

# **A Research Proposal for an Evaluation on a Public-Private Partnership in Asset Management**

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*The proposed research is going to evaluate the effectiveness of a public-private partnership in interstate highway maintenance between the Virginia Department of Transportation (VDOT) and VMS, a transportation and operations firm, and answer the research question “**Has the VDOT-VMS program been more effective than interstate maintenance managed by VDOT?**”. In this research, effectiveness will be understood from the public sector’s perspective and tested in three aspects: cost-effectiveness, performance-effectiveness and organizational development. A mixed research methodology will be applied, using quantitative analysis to examine cost-effectiveness and performance-effectiveness, and using qualitative analysis to examine organizational development. Research data will be collected through contracts, VDOT’s work records, VMS’ work records, JLARC’s reviews, previous studies, surveys and interviews. The test results are expected to show some superiorities of partnership over public sector’s work in asset management and help VDOT determine if it should expand partnership statewide.*

## **Statement of Purpose**

In December 1996 the Virginia Department of Transportation (VDOT) entered into a five-and-a-half-year contract with VMS, Inc., a transportation and operations firm in Richmond, for asset management services on a portion of Virginia’s interstate highway system. Virginia became the first state to use Public-Private Partnerships (PPPs) in asset management for interstate highway maintenance (JLARC, 2001A). As a pilot contract, the VDOT-VMS contract was believed to have the potential to provide cost savings, increase level of service, supplement state resources, and meet peak demands associated with accelerated schedules (Ribreau, 2004). In 2001, VDOT renewed the VMS contract for the same highway segments to cover the years from 2002 to 2007 without any additions or deletions.

For several years, attempts to expand the scope of PPPs in asset management in Virginia have been frustrated and one of the major reasons is there has been little follow-up to determine whether initial claims of savings and benefits have been achieved in actual experience (Ribreau, 2004). Now the second term of the VMS contract is ending in no time and VDOT is considering if it should continue the contract or even expand PPPs in asset management statewide.

The proposed research can help VDOT make the decision by answering the question “**Has the VDOT-VMS program been more effective than interstate maintenance managed by VDOT?**”. Based on Graddy and Chen’s theory (2006) of collaborative effectiveness, this research is going to study two dimensions of effectiveness (client goal achievement and organizational development), and test three aspects of effectiveness (cost-effectiveness, performance-effectiveness and organizational development) in the following three hypotheses:

*Hypothesis I: The VDOT-VMS program has consumed fewer inputs than interstate maintenance managed by VDOT.*

*Hypothesis II: The VDOT-VMS program has provided better level of service than interstate maintenance managed by VDOT.*

*Hypothesis III: The VDOT-VMS program has helped VDOT with organizational development which wasn't found in interstate maintenance managed by VDOT.*

Since the VDOT-VMS program is the only partnership case in Virginia's asset management so far, the research may not be able to provide conclusive findings on the overall effectiveness of PPPs over public programs, but information learned from the research can be used to help VDOT with future policy making and improve its provision of asset management services.

## **Theoretical Background**

A Public-Private Partnership is a contractual agreement between a public agency and a private sector entity, through which the skills and assets of each partner are shared in delivering a service or facility for the use of the general public. In addition, each party shares in the risks and rewards potential in the delivery of the service and/or facility (NCPPPS, 2006). Here, the public agency could be any agency from either federal, state or local government, and the private sector entity could be an individual, a for-profit organization (business), or a non-profit organization (a community group or civil society). The rest of this session will discuss different types of PPPs and the potential benefits of and concerns regarding the application of PPPs.

### *Classification: Skelcher's Partnership System*

There are a variety of principles of classification found in the literature on PPPs, each of which is usually informative for a particular purpose. For example, the PPPs Continuum System, which is widely adopted in the U.S. and Canada, is restricted to infrastructure constructions (Ghobadian, Galliar, O'Regan and Viney, 2004; Kernaghan, 1993). This research will adopt Skelcher's partnership classification system, which uses a generic sense to explain PPPs and probably has the most applicability among all classifications.

Skelcher (2005) classifies partnerships by referring to the way government and the private sector work together in pursuit of societal goals. He sorts PPPs into five categories, namely **Public Leverage**, where government creates material and financial conditions to attract private investment and business development; **Contracting-Out and Competitive Tendering**, where government aims at achieving cost reductions, efficiency gains and quality improvement in public service delivery by contracting with the private sector; **Franchising**, in which government transfers management of public enterprise to the private sector; **Joint Ventures**, which deliver projects where government has common interests with private actors, and enable government to gain access to private capital and to transfer risks to the private sector; and **Strategic Partnering**, where government integrates private actors into the public policy process, and is able to gain significant cost reductions and business gains over the medium to long term.

### Potential Benefits of PPPs

Proponents of PPPs believe that the public is good at certain things, the private is good at something else, so creative partnership between the public and private could take full advantages of both sides' strengths to work for the public interest. There are five major purported advantages of PPPs.

**Cost reduction** is one of the major reasons to use PPPs. Cost savings can mainly be achieved through increase in efficiency and reduction in staffing and employment conditions (Skelcher 2005). Cost savings are also the result of improved management due to lack of red tape, increase in flexibility, and speedy implementation (Abrahams, 2000; Seader 2002).

Another major benefit of using PPPs is **the access to private resources**, including specialized expertise, proprietary technology and private capital. Government is fully aware that the private sector has some advantages that cannot be found in the public sector. The private sector owns know-how and advanced technology and private laboratories accelerate change to an amazing rate, especially in high-tech fields like information and communication areas. In contrast, as a generalist, government can not afford to maintain know-how in-house, and it is even more impossible for government to conduct research and development in every field (Domberger and Jensen, 1997; Seader 2002). Partnership provides a great opportunity for government to access specialized expertise and advanced technology from the private so as to better serve the public interest. Also, partnership serves as a vehicle for the injection of private capital in public service delivery. It may permit projects to proceed when there are no enough public finances available. Or with private capital coming in, government can devote its finite finances to other high-priority areas of expenditure (Allen 1999).

**The sharing of risks** between the public and private is also a key benefit of partnership. Scholars believe that partnership can efficiently distribute particular risk to the partner best suited to manage that risk, and therefore the overall risk costs can be minimized (Allen 1999, Seader 2002, Skelcher 2005). Also, as we mentioned above, partnership offers the opportunity for the public sector to access private technology, and then a private partner will have to guarantee the effectiveness and efficiency of the technology it brings in. This will relieve the public sector of the risks of enormous costs associated with research, innovation, and performance. Furthermore, after signing the contract of a partnership, the private sector is obligated to perform with fixed or maximum costs for the operation of the project (Paquet, 1997). This apparently relieves government of its open-ended financial risks in this particular public service area. In addition, in some cases where private actors are contracted to market on their own, like in concession projects, the public sector is even free from market risks or rate/pricing risks (Seader 2002).

Furthermore, proponents believe that in partnership both the public and private have better incentives for **quality improvement**. To the public sector, partnership is a useful vehicle for increasing their familiarity and direct interaction with private actors; therefore public agencies are able to adopt more advanced managerial skills and expertise from their private partners. Additionally, partnership offers a good opportunity for government to closely communicate with clients – citizen or other particular service receivers – so as to better understand, determine and meet their needs (Allen 1999).

To private actors, PPPs also provide several strong incentives for better performance. Risk sharing is the greatest incentive for good private performance: for example, in many partnerships, payment is conditional upon the initiation of the actual provision of public services, or the quality of the services delivered. In addition, a private actor usually has access to a range of performance-based payment arrangements, which are rarely available in the public sector (DiLullo and Stainback, 2001). Moreover, private actors are usually free from bureaucratic “red tape” and relatively isolated from political intervention, so that they are able to work more flexibly and effectively than a public agency (Allen 1999).

### Concern regarding PPPs

Private accountability is the biggest concern regarding PPPs (Allen, 1999; DiLullo and Stainback, 2001; Domberger and Jensen 1997). Not only skeptical scholars but also some citizens are worried that the private actors might be less accountable than government to the public interest. Unlike public agencies which have the goal of best serving the public interest, the private sector, especially for-profit organizations, aims at maximizing its financial benefits. Critics argue that private actors might have strong incentives to take short cuts in providing public services so as to achieve cost-savings and financial benefits. It could get worse when private actors conduct illegal practices to win over government for a contract by bribery, black-box operations and other corruptions (Kernaghan, 1993).

## **Research Statement**

The goal of the research is to help VDOT determine if it should continue the VDOT-VMS contract and expand PPPs statewide. The research will compare the VDOT-VMS program with interstate maintenance managed by VDOT, demonstrate if the former has fulfilled its promises of cost savings, quality improvement, and better performance in other aspects, and then answer the question:

***“Has the VDOT-VMS program been more effective than interstate maintenance managed by VDOT?”***

There are two crucial things that need to be clarified. First, given the fact that the VDOT-VMS program is the first and only partnership in interstate highway maintenance in Virginia so far and will be the only partnership case studied in the research, the research has no intention to make a conclusive statement regarding the overall effectiveness of PPPs, as an alternative method of public service provision, over public provision, but instead it will simply evaluate the effectiveness of the VDOT-VMS project over interstate maintenance managed by VDOT alone. However, the research will still provide informative insights regarding the differences between the VDOT-VMS project and VDOT’s work, which can help VDOT with its future policy making and provision of interstate highway maintenance. Secondly, the word “effective” is a complex notion, especially in the context of partnership. Even though partnership is widely recognized as an effective alternative to public-managed work, there has been little consensus about what effectiveness means in partnership and how to measure it. The rest of this session will discuss a generic way to understand the notion of effectiveness in partnership and then propose a research

framework to evaluate the effectiveness of the VDOT-VMS program over VDOT's maintenance work.

### *Effectiveness in Partnership*

According to Graddy and Chen (2006), there are three dimensions of effectiveness in collaboration: (1) client goal achievement; (2) improved inter-organizational relationships; and (3) organizational development. The three dimensions reflect the different types of goals organizations might seek through partnership. Based on the nature of this comparative research, the second dimension (improved inter-organizational relationships) won't be considered as an analysis criterion because the core of the research is to compare partnership with public projects, but the inter-organizational relationships in partnership are fundamentally different from the ones in public projects, so analysis of this dimension won't have substantial contribution to our understanding regarding effectiveness difference between partnership and public projects. Consequently, the research will focus on two dimensions of effectiveness: client goal achievement and organizational development.

**Client goal achievement** refers to the primary purpose of public sector's efforts to increase collaboration, which in this particular case has two components: (1) the VDOT-VMS program provides services at equal or lower costs than interstate maintenance managed by VDOT; (2) the VDOT-VMS program provides equivalent or better level of service than interstate maintenance managed by VDOT (JLARC, 2001).

**Organizational development** refers to the organization's benefits in increased capacity to effectively compete for future contracts and improved ability to achieve its mission and goals. Such development is often caused by the organizational learning which comes from "working with another organization in developing a shared understanding of the problem and reaching a consensus of how to address it" (Graddy and Chen, 2005; Gray, 2000). In this particular case, organizational development is highly needed on the side of VDOT. According to the Joint Legislative Audit and Review Commission (JLARC) of the Virginia General Assembly, VDOT repealed its old productivity measurement system in 1995 and has not been able to systematically measure the productivity of its maintenance activities since then (JLARC, 2001B). It also found that 2 years after the 1997 VDOT-VMS contract was signed, VDOT had neither developed comprehensive performance measurement nor completed any documented analysis of cost effectiveness. A number of recommendations for VDOT's organizational development were thought to be necessary, including improving its performance measures for the contract, increasing oversight and developing comprehensive and consistent oversight guidelines and so on (JLARC, 2001A).

It is noteworthy that since the research is to offer VDOT suggestions for its future work, it mainly focuses on examining the effectiveness from VDOT's perspective without considering the effectiveness in the private sector. As a result, "client goal achievement" only examines the accomplishment of VDOT's goals (cost savings and better level of service), and "organizational development" only concentrates on VDOT's development in performance measures, contract oversight and other aspects in organizational management.

### *A Proposed Research Framework*

Based on Graddy and Chen's theory and the facts of this particular case, the research will use multiple measures to "capture" the effectiveness of the asset management projects by testing the following three hypotheses:

***Hypothesis I: The VDOT-VMS program has consumed fewer inputs than interstate maintenance managed by VDOT.***

The first goal of the VDOT-VMS contract is to achieve cost-effectiveness by providing services at equal or lower costs than VDOT. Since it is a fixed-price contract with a total of \$131 million compensation over the years from 1997 to 2002 and \$160 million from 2002 to 2007 (JLARC, 2001A; Ribearu 2004), inputs actually consumed by the program will be more informative than the payments made by VDOT to VMS. Specifically, inputs should include money, personnel, equipments, and materials consumed by this program from 1997 to 2007. The data can be processed and presented in the form of average cost per unit, for example average costs to maintain per lane mile of highway.

***Hypothesis II: The VDOT-VMS program has provided better level of service than interstate maintenance managed by VDOT.***

The second goal of the VDOT-VMS program is to achieve performance-effectiveness by providing equivalent or better level of service than VDOT. This hypothesis will test two components of performance-effectiveness: service quality and timeliness. Service quality can be evaluated by a set of pre-established outcome standards and all of the roadway features should be maintained to meet these standards (Ribreau, 2004). Timeliness refers to service availability, request response time or waiting time (USGAO, 1992). The VDOT-VMS contract requires the contractor to repair damages within specific time periods. For example, damaged road signs must be replaced within 24 hours, and debris must be removed from the roadway immediately (JLARC, 2001A).

***Hypothesis III: The VDOT-VMS program has helped VDOT with organizational development which wasn't found in interstate maintenance managed by VDOT.***

Organizational development is another important dimension of effectiveness which was strongly recommended by the 2001 JLARC review. Based on the recommendations made by JLARC, this hypothesis will examine the organizational development of VDOT by studying the following factors: (1) performance measurement system; (2) daily monitoring of the contractor's work and oversight guidelines; (3) periodic reviews and evaluations; (4) report and information processing system; (5) cost-effectiveness analysis; (6) internal communication and information flow; (7) risk management; and (8) accountability issues in contract and actual experience.

## **Methodology**

Methodology is determined by the research question (Rudestam and Newton, 2001). Based on the research question, hypotheses and research subjects, the methodology of this research has two characteristics. First, the research is going to use a mixed research methodology, both

quantitative and qualitative analyses. Quantitative analysis will be conducted to test Hypothesis I and II and qualitative analysis will be used to test Hypothesis III. Secondly, for all three hypotheses, the research will conduct a comparative study to compare the VDOT-VMS program with interstate maintenance managed by VDOT. Specifically, in the test of Hypothesis I and II, the VDOT-VMS program will be compared with two groups of VDOT's work: Group 1 consisting of all maintenance done by VDOT alone from 1997 to 2007, and Group 2 consisting of the VDOT's interstate maintenance that had been maintaining the same portion of Virginia Highway from 1987 to 1997 as the VDOT-VMS program has been doing since 1997. In the test of Hypothesis III, the VDOT-VMS program will be compared to Group 1—VDOT's interstate maintenance from 1997 to 2007.

The following will discuss the nuts and bolts in both quantitative and qualitative analyses, including how to form comparable groups, data collection, data processing, evaluation on the approach and expected results.

### Quantitative Analysis

Quantitative analysis will be conducted to examine Hypothesis I and II with comparing the VDOT-VMS program with interstate maintenance managed by VDOT in the aspects of inputs consumption and level of service.

#### ***(1) Forming comparative groups***

Two comparative groups will be formed. In order to make the “comparative” samples “comparable” to the VDOT-VMS program, it is necessary to first understand the study subjects, then identify possible variables, and make the tested variable the only differentiating factor between samples by controlling other variables, so results from the comparison will be the evidence of the effect of the tested variable.

First, it is important to discuss some details of the VDOT-VMS program. It is the first and only interstate maintenance contract in Virginia so far, which has been effective since 1997. It provides maintenance for 250 miles of the State's interstate highway on parts of I-95(101 miles), I-81(87 miles), I-77(59 miles), and I-381(3 miles) (JLARC, 2001A).

Secondly, the difference between the VDOT-VMS program and VDOT's maintenance, if any, could have been caused by the use of partnership, social development and geographic location. The use of partnership is the variable the research aims to test, so other possible variables need to be controlled, which is the reason for forming two comparative groups. Group 1 consists of all interstate asset maintenance managed by VDOT from 1997 to 2007. This criterion puts all research subjects in the same social context and rules out the impact of different societal values, managerial practices and technological capabilities in different time periods. However, it can't exclude the possible impact of different geographic locations on maintenance performance. Based on the fact that the VDOT-VMS contract has a relatively unusual combination of responsibilities: 101miles on I-95, 87 miles on I-87, 59 miles on I-77 and 3 miles on I-381, it is possible that VDOT has purposely contracted out tough spots or portions of highway that need special maintenance and services.

This is why Group 2 is formed, which consists of the VDOT's maintenance that had been maintaining the same portions of Virginia Interstate Highway from 1987 to 1997 as the VDOT-

VMS program has been doing since 1997. The time range “from 1987 to 1997” is determined so that the data from Group 2 covers the same time length as the data from the VDOT-VMS program. This criterion helps rule out uncertain impact of geographic location, but leaves another concern: things could be done very differently in 20 years. This concern could be mitigated by the comparison with Group 1.

**A Model for Hypothesis I and II**

	The VDOT-VMS Contract	Group 1	Group 2
Hypothesis I: Inputs			
Hypothesis II: Level of service			

**(2) Data collection**

Information will be collected through contracts, VDOT’s work records, VMS’ work records, JLARC’s reviews, previous studies, surveys and interviews. VMS’ work records are a crucial information source, sometimes even more informative than VDOT’s. For example, the VDOT-VMS contract requires the contractor to repair damages within specific time periods and VMS has reported data on its compliance with the timeliness requirements since the beginning of the contract, but it was not until 2000 that VDOT implemented a process to report this type of information (JLARC, 2001A). Another potential information source is Virginia Tech, which finished a cost study on the asset management contract on November 30, 2000. Even though the study only examined selected costs and was believed “too narrow to be conclusive” (JLARC, 2001A; Ribreau, 2004), it can still provide useful insights to help this research do a broader and direct comparison of interstate maintenance costs.

For the test of Hypothesis I, the following information will be collected from all three samples: the volume of maintenance accomplished in each sample, including maintained road surface and subsurface, snow and ice removal, road sign repairs and so on; the amount of consumed inputs, including money, personnel hours, equipments and materials. The results can be presented in the form of average consumption per unit, for example average costs to maintain per lane mile of highway. For the test of Hypothesis II, the following information will be collected: the contents of the pre-established standards of service quality for interstate highway maintenance; the percentage of maintenance services in each sample that meet the standards; and the average response times or waiting times for maintenance, repairs and emergency.

**(3) Data processing**

In the test of Hypothesis I, the data from the VDOT-VMS program will be compared with the data from Group 1 and 2 respectively. The maintenance work in Group 1 happened during the same time period as the VDOT-VMS program (from 1997 to 2007), so they are put under the same social context in terms of technology, economy, managerial practice, and other aspects of social conditions. The comparison will examine the cost-effectiveness of the asset management contract by testing if the VDOT-VMS program has consumed significantly fewer inputs than VDOT’s maintenance under the same social context. The maintenance work in Group 2 had been maintaining the same portion of Virginia Interstate Highway from 1987 to 1997 as the VDOT-



VMS contract has been doing from 1997 to 2007, so they all happened at the same geographic location, just at different periods of time. The comparison will supplement the cost-effectiveness analysis done in the first comparison by testing if the VDOT-VMS program has consumed significantly fewer inputs than the VDOT's maintenance happening at the same geographic location before.

In the test of Hypothesis II, the VDOT-VMS program will also be compared with both Group 1 and 2. The comparison with Group 1 will examine the performance-effectiveness of the asset management contract by testing if the VDOT-VMS program has provided better level of service than VDOT's maintenance under the same social context. The comparison with Group 2 will show if the VDOT-VMS program has provided better level of service than the VDOT's maintenance happening at the same geographic locations before.

***(5) Evaluation on the approach***

The comparison between the VDOT-VMS contract and Group 1 and 2 is an effective and concise approach to test Hypothesis I and II. However it is noteworthy that the comparison with Group 1 does not take into account the possible impacts of different geographic conditions, and consequential requirements on maintenance services. The comparison with Group 2 can supplement this defect by comparing maintenance work for the same portion of highway before and after using the VDOT-VMS program. But this comparison causes another concern: things could be done very differently in 20 years with the changes in techniques, managerial practice and work requirements. Conclusively, neither of the two comparisons is flawless, both have their strengths, but also embrace uncertainties. So it is important to conduct both comparisons and make final judgments with deliberate reflection and discretion.

***Qualitative Analysis***

Qualitative analysis will be conducted to examine Hypothesis III by comparing the VDOT-VMS program with interstate maintenance managed by VDOT to examine if there is any organizational development after the launch of the asset management contract.

***(1) Forming a comparative group***

In the test of Hypothesis III, the VDOT-VMS contract will only be compared with one comparative group, which consists of all interstate asset maintenance managed by VDOT from 1997 to 2007. The reason why there won't be another comparison with the maintenance happening at the same location before, like what the previous quantitative analysis does, is that it is already known that VDOT had neither formed systematic performance measurement nor completed cost-effectiveness analysis by 1999 (JLARC, 2001B). Hence merely comparing the VDOT-VMS contract with VDOT's maintenance happening after the launch of the contract in 1997 will sufficiently illustrate if the partnership has made any difference in the way of how VDOT measures performance, operates programs, analyzes cost-effectiveness and manages risks.

### A Model for Hypotheses III

	The VDOT-VMS Contract	Group 1
Hypothesis III: Organizational development		

***(2) Data collection***

Interviews and surveys will be the major methods to collect information from the following: (1)VDOT officials and engineers; (2)the Maintenance Division officials; (3)maintenance engineers, traffic engineers, equipment and facilities managers at the district level; (4)staff at the residency and area levels; (3)representatives from local road maintenance programs, and (6)representatives from VMS, Inc.

These people will be asked a series of open-ended questions concerning the following issues: (1) what kind of performance measurement system is in place, and how these performance measures are chosen and performed; (2) how often inspections are conducted and what are the contents; (3) how VDOT staff work with the contractors and monitor their daily work; (4) how information flows among organizations and what types of communication tools are being used; (5) how the risk management system is formed and how it is performing; (5) how accountability issues are being solved.

***(3) Data processing***

The series of open-ended questions will provide a large amount of information and insights, which are not available from numerical statistical analysis, regarding how the VDOT-VMS contract and VDOT’s maintenance have been operated and managed. These information and insights will be carefully decoded and organized and the comparison will illustrate if the partnership has made any difference in the way of how VDOT measures performance, operates maintenance, analyzes cost-effectiveness and manages risks.

***(4) Evaluation on the approach***

The qualitative approach is properly designed and capable of performing a legitimate comparison. Interviews and surveys will not ask respondents to directly compare the VDOT-VMS contract with VDOT’s maintenance, but simply ask respondents for direct description about the maintenance projects they have worked for. This will maintain the objectiveness of respondents and eliminate their personal preference for either one of the practices. Unavoidably, there is expected difficulty in decoding and organizing the information from interviews and surveys. The process will certainly be time-consuming and probably bring out some unexpected answers which might become a challenge for the analysis.

***Expectation***

Based on the general impression of PPPs and a few previous studies on the VDOT-VMS program, it is expected that the research will show some superiorities of partnership over public work in interstate maintenance. Even though the previous studies were “too narrow to be conclusive” (JLARC, 2001A), they can still offer some insights: in the end of the first term of the contract, an analysis done by VMS showed the contract had saved Virginia taxpayers nearly \$8000 per lane mile of maintenance (Ribreau, 2004); the FY 2000 evaluation illustrates that

VMS was performing at the level required by the contract by meeting or exceeding the performance targets for 90 percent of the items evaluated on I-95, 89 percent on I-77, 86 percent on I-81, and 86 percent on I-381 (JLARC, 2001A).

This research will provide a comprehensive evaluation on the effectiveness of the VDOT-VMS program, not only in cost-effectiveness and performance-effectiveness, but also in the aspect of organizational development. It is difficult to predict if the partnership will show superiority in every aspect, but the research will undoubtedly help VDOT better understand the performance and strengths of the VDOT-VMS contract, and further determine if it would expand partnership statewide.

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