types of failure elaborated in Table 1. The procurement stage is then further divided into pre-tendering, tendering, and post-tendering stages. Figs. 1(a and b) illustrate failure mechanisms initiated by the public sector partner and the associated establishment. Primary and secondary failure drivers are illustrated in rectangular boxes with rounded corners and in rectangular boxes respectively, while the final failure status is expressed in circular boxes.

Fig. 2 consolidates all 27 failure mechanisms to illustrate the overall trend of the identified failure mechanisms and the failure drivers in sharing multiple failure mechanisms. In Fig. 2, all failure drivers and the failure statuses are presented in three rectangular shaped boxes; the top left rectangular box contains the numbers of failure mechanisms passing through each failure driver, the center box contains the name of the failure driver, and the right bottom box contains the party responsible for dealing with the failure driver.

Failure Mechanisms Initiating at Feasibility Study Stage

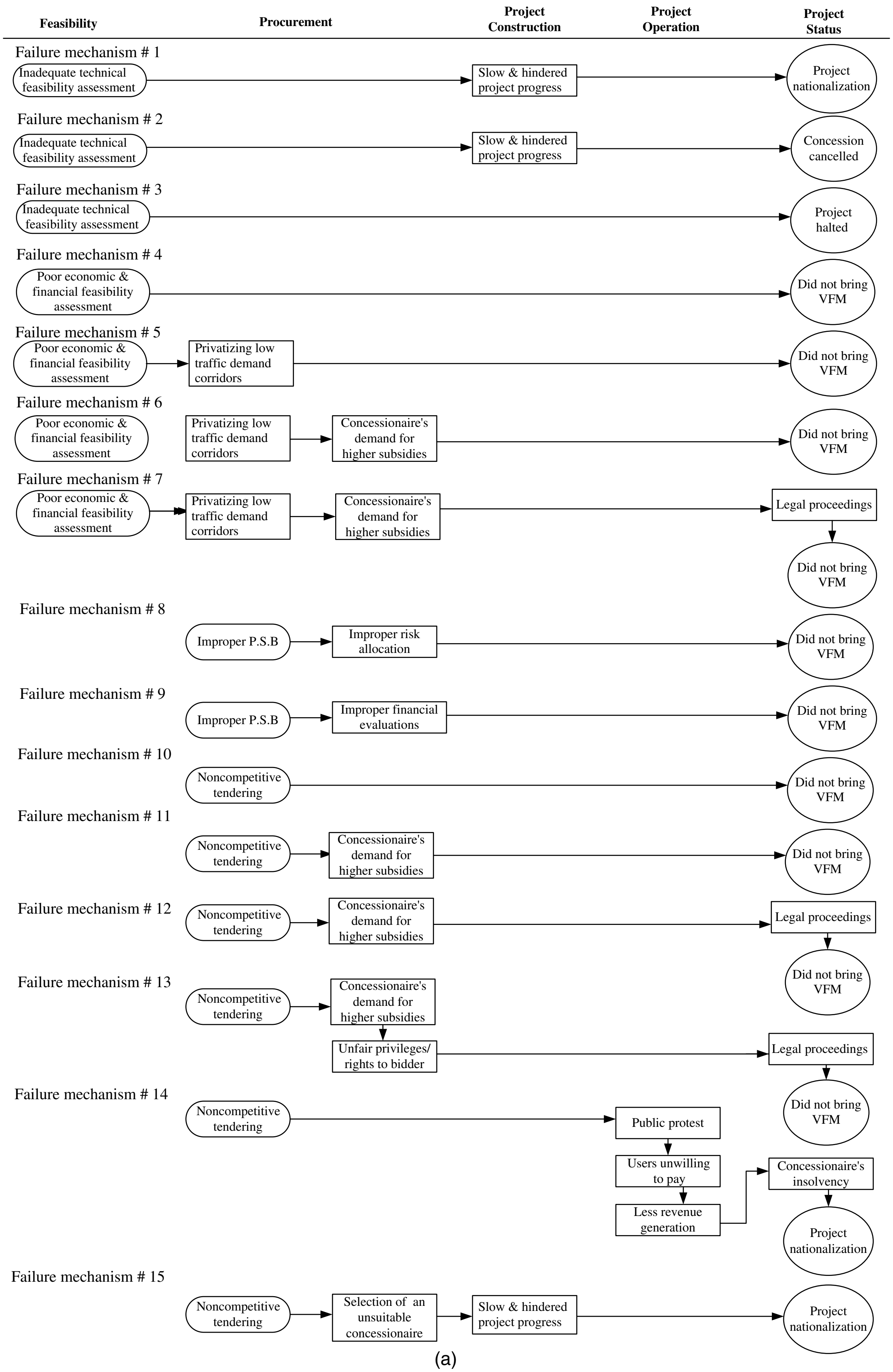
The first and second failure mechanisms are initiated by inadequate technical feasibility assessment that causes slow and hindered project construction progress, which may further result in the cancellation of the concession or project nationalization. The technical feasibility assessment is intended to unveil the technical possibilities, requirements, and constraints associated with the project construction and operation. It considers all possible alternatives for project location, construction methods, associated risks, and regulations to be followed by the project developers. Technical feasibility assessment also helps the public sector to prioritize projects, if a project bundling approach is intended or if the proposed project location has a number of parallel developments, as it may be difficult to proceed with multiple projects at similar times. The brutal failure of the Bangkok Elevated Road and Track System (BERTS) is a good example for understanding the impact of inadequate technical assessment. The BERTS project was awarded without conducting any technical feasibility study, and some elementary-level issues were not highlighted. The lack of a study impacted the BERTS very badly, such that only 13% of the work was completed by the end of the total stipulated construction time (World Bank 2000). The failure case of the Mexico Toll Road program also exhibited a similar failure mechanism, where improper feasibility assessment led to a flawed project design, making less contiguous toll sections. Therefore, the toll roads were unable to attract sufficient long distance traffic (Ruster 1997). The third failure mechanism is also initiated by an inadequate technical feasibility study and results in temporary or long-term project delays. Such delays usually result from the unavailability of plans to overcome the formalities or problems that were not highlighted earlier in the project feasibility study.

Poor economic and financial feasibility assessment has a direct impact on the anticipated VFM in transportation PPP projects. The fourth failure mechanism, initiated by poor economic and financial feasibility assessment, directly results in lower VFM for the public. Failure of the first generation of the Mexico toll road program, in the early 1990s, depicts an example of poor economic and financial assessment at the macro level, where government officials were unable to foresee the effects of adoption of such large concessions at the same time, as the country's economic situation was not able to sustain large and long-duration debts (Ruster 1997). Poor economic and financial feasibility assessment also leads public sector authorities to attempt to privatize low traffic demand corridors. Case studies have shown that attempts to privatize low traffic demand corridors never yield VFM. The majority of the efforts for privatizing low traffic demand corridors end in cancellation of the concession tenders; for example, the D5 Motorway in the Czech Republic, and the M7 Toll Roads and the M9 Danube toll bridge in Szekszárd in Hungary. For a PPP on low traffic demand corridors, it is highly probable that the concessionaire may require high subsidies to make the project financially viable, usually when the concessionaire is declared as a preferred bidder. The position of a preferred bidder gives a stronger position to negotiate for better profitability. Examples are the Horgos-Pozega Highway in Serbia and the M7 Toll Road in Hungary, where the concessions were canceled upon the demand for higher subsidies by the respective concessionaires (Carpintero 2010). In Fig. 2, the sixth and seventh failure mechanisms show the aforementioned consequences of privatizing low traffic demand corridors. Privatizing low traffic demand corridors are witnessed in developing countries where PPP may be considered as the only alternative to fill in the persisting infrastructure gap.

Failure Mechanisms Initiating at Procurement Stage

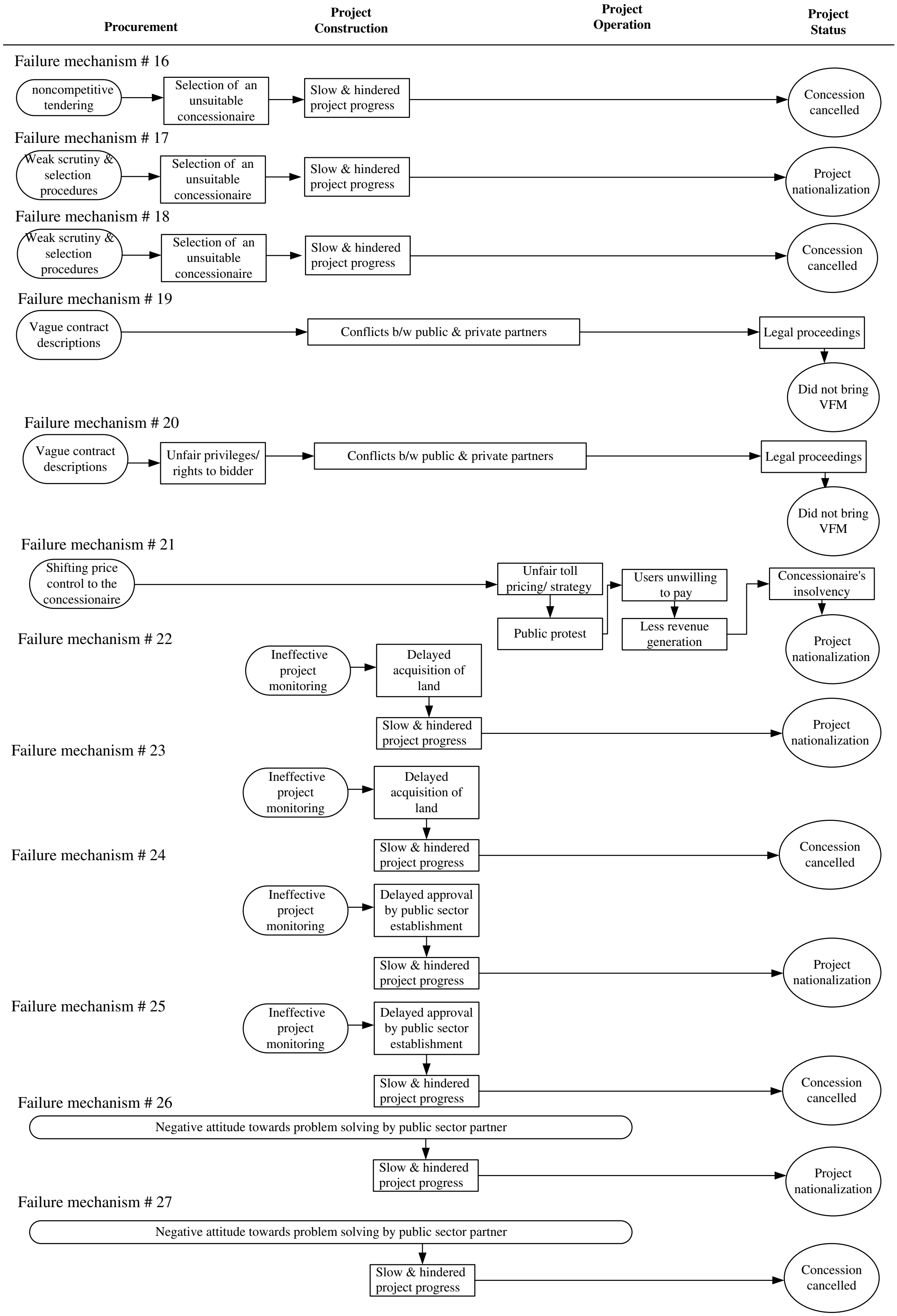
Failure Mechanisms Initiating at Pre-Tendering Stage

The development of a public sector benchmark is the very first stage of the procurement process in any transportation PPP project.



(a)

Fig. 1. Failure mechanisms initiated by public sector partners



(b)

Fig. 1. (*Continued.*)

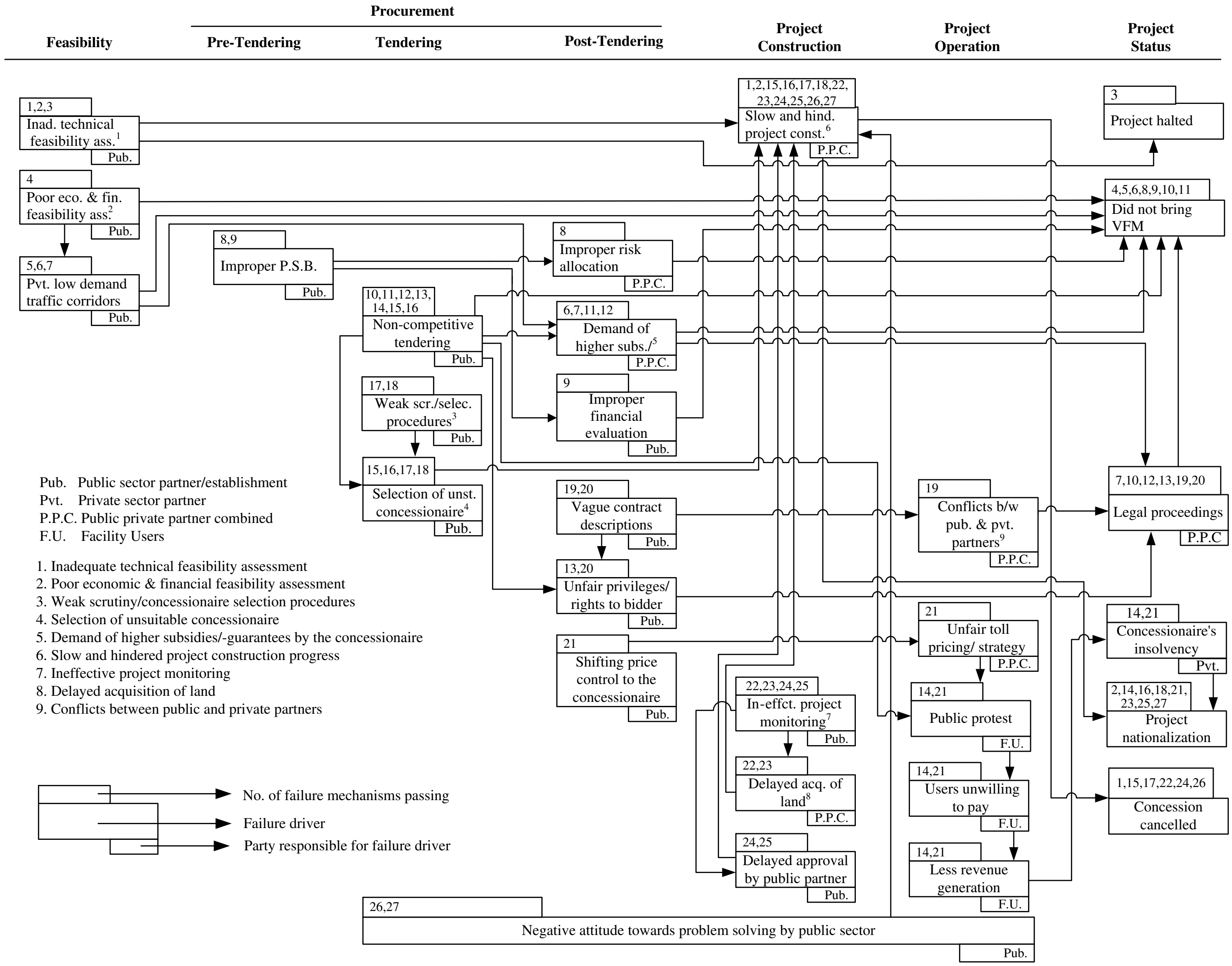


Fig. 2. Failure mechanisms (consolidated) initiated by public sector partners

This study confirms that improper public sector benchmarking is initiated in at least two failure mechanisms, i.e., the 8th and 9th, which systematically undermine the expected VFM for tax payers. The public sector benchmark (also called the Public Sector Comparator) is a hypothetical risk adjusted cost for a planned project if the project is to be developed with public money. The public sector benchmark helps public sector personnel to evaluate and compare the different procurement options against public finance and public ownership of the proposed infrastructure. Therefore, improper public sector benchmarking can ruin the entire evaluation process, and consequently it is highly probable that the public sector may not be able to identify the best available option. As public sector benchmarking is ex-ante evaluation of the available alternatives, which usually span more than ten years, it has a potential for human error. Past experience and case studies (Soomro and Zhang 2011) have identified that the most frequent errors, in developing public sector benchmarks, were made in estimating the future financial flows and in allocating the risk between project partners. The failure mechanisms caused by improper public sector benchmarking were witnessed in the PPP projects of the Confederation Bridge in Canada (Loxely 1999) and in the Wijker tunnel in the Netherlands (Ridolfi 2004).

Failure Mechanisms Initiating at Tendering Stage

After finalizing a public sector benchmark, the best available option becomes clearer to the public sector establishment. If the public sector benchmark evaluation indicates private finance as the best option, public sector personnel can proceed with the second stage of procurement, the bid competition. At this stage, the public sector personnel's failure to organize competitive tendering may have negative results in terms of achieving VFM. This study has found that non-competitive tendering initiates failure mechanisms more than for any other failure driver. Non-competitive tendering is confirmed as initiating at least 7 failure mechanisms. Fig. 2 shows trails of non-competitive tendering across project stages. Among the seven failure mechanisms caused by the non-competitive tendering, the simplest failure mechanism (i.e., the 10th failure mechanism) results in negative VFM in the short and long terms. Less competition may not bring about appropriate opportunities for the public sector partner. In the case of minimal or no competition, the available private alternative may reflect a price lower than the public sector benchmark, but it is highly probable that it contains more uncertainties than usual. The case of Railfreight Distribution in the U.K. is an example of such a failure mechanism, where initially many private sector bidders participated and pre-qualified for the bid competition, but eventually only two organizations submitted bids (Bourn 1999). Bourn (1999) also identified that, due to the lack of competition, the preferred bidder was in a strong position to negotiate with its prospective public sector partner; such imbalanced negotiation resulted in ineffective risk allocation between the project partners.

The 11th, 12th and 13th failure mechanisms illustrate possible situations created by the non-competitive tendering, which puts the preferred bidder in a strong position to negotiate on better terms for profitability, as the public sector has fewer or no alternative choices other than the preferred bidder. The 11th and 12th failure mechanisms depict the scenario of a concessionaire's demand for higher subsidies. The 11th failure mechanism shows that if such demands for higher subsidies are approved by the public sector authorities, it may impact on the anticipated VFM. The 12th failure mechanism shows that the public sector authorities' refusal to grant higher subsidies could lead to a legal battle between public and private partners. Such a legal battle puts the VFM at risk, as such legal proceedings are not meant to protect the VFM but only to decide between the claims of the partners. It is also found that such legal proceedings took a longer time to resolve matters between the partners and therefore impacted on the pace of project progress affecting the embedded VFM for the tax payers.

Non-competitive tendering provides the concessionaire with a strong and sometimes monopolistic position. Therefore, it is probable that the preferred bidder may be granted rights and privileges which can be termed as "unfair" in the context of social justice or social welfare. The 13th failure mechanism shows such a scenario. The non-competitive tendering and the consequent award of unfair rights to the concessionaire were observed in the projects of the Trakia Motorway in Bulgaria, and the M9 Motorway in Pakistan. The grant of unfair rights in these two projects included the right to collect tolls, at a newly privatized route, before performing any improvements or rehabilitation works, and collecting rentals and utilizing other public facilities existing on the road side (McGrath et al. 2008). However, unfair rights and privileges are also found due to the vague contract descriptions, which are discussed in later paragraphs.

Non-competitive tendering is considered as undermining the VFM and the social welfare of the project, and therefore may lead to protests by the public. The 14th failure mechanism depicts the public protests caused by non-competitive tendering. Public protests can be categorized under two domains, i.e., protests by the general public and protests by the facility users. The protests by the facility users are generally caused by high tolls and poor services by the concessionaire; however protests by the general public represent a demonstration against alleged corruption, expensive deals and sometimes against unjustified political favors. For example, the cases of the Trakia Motorway and the D47 Motorway demonstrated massive public opposition against direct award concessions. Even, in the case the Trakia Motorway, the public protests were able to achieve attention of Transparency International (Cuttaree et al. 2009) and the European Investment Bank (EIB) (McGrath et al. 2008).

The 15th and 16th failure mechanisms illustrate the selection of an unsuitable concessionaire due to non-competitive tendering, which further slows and hinders the project progress, and ultimately terminates either in cancelation of the concession or in the nationalization of the project. The causal relationship between non-competitive tendering and the selection of an unsuitable concessionaire is witnessed in four case studies conducted for this research. The unsuitability of the concessionaire can be defined as the inability of the concessionaire to deliver the performance necessary to achieve the targeted VFM. The impact of unsuitable concessionaire is seen in projects of the Bangkok Elevated Road and Train System (BERTS) in Thailand, the M9 Motorway in Pakistan and the Belgrade Novisad Motorway in the Czech Republic (World Bank 2000; Carpintero 2010; Cuttaree et al. 2009). Among these projects, BERTS brutally failed and was never completed.

The selection of an unsuitable concessionaire is not only caused by non-competitive tendering but it can be due to weak selection and scrutiny procedures by public sector personnel. The 17th and 18th failure mechanisms illustrate the selection of an unsuitable concessionaire caused by weak selection and scrutiny procedures, and was seen through the failure of the Mexican Toll Road Program (Ruster 1997), and in the Belgrade Novisad Motorway (Carpintero 2010).

Failure Mechanisms Initiating at the Post Tendering Stage

After finalizing a preferred bidder, a PPP project enters into the formal negotiation stage, in preparation of the concession contract documents. Many important decisions are meant to be taken during this stage, including finalizing risk allocation between partners, deciding upon the rights of the concessionaire, and financial plans and guarantees by the government. The project goals and requirements are also finalized at this stage. This study has identified two potential failure drivers, i.e., vague contract descriptions and shifting pricing control to the concessionaire, which at this stage can cause at least three failure mechanisms. Vague contract descriptions trigger two failure mechanisms, and shifting toll price control to the concessionaire initiates at least one failure mechanism. The 19th failure mechanism marks conflicts between the public and private sector partners due to vague contract descriptions in the concession contract that create fuzzy boundaries between the roles and responsibilities of the project partners. Such conflicts between the partners lead them towards legal battles which ultimately impact negatively on the VFM. The 20th failure mechanism that starts through vague contract descriptions and leads to the granting of unfair rights to the concessionaire may also result in legal proceedings. Vague contract descriptions are sometimes purposely set to hide the unfair rights granted or to create fuzzy boundary lines between the rights and responsibilities of the project partners.

The impact of vague contract descriptions in transportation PPPs is well illustrated by the case of the Route 91 Express Lanes in California, where introducing toll lanes increased the congestion on the free parallel public lanes. Therefore, the governing transport agency planned to increase the capacity by constructing new public lanes. The expansion plans were challenged in a court of law by the concessionaire, by declaring the expansion plan was a violation of the "no-competition rights" granted to the concessionaire under the concession contract (Munaya 2010). According to Sullivan (2000), the condition of no-competition was not known to many in the public partner agency until it was claimed by the concessionaire. Finally, the public sector partners were left with no option but to buy back the infrastructure. This case showed that vagueness in the concession contract resulted in preventing the public sector agency from carrying out the required expansion, and therefore the users were indirectly forced to suffer congestion or to pay the toll to use the express lanes.

Apart from the conflicts over the no-competition clause, in the case of the Route 91 Express Lanes in California, the concessionaire was also found to be exploiting the pricing power vested in them under the concession agreement by enforcing unfair toll pricing (Munaya 2010). The transfer of pricing power and its consequent exploitation is illustrated by the 21st failure mechanism. Although it is quite odd to completely transfer the toll pricing control to the concessionaire, it has been witnessed in real life. Among the case studies examined in this research, four projects were found to solely authorize concessionaires to set toll prices with capping at the maximum rate of return, and all four resulted in enforcing unfair toll pricing by means of adopting profit maximization policies. The projects found to exploit pricing powers include the Route 91 Express Lanes in California (Munaya 2010), the M1/M15 toll road in Hungary (Joosten 1999), the Skye Bridge in the U.K. (Pollitt 2005), and Highway 407 in Canada (Vinning and Boardman 2008).

Failure Mechanisms Initiating at Project Construction Stage
The project construction phase is also critical in triggering problems, which may lead to PPP project failure. During the project construction stage, ineffective project monitoring by the public sector is another failure driver that triggers at least four, i.e., 22nd, 23rd, 24th, and 25th, failure mechanisms. The delayed acquisition of land for the project right of way, caused by ineffective project monitoring, marks the 22nd and 23rd failure mechanisms. Timely acquisition of land is very critical in transportation PPP projects, and failure to do so may cause slow and hindered project progress and ultimately end either in the cancellation of the concession or in nationalization of the project. BERTS in Thailand and the Mexico Toll road program suffered through this failure mechanism. The other two failure mechanisms initiated through ineffective project monitoring may cause late approvals by public sector officials which ultimately impact on the project progress, which may consequently end either in cancellation of the concession or in project nationalization. The failure of the Mombasa container terminal in Kenya and BERTS in Thailand are examples of such a failure mechanism.

The last two, i.e., the 26th and 27th, failure mechanisms are initiated through the negative attitude of public sector partners towards solving project problems, which causes slow and hindered project progress, and consequently the project may end in either cancellation of the concession or project nationalization. The negative attitude of the public sector establishment at any stage of the project life cycle, from inviting expressions of interest (EOI) to the successful completion of the project, may prove to be fatal for project success. The negative attitude of public sector officials is again rooted in their lack of capability in establishing firm and strong partnerships with the private sector. BERTS in Thailand and the M1/M15 in Hungary were found to suffer from this failure mechanism; i.e., public officials were found to be uninterested in helping the concessionaire with domestic issues and problems.

Further Comments on Failure Mechanisms in Transportation PPPs

It is interesting to find that failure drivers initiated by the public sector partners mostly create problems for themselves. Among all significant failure drivers found in failure mechanisms initiated by the public sector partners, concessionaire's insolvency is the only failure driver whose responsibility falls upon the private sector partners. However, inappropriate actions by public sector personnel do cause some failure drivers in which the responsibility is usually mutually shared between the public and private partners.

This study finds that the procurement stage is most critical for public sector personnel in triggering failure mechanisms. Out of total 27 failure mechanisms initiated by public sector personnel, 14 failure mechanisms were found to be initiated in the procurement stage of transportation PPP projects. Noncompetitive tendering is found to initiate seven failure mechanisms alone, which is the highest number of initiating failure mechanisms by any primary failure driver. The case studies conducted for this research identified that the occurrence of noncompetitive tendering is also attributed to particular factors. For example, the private sector's lack of interest in a particular PPP project is one of the main reasons causing fewer bidders to join the bid competition, which tempts public sector personnel to further avoid a bid competition and to opt for direct negotiations with interested bidders. Lack of interest by the private sector is again preceded by different factors primarily associated with the public sector, such as vague project design, the politico-economic situation of the PPP hosting countries, laws and regulations associated with the private investments, etc.

Enforcement of unfair toll pricing is another critical failure driver found in the procurement stage of transportation PPPs, which is usually caused by shifting pricing control to the concessionaire. As mentioned earlier, this study found four projects in which the pricing authority was shifted to the concessionaire and all were found to have profit maximization policies. However, all those cases, except Highway 407 in Canada, ended in nationalizing the projects. Among the four projects subjected to the enforcement of unfair toll pricing, public protests were observed to play vital roles leading to project nationalization. In the case of M1/M15, civil litigation led to the reduction of toll prices together with returning of the excessive toll to the users, which led to the default of the concessionaire and subsequent nationalization of the project. In the case of the Skye Bridge that was bought back by the government, the purchase was the result of long political pressure developed by continual protests by the people of Skye, as the bridge was the only connection with the mainland. This case demonstrates the power of public opposition that can create massive problems for project developers, including outright cancellation of the PPP project. Public protests are also used to develop political opposition to the private ownership of a project, which further complicates the problems, including loss of credibility. Consequently, the project operators may lose political support, and the government may have to nationalize the project.

Apart from noncompetitive tendering, weak scrutiny and selection procedures undermine the essence of a PPP project which can deliver VFM. Weak scrutiny and selection procedures are actually indicators of lower capability of the public sector agencies in facilitating long-term partnerships for developing infrastructure projects. However, it is not easy to identify the adequacy of the concessionaire selection rules, as they vary from project to project. Defining private partner selection parameters could be harder if the concerned public sector agency is new to the PPP business. In this situation, it is more advisable that the concerned agency seeks help from other agencies having previous experience in organizing PPP projects.

Conclusions

This paper focuses on the roles played by public sector partners in the failure of transportation PPPs projects by examining how failure mechanisms are initiated. The failure drivers and failure mechanisms in transportation PPPs are identified based on the evaluation of 35 failed transportation PPP projects around the world. Among the 27 failure mechanisms found to be initiated by public sector partners, 7 failure mechanisms occurred during the feasibility study stage, 14 failure mechanisms occurred during the procurement process, and four failure mechanisms occurred during the project construction stage. Two failure mechanisms initiated by the negative attitude of the public sector partners are considered to have a longer time span which covers the procurement, construction, and operation stages. By looking at the number of initiating failure mechanisms at each project stage, it may be concluded that the project feasibility and procurement stages are the most critical for public sector personnel to trigger a number of failure mechanisms.

Some failure drivers share multiple failure mechanisms. The number of failure mechanisms shared by each failure driver shows the level of complexity of the failure driver, i.e., the more failure mechanisms, the higher the complexity of the failure driver. Following this notion, "slow and hindered project progress" is the most complex failure driver that shares 12 failure mechanisms. "Noncompetitive tendering" is ranked second by sharing seven failure mechanisms, and "initiating legal proceedings" is ranked third.

The failure mechanisms presented in this paper provide a new perspective on vulnerability induction in transportation PPPs. The findings of this paper are useful in understanding the dynamics of inappropriate actions and decision-making that take place in the public sector domain, and in providing other project partners with a perspective on the negative outcomes, especially those which are particularly harmful. The failure drivers and the associated failure mechanisms can be integrated into the management framework of a transportation PPP project, thereby preventing the occurrence of primary failure drivers. The failure mechanisms as explained in this paper can guide the stakeholders to the next possible domains of secondary failure drivers in order to take preventive measures. Therefore, the failure mechanisms have a strong potential to be part of a risk management protocol for transportation projects.

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