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## Working Paper Proceedings

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**Engineering Project Organization Conference**

Cle Elum, Washington, USA

June 28-30, 2016

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## **A SYSTEMS ANALYSIS OF GOVERNANCE IN TRANSPORTATION PUBLIC-PRIVATE PARTNERSHIPS: EXPLORING MAJOR FEEDBACK MECHANISMS**

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### **ABSTRACT**

Research on governance of public-private partnerships has attracted significant scholarly attention over the last several years. However, it remains unclear how much these studies contribute towards building a better understanding of the reasons behind PPP successes and failures. To address this lack of clarity, we propose an alternative way of conducting a systematic review of the literature. Instead of relying on metrics related to citations and other bibliographic measures, we explore PPP-related publications in order to highlight governance challenges, identify governance-related variables, and establish causal relationships between such variables. Our goal, therefore, is to develop a systems map, informed by past-published evidence from actual projects.

Our focus is presenting the methodology and future efforts since this study is a work in progress. The methodology consists of two components: (1) systematic selection of the papers to be studied and (2) implementation of the review procedures. A total of 44 papers depicting actual PPP-related evidence have been selected after examining articles from engineering and non-engineering journals. The review process has followed an inductive approach developed within the System Dynamics field, which involves identifying and analyzing text excerpts in order to obtain governance variables and relationships. Our preliminary results comprise an initial systems map from one of the selected papers. Conclusions highlight the need to complete the map and emphasize its usefulness in terms of understanding PPP governance.

**KEYWORDS:** public-private partnerships, governance challenges, systems map, literature review.

### **INTRODUCTION**

The number of academic publications focused on examining the development of public-private partnerships (PPPs) is on the rise. Public-private agreements have attracted significant scholarly attention because researchers from multiple fields have recognized that PPP development processes for infrastructure have been far from perfect. The variety of publications within this stream of literature has prompted the call for conducting studies focused on classifying PPP research papers by thematic areas, research methods, and writers' contributions. Some scholars, as a result, have provided comprehensive literature surveys through which they seek to examine knowledge gaps and academic developments.

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Despite these contributions, most of the systematic reviews of PPP research articles do not go beyond providing multiple categorizations of journal papers. Although such classifications are useful to the academic community, it is not evident how these studies can significantly contribute towards building a better understanding of PPP implementation challenges. Consequently, a need exists to examine the existing PPP body of knowledge from a different perspective so as to gain insight into the reasons behind failures and successes in public-private agreements.

The final product of this research will be a systems map, informed by past-published evidence from actual projects, depicting the governance mechanisms and challenges associated with PPP initiatives. Such a map will uncover interrelated connections between major variables and depict the main sources of complexity in governance of PPP projects. The concept of governance is selected because it allows examining how different PPP challenges arise and propagate across the project life cycle. Consequently, the literature review approach selected for this study does not thematically categorize a particular set of papers. On the contrary, our research takes PPP projects, rather than PPP programs or general policies, as its main unit of analysis and explores project data in PPP-related publications to highlight governance challenges, identify the governance-related variables behind the challenges, and establish causal relationships between such variables.

This paper starts by describing the academic evidence related to governance challenges and mechanisms for public-private partnerships. Subsequently, the research methodology is introduced in order to explain the procedures followed to conduct our systematic literature review. Finally, we conclude with a brief description of the preliminary results and implications.

## **GOVERNANCE: CONTRACTUAL AND RELATIONAL MECHANISMS**

Researchers have mostly relied on contractual and relational mechanisms as their two main governance approaches to study PPP development. The literature on contractual governance mechanisms suggests that these instruments follow a transaction cost economics (TCE) rationale (Williamson 1979). According to this logic, contracts are the main instruments for organizing the transactions through which project actors are able to cooperate and compete (Ruuska et al. 2011; Williamson 1999). Assuming that organizational interactions between project participants are affected by opportunism and bounded rationality, the goal of the contractual agreements is to establish clear and legally binding relationships (Guo et al. 2014). In this way, the contractual parties intend to receive protection from the hazard of opportunism through minimizing their transaction costs (Spiller 2008).

In PPPs, contractual governance and TCE are useful tools to design mechanisms focused on controlling issues related to asset-specificity and uncertainty (Ho et al. 2015). Based on TCE, it is assumed that an optimal contract is one focused on achieving its objectives with the lowest transaction costs (Hartmann et al. 2014). However, since drafting a contract containing all the necessary provisions and safeguards against opportunism is not feasible, PPP contracts are usually incomplete and exhibit significant formation and procurement costs (Zheng et al. 2008). As a result, many authors argue that contractual mechanisms need to be complemented with relational instruments (Brinkerhoff and Brinkerhoff 2011a; Caldwell et al. 2009; Caniëls et al. 2012; Roehrich and Lewis 2010).

Relational governance mechanisms rely on the idea that project performance is positively related to the amount of trust and collaboration generated through project participants' relationships (Baker et al. 2002; Smyth and Edkins 2007; Turner and Müller 2004). The

literature in this field indicates that trust-based governance is an emergent structure that originates from the shared values and common expectations found in social relationships (Gulati 1995; Poppo and Zenger 2002). Relational scholars argue that these mechanisms promote solidarity between contractual parties, flexible arrangements, and informal safeguards against uncertainty and opportunism (Zheng et al. 2008). Therefore, relational governance seeks to monitor project transactions through personal interactions, shared beliefs, and collective norms (Roehrich and Lewis 2010).

The implementation of relational instruments in complex projects and PPPs has been primarily examined through the lens of their interplay with contractual mechanisms. Researchers have found that trust enables streamlining procurement and contract drafting processes because it facilitates collaboration (Zheng et al. 2008). During the construction of Terminal 5 at London's Heathrow Airport, for example, informal control mechanisms played a key role in the delivery of the transportation facility (Caldwell et al. 2009). However, although many other authors report similar results (Cao and Lumineau 2015; Clifton and Duffield 2006; Koppenjan 2005; Roehrich and Lewis 2010), scholars have not reached consensus on how to properly integrate relational mechanisms with contractual structures (Caniëls et al. 2012).

In short, the contractual and relational mechanisms have been the governance instruments most widely analyzed in terms of managing PPPs and large infrastructure projects (Roehrich and Lewis 2010; Zheng et al. 2008). Hence, a growing body of knowledge has started to examine how these two approaches have been applied and combined (Brinkerhoff and Brinkerhoff 2011b; Eriksson and Westerberg 2011; Rwelamila and Fewings 2014). However, such applications remain unclear due to the fragmented bibliographic evidence. Similarly, integration remains a work in progress because there is little evidence regarding the complementary nature of contracts and trust processes. The analysis and literature review presented in this paper seek to analyze the challenges associated with governance approaches.

## **GOVERNANCE CHALLENGES FOR PUBLIC-PRIVATE PARTNERSHIPS**

Recently, some authors have explored integrated forms of governance in infrastructure initiatives (Henisz et al. 2012; Jooste et al. 2011; Levitt et al. 2010). They have paid particular attention to PPP projects because of their combination of state and private interests, the large upfront capital investments required to develop them, and their long-term and uncertain nature (Henisz 2006). Taking into account the traditional views offered by contractual and relational governance, these scholars have utilized socio-political concepts to argue that infrastructure agreements need to implement new kinds of governance mechanisms (Levitt et al. 2009).

Since implementing new types of governance mechanisms is not easy, scholars have analyzed some of the governance challenges associated with developing PPPs and civil infrastructure projects. For instance, Levitt et al. (2009) argue that the application of socio-political governance faces opportunism and political risks as their two main contractual hazards. Also, Henisz et al. (2012) claim that the application of contractual and relational mechanisms needs to overcome barriers such as, displaced agency, coordination complexity, and high asset specificity. Additionally, Levitt et al. (2010) highlight that the difficulties associated with recovering full costs from toll fees, raise concerns related to traffic forecasts and public perception.

In general, researchers tend to agree that there are multiple challenges related to implementing contractual and relational governance mechanisms. However, such multiplicity of challenges makes it difficult to study and categorize them. In this paper, therefore, we build from

Levitt et al. (2010) and classify the various governance challenges into four groups. The first group comprises concerns related to the *political legitimacy* of private ownership and operation. Since the development of a PPP initiative entails private capital utilization and often the imposition of tolls, if the project is not perceived as a legitimate initiative, the general public will call for ex-post interventions (Levitt et al. 2010; Zhang et al. 2015). The second category entails the *uncertainty* around PPPs. Such uncertainty can, for instance, make public-private agreements prone to rely on over-optimistic forecasts, thus obtaining insufficient revenues (Henisz et al. 2012). A third class of challenges refers to the *opportunistic behaviors* of PPP participants. Such actions facilitate corruption and increase transaction costs (Ho et al. 2015). Finally, the last category embodies *displaced agency* and decision-making issues. It includes problems generated by adversarial relationships, low levels of trust, and complex technical requirements (Caniëls et al. 2012; Zheng et al. 2008).

## RESEARCH METHODOLOGY

Building on previous literature reviews, this study seeks to examine and integrate the variety of research efforts relevant to overcome governance challenges in transportation PPPs. This project sector is selected because its prevalence in PPP developments worldwide (Yescombe 2011). This research analyzes multiple PPP articles from 1998 to 2015 across a range of multi-disciplinary literature. The analysis takes into account publications derived not only from the civil engineering and construction management domains, but also from fields related to finance, law, public policy, and many other disciplines. The review focuses on finding actual evidence of PPP governance challenges in real public-private projects. In this sense, our unit of analysis is the PPP project itself, rather than general implementation policies or national public-private initiatives. We intend to answer the following questions: what type of causal relationships between governance practices and PPP development processes can be inferred from project data in the existing literature? And based on that, what are the current knowledge gaps in terms of analyzing governance in PPPs?

The methodological process has been divided in two components, and its implementation remains a work in progress. The first element refers to searching, organizing, and categorizing multiple articles from various research journals. The second component involves the development of the PPP governance map. Here, a qualitative mapping technique developed within the System Dynamics (SD) field will be employed. The two methodological components are further explained below.

### Methodological Component 1: Paper Selection and Classification

Four previous investigations have focused on conducting systematic literature searches of PPP-related articles in construction and non-construction journals. Al-Shariff et al. (2004) selected the four most significant construction journals (*Construction Management and Economics*; *Engineering, Construction and Architectural Management*; *International Journal of Project Management*; and *Journal of Construction Engineering and Management*) and reviewed papers published between 1998 and 2003. They studied 34 articles and categorized them in three thematic groups: procurement, risk management, and financial management. This first effort was mainly focused on the early stages of the Private Finance Initiative (PFI) movement.

Ke et al. (2009) and Tang et al. (2010) complemented Al-Shariff et al.'s examination. Ke et al. reviewed papers published from 1998 through 2008 in seven construction journals (Al-Shariff et al.'s journals, the *Journal of Management in Engineering*, *Proceedings of Institution of*

*Civil Engineers-Civil Engineering, and Public Money and Management*). They studied 170 articles, established seven subject categories, identified the most frequently cited authors, and analyzed research interests and methodologies. Similarly, Tang et al. selected six construction journals (Al-Shariff et al.'s journals, the *Journal of Management in Engineering*, and *Building Research and Innovation*) and focused on 107 PPP-related papers between 1998 and 2007. In contrast to Ke et al., they provided a more extensive comparative analysis of empirical and non-empirical works. Empirical studies involved the collection of primary data and were grouped in three categories: financing, risks, and relationships. Non-empirical works entailed the development of models and were classified in four groups: financing, success factors, and risks.

In an effort to complement the previous reviews, Garvin and Gross (2012) decided to study PPP-related literature beyond the construction and civil engineering domains. They used Google Scholar to identify 278 PPP articles from 140 journals over the period of 1997 to 2010. They explored journals from several fields including, among others, public policy, accounting, and transportation. The papers were organized into eight main thematic categories (general concepts, governance issues, procurement, contract design, risk, finance, public sector issues, and national applications) and 59 sub-groups. The analysis focused on comparing research methods and number of citations.

Building on the four previous studies, we developed a four-stage literature search in order to identify the articles focused on PPP governance between 1997 and 2015. We searched for papers analyzing the four governance challenges described previously. In stage one, Ke et al.'s and Tang et al.'s methodologies were followed in order to identify PPP-related papers. After examining titles, abstracts, and keywords in each one of the construction and civil engineering journals identified by these authors, a set of 362 articles was obtained. In the second stage, we used Garvin and Gross' (2012) search parameters to highlight PPP articles from the Google Scholar database. A total of 368 papers were selected from around 140 publications. Overall, a total of 730 papers were identified from journals within and outside the civil engineering and construction domain.

In stage three, we identified PPP papers focused on topics closely related to governance. Our goal was to obtain articles describing real issues in actual PPP projects, from which governance issues could be examined. Regardless of the article type (i.e. qualitative, quantitative, theoretical, or case study), we looked for analyses focused on real projects. At the start, 41 articles from the initial group were excluded because they were editorials, book reviews, or any other document not qualifying as a research paper. After applying this filter, we skimmed each one of the remaining 689 articles. This process resulted in the selection of a total of 273 papers and the exclusion of the other 416 articles.

The 416 excluded articles did not contain information regarding actual projects. Instead, most of them involved discussions related to theoretical developments, analytical tools, or issues concerning the state, society, and industry. For instance, theoretical papers comprised definitions of public-private terminology and descriptions of PPP concepts. The articles referring to analytical tools were mainly about optimization models, factor analysis studies, or statistical processes. Additionally, the investigations on state- and social-related issues mostly examined questions regarding value for money and the advantages or disadvantages of choosing public-private agreements over public procurement initiatives. Industry papers, on the other hand, explored topics relative to the organizational transformations required in joint ventures and PPPs. In short, although these research works represent valuable contributions to the PPP literature in

general, they were not taken into account because they did not incorporate actual project data into their analysis.

In the fourth stage, we conducted a series of recurrent readings to filter the 273 articles under review. We looked for pieces of analysis regarding actual projects and PPP governance. Initially, we examined each paper through a 20-min reading with a focus on the analysis and conclusions sections. As a consequence of this process, the initial number of papers was reduced to 107. Each one of these were subsequently analyzed through a 1-hour reading. A total of 44 papers were finally chosen for additional analysis (described subsequently).

## **Methodological Component 2: Mapping Causal Relationships**

This component is based on SD and follows Kim (2009). SD is a methodology for analyzing and managing complex systems (Forrester 1961; Sterman 2000). The approach focuses on understanding how system conditions evolve over time as a result of causal interdependencies and feedback relationships between system components. Considering that PPP projects are temporary endeavors in which multiple governance-related variables interact and influence the project's life cycle performance, we argue that SD can help us to better understand not only the effects of such interactions in the system (i.e., the project), but also the system's reactions.

Kim's technique uses a grounded theory approach and seeks to elicit causal maps from written texts (Kim and Andersen 2012). The method has shown to be particularly useful to map causal structures from text data that neither have been directly collected by modelers, nor have been generated with the intention to be simulated (Kim and Andersen 2012). Since the remaining research articles under review exhibit such characteristics, Kim's methodology is considered as a useful analytical tool.

By following Kim's approach, we are analyzing the 40 papers selected to examine the four governance challenges adapted from Levitt et al. (2010): political legitimacy, uncertainty, opportunism, and displaced agency. Since these articles were chosen because they had multiple pieces of analysis from actual PPP projects, our objective is to develop a systems map of the governance mechanisms underlying real public-private agreements. The map will identify governance variables, illustrate interactions between governance processes, and highlight knowledge gaps in the literature. The procedure for building such a map is divided into several stages, as explained below. So far, stages 1 and 2 are partially completed for all of the 44 selected papers.

1. *Open coding.* Every article has been read on a line-by-line basis and a total of 813 data segments have been highlighted. We selected only those segments focused on arguments related to governance challenges and their influence on PPP development. An initial code and identification number was assigned to each text fragment so as to improve identification.
2. *Identification of variables and causal relationships.* In this stage, we have assumed that each argument or expression indicates the authors' mental models. We have analyzed both the data segment and its corresponding code. Based on that, we have inspected each text excerpt so as to elicit causal relationships and variable behaviors. This involved the identification of variables, behaviors (positive or negative), and potential interactions. So far, we have identified an average of three causal relationships per segment for a total of 2,439 relationships and more than 5,000 variables.

3. *Word-and-arrow diagrams.* In each article, the variables and relationships previously identified will be transformed into word-and-arrow diagrams. For each data segment we will have one or more causal maps. At the end of this stage, we will have several word-and-arrow diagrams for each one of the selected papers.
4. *Structural generalization.* Here, we will combine the causal maps previously developed. Our goal is to represent the literature review through a single causal diagram. We will merge variables into a series of summary categories or macro-variables. Each one of these macro-categories will contain variables with similar meanings and common conceptual definitions. In some cases, following Kim and Andersen (2012), we will decompose variables and relationships to emphasize implicit structures. At the end of this process, we will have a single word-and-arrow diagram representing the causal relationships between the macro-variables previously highlighted. This map will help us not only to identify the most common cause-effect links, but also to highlight knowledge gaps if variables that should be linked are not connected.
5. *Connecting the bibliographic evidence with the causal map.* According to Kim and Andersen (2012), the successive data reduction process may generate a disconnection between the final causal map and the original dataset. For this reason, it is important that the map truly represents its source data. We will do so by keeping a record of variables, relationships, and their corresponding text segments.

## PRELIMINARY RESULTS

### Paper Selection Results

Table 1 depicts the 44 papers selected after completing the procedures related to the first methodological component. As shown, our articles comprise evidence of governance challenges in PPP development worldwide. Most of the evidence comes from industrialized countries such as the UK, Canada, Australia, and the United States. Additionally, it is worth noting that around half of the articles have been published in the last decade and some of the most studied projects include initiatives developed in the 1990s or early 2000s (e.g. Channel Tunnel in the UK-France, SR 91 in California, the Dulles Greenway in Virginia, or the Cross City Tunnel in Sydney). This is consistent with previous findings by Ke et al. (2009) and Tang et al. (2010).

In terms of analyzing the impact of the selected papers, we have listed the number of citations and the PPP evidence per article in Table 1. The citations have been tracked through Google Scholar as a way of including references from multiple journals and databases. We found that most of the papers under study have more than 20 citations with an average of 6.5 cites per year. Among them, the most cited paper (245 references) focuses on Australian railways (Ng and Loosemore 2007) and an important group of articles with more than 90 citations study governance issues within toll roads in the US (Zhang 2005), UK (Debande 2002; Shaoul et al. 2006), Netherlands (Koppenjan 2005), and Canada (Asenova and Hood 2006).

Table 1. Research Papers under Review

ID	Writer/Year	Year	PPP evidence	Citations
1	Abdel Aziz	2007	6 projects in Canada: Kicking Horse Canyon, Sea-to-Sky highway, Sierra Yoyo Desan, Okanagan Lake Bridge, Golden Ears Bridge, Canada Line Transit.	34
2	Abdel-Azis, Russell	2001	5 international projects: Channel Tunnel, Second Severn Bridge, Highway 104, Northumberland Strait Crossing, SR 91.	15

3	Asenova, Hood	2006	4 projects in Canada: Sea-to-Sky Highway, William R. Bennett Bridge, kicking Horse Canyon Highway, Sierra Yoyo Desan Road.	145
4	Aziz	2007	PFI projects in the UK	11
5	Bunch	2012	PPP projects in Texas	2
6	Carpintero, Vassallo, Soliño	2014	Projects in Brazil, Mexico, Chile, and Colombia	15
7	Chi, Javernick-Will	2011	High-speed Trains in China and Taiwan	15
8	Chung, Hensher	2015	The M4 motorway in Australia	0
9	Chung, Hensher, Rose	2010	Toll roads in Sydney	49
10	Clark, Root	1999	PFI projects in the UK: road projects	44
11	Daito, Chen, Gifford, Porter, Gudgel	2013	PPP project in Virginia	2
12	Debande	2002	PFI projects in the UK: the Skye Bridge project and other road projects	98
13	Edkins, Smyth	2006	Two PFI projects in the UK	55
14	Garvin	2010	Multiple projects in the US and Canada	43
15	Garvin, Bosso	2008	SR 91, Dulles Greenway, and Pocahontas Parkway	57
16	Gilmour	2012	Two projects in the US	7
17	Ho, Levitt, Tsui, Hsu	2015	Channel Tunnel Project	0
18	Ho, Lin, Chu, Wu	2009	Taiwan High Speed Rail	19
19	Iseki, Houtman	2007	Golden Ears Bridge in Canada and Texas State Highway 130 in the US	8
20	Johnston	2010	Cross-City Tunnel toll way in Sydney, Australia	16
21	Johnston, Gudergan	2007	Cross-City Tunnel toll way in Sydney, Australia	66
22	Koppenjan	2005	Nine PPP projects in the Netherlands	188
23	Lee, Schaufelberger	2014	Projects in Malaysia, Taiwan, and Thailand	3
24	Lenferink, Tillema, Arts	2013	PPP projects in the Netherlands	25
25	Marrewijk, Clegg, Pitsis, Veenswijk	2008	Projects in the Netherlands and Australia	211
26	Ng, Loosemore	2007	The New Southern Railway in Sydney, Australia	245
27	Ni	2014	Project in the US	9
28	Ortiz, Buxbaum	2008	Chicago Skyway, Indiana Toll road, Texas State Highway 130.	36
29	Park, Chang	2013	Channel Tunnel Project	4
30	Regan, Smith, Love	2010	PPPs in Australia	46
31	Schaufelberger, Wipadapisut	2003	Highway 407 in Canada. The Dulles Greenway and SR 125 South Tollway in the US. Cross Harbour Tunnel and Western Harbour Tunnel in Hong Kong.	74
32	Shaoul, Stafford, Stapleton	2006	PFI projects in the UK: road projects	95
33	Soomro, Zhang	2013	Several projects in multiple countries	7
34	Soomro, Zhang	2016	Multiple projects worldwide	0
35	Vassallo, Ortega, Baeza	2012	Toll highways in Spain	13
36	Vassallo, Ortega, Baeza	2013	Toll highways in Spain	5
37	Verweij	2015	1 project in the Netherlands	8
38	Vining, Boardman, Poschmann	2005	Dulles Greenway and the SR 91 in the US. 407 Highway and Confederation Bridge in Canada.	66
39	Wang	2015	Dulles Greenway, SR 91, Pocahontas Parkway, and LBJ lanes in the US.	4
40	Ye, Tiong	2003	PFI projects in the UK	14
41	Zhang	2005	PFI projects in the UK and toll roads in the US.	99
42	Zhang, Kumaraswamy	2001	Tunnel projects in Hong Kong	78
43	Zhang, Kumaraswamy	2001	Tunnel project in Hong Kong and toll roads in the US	76
44	Zou, Wan, Fang	2008	1 project in Australia	62

Although the number of citations helps to indicate research impact within the academic community, we chose to confirm the overall influence of the publication sources. Table 2

categorizes the papers according to their publication journals and lists their impact factors and subject areas. The impact factors and quartiles have been obtained from the Journal Citation Reports (JCR) and the SCImago Journal Rank (SJR). The subject areas have been retrieved from the Web of Science and Scopus databases.

According to Table 2, most of the publications are ranked in the first three quartiles across different subject areas in both the JCR and the SJR. In respect to impact factors, *Political Geography* and the *International Journal of Project* exhibit the highest indices, followed by the *Journal of Transport Economics & Policy* and *Building Research & Information*. Regarding the subject areas, while half of the articles belong to either civil engineering or building construction, the other half involves public administration, transportation, business finance, geography, and economics. In general, all the selected papers come from reputable journals and have showed adequate impact levels within the academic community.

Table 2. Selected Journals under analysis

Journals	Paper I.D.	JCR Impact Factor	JCR Quartile 2014	SJR	SJR Quartile 2014	Subject Area
Australian Accounting Review (AAR)	7	0.38	4	0.36	3	Business Finance
Australian Journal of Public Administration (AJPA)	17	0.42	4	0.26	3	Public Administration
Case Studies on Transport Policy	11	N/A	N/A	0.38	2	Transportation
Canadian Journal of Civil Engineering (CJCE)	2	0.56	3	0.38	3	Engineering, Civil
Construction Management and Economics (CME)	1,7,29,40	N/A	N/A	1.12	1	Building and Construction
International Journal of Project Management (IJPM)	24,25,26,37,39	2.44	1	1.51	1	Management
International Review of Administrative Sciences (IRAC)	21	0.66	3	0.53	2	Public Administration
Journal of Comparative Policy Analysis (JCPA)	38	0.61	3	0.3	3	Public Administration
Journal of Construction Engineering and Management (JCEM)	4,14,18,30,31,41,42,43	0.84	3	1.2	1	Construction & Building Technology
Journal of Financial Management of Property and Construction	44	N/A	N/A	0.23	3	Finance
Journal of Management in Engineering (JME)	6,17,23,33,34,35	0.93	3	1.04	1	Engineering, Civil
Journal of Professional Issues in Engineering Education and Practice (JPIEEP)	13	0.27	4	0.45	2	Engineering, Multidisciplinary
Transportation Research Record (TRR)	36	0.54	4	0.52	2	Engineering, Civil
Journal of Transport Economics and Policy (JTEP)	12	1.18	2	0.77	2	Economics
Political Geography (PG)	10	2.68	1	2.46	1	Geography
Public Administration (PA)	16,22	1.52	1	1.28	1	Public Administration
Public Budgeting & Finance	5	N/A	N/A	0.681	2	Finance
Public Performance & Management Review	27	N/A	N/A	0.907	1	Public Administration
Public Policy and Administration (PPA)	3	N/A	N/A	0.37	2	Public Administration
Public Works Management & Policy (PWMP)	15,28	N/A	N/A	0.35	2	Public Administration
Research in Transportation Economics (RTE)	9,19	N/A	N/A	0.79	2	Transportation
Transport Reviews (TR)	32	N/A	N/A	2.12	1	Transportation

## A Causal Map of PPP Governance Issues

So far, we have only examined the paper of Abdel-Aziz and Russell (2001) through the methodological component’s first two stages. This paper addresses the governance challenge of uncertainty through its focus on uncertainty-related challenges and explores PPP projects in Canada and the US. The authors explore topics related to difficulties in recovering costs from toll fees and unpredictable traffic forecasts. We have extracted a total of 38 text segments and developed a causal map based on some of the variables and relationships highlighted in the article. Although the map remains a work in progress, it provides an indication of how some of the governance issues studied by Abdel-Aziz and Russell affect project development.

To illustrate the results of the coding process, the following text segment was analyzed as shown in Table 3.

*The government allowed for additional proposals for adjusting the toll level (and (or) concession period) in order to take account of actual traffic flows diverging from the bid assumptions. For this case, detailed information was required regarding the mechanism for adjusting toll levels and (or) the concession period, the traffic demand assumptions, and the upper limit for the concession period.*

Table 3. Coding example

Paper: A structure for government requirements in public-private partnerships; Paper ID: 2				
Governance challenge: uncertainty				
	Cause:	Actual Traffic flows	Actual Traffic flows	Good forecast fit
Causal Structure	Effect:	Toll level	Concession period	Need of Renegotiations (tolls and concession periods)
	Relationship Type:	Negative	Negative	Negative
Comments:		Low traffic flows promote increasing tolls.	Low traffic flows call for extended concession periods.	Good traffic forecasts decreases potential future renegotiations

Note: table adapted from Kim (2009).

The proposed text excerpt refers to the interaction of three specific variables (i.e. traffic flows, toll levels, and concession periods) and how such interaction impacts the PPP project. According to the text, if traffic flows are different from the forecasted data, toll levels and concession periods are expected to change. These changes, in turn, would bring renegotiations and adjustments into the contract. Consequently, as depicted in Table 3, we can argue that if the actual traffic flows decrease, the PPP initiative needs higher toll levels and a longer concession period in order to remain viable. Similarly, we can also infer that a good fit between forecasted and actual data reduces the need for renegotiations.

Following the example shown in Table 3 and the methodology presented in previous sections, Figure 1 depicts the main variables and relationships obtained from the proposed text segment. The arrows symbolize cause-effect relationships and the polarity marks denote that variables move either in the same (positive sign) or in opposite directions (negative sign). If a group of concatenated variables forms a closed cycle, a feedback structure is generated and can be categorized as a reinforcing or balancing (self-correcting) loop.

As shown in Figure 1, there are two balancing loops (i.e. B1 and B2) and one reinforcing cycle (i.e. R1) that explain the interaction between traffic flows, toll fees, and concession periods. According to B1, high toll levels increase toll income, reduce the gap between forecasted and actual earnings, and decreases the need to further raise toll fees in the future. However, excessive toll levels decrease traffic flows and ultimately push for higher rates (loop



## ACKNOWLEDGEMENTS

This material is based upon work supported by the National Science Foundation under Grant No. 1333264. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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