Leadership in Sustainable Infrastructure
Leadership en Infrastructures Durables

Vancouver, Canada
May 31 – June 3, 2017/ *Mai 31 – Juin 3, 2017*

EXAMINATION OF TRANSPORTATION PROGRAM DELIVERY: PRELIMINARY ANALYSIS

Upare, Anushree[1,2] and Tran, Daniel[1]
[1] University of Kansas, USA
[2] a126u212@ku.edu

Abstract
Transportation programming is a process of developing and improving transit facilities using innovation and technology. Transportation programs are often developed with a vision that these facilities sustain and serve for a longer period. Delivering projects on time and within budget, distributing funding effectively, and managing resources are typical driving forces for program delivery. While a number of project delivery options are available for transportation agencies to choose to deliver their transportation projects, there is a lack of research that documents how to implement a variety of project delivery methods including design-bid-build (DBB), design-build (DB) and construction manager/general contractor (CM/GC) for a transportation program. Each delivery method has certain performance opportunities in terms of cost, schedule, quality, risk management, and other performance metrics. Developing an effective strategic plan by incorporating these diverse delivery options is critical to the success of program delivery. This paper documents the state of practice in strategic program delivery based on a rigorous literature review, survey questionnaires, and a content analysis of research reports, guidelines, and manual relevant to program delivery from 13 experienced highway agencies in the United States. The results show that the most significant benefits of the strategic approach to transportation program delivery are accelerated delivery, flexibility in innovation, and flexibility in reassessing and reassigning risk. The major challenges of using a strategic approach to program delivery include staffing capacities, cultural barriers, and required organizational changes. The results of this study will provide for practitioners and professionals with proactive measures and guidance on successfully delivering their transportation programs.

1 INTRODUCTION

State Department of Transportation (DOTs) and highway administration across the United States have a common goal to deliver high-quality transportation programs and projects on schedule and within budget (Keck et al. 2010). State DOTs continually seek solutions to improve managerial, operational, and organizational effectiveness in delivering much-needed transportation programs. Recently, several DOTs have adopted a holistic approach to delivering transportation programs rather than individual projects to maximize the benefits of schedule and cost savings. Project delivery methods ranging from the traditional design-bid-build (DBB) to alternative contracting methods (ACMs) such as design-build (DB), construction manager/general contractor (CM/GC), and public-private partnerships (P3) are used to deliver transportation programs. It is noted that there is no single project delivery method that is right for all projects or programs. However, an optimal delivery method exist for a given project or program. A decision of selecting a delivery method should be based on a rigorous analysis of the goals, attributes, constraints, and risks of an individual project or program. To effectively deliver a transportation program, serval state DOTs have employed a broader approach. This approach includes combining winning strategies, taking an all-inclusive approach to project delivery, implementation of a project management culture, and enhancing communication across the organization. It also includes the use of a variety of innovative contracting methods and strategic programming approaches to transportation programs. These methods often require greater cooperation, partnering, and risk sharing among agency owners, designers, contractors, and other

parties. A considerable amount of published research and literature is available on the process of selecting an optimal project delivery for a given project. However, there is a lack of research that documents how implementing a variety of delivery methods strategically can improve the program delivery. The use of a variety of delivery methods to deliver a program is still relatively new to state DOTs. This paper examines the concept of program delivery and identifying the benefits and challenges of transportation program delivery.

2 LITERATURE REVIEW AND BACKGROUND

The Project Management Institute (PMI) defines a project as "a temporary endeavor undertaken to create a unique product or service." A transportation project is a set of distinct activities, tasks, processes, or initiatives that results in the construction of product or service and has a finite timeline (Zeng et al. 2014). Transportation construction projects are usually large, horizontal public projects such as highways, airports, subways, dams, and railroads. Today's environment, smaller transportation projects, such as those involving maintenance, minor repairs, resurfacing, and similar types of engineering and planning projects, have been taking a center stage. Projects may be viewed as piecemeal systems; however, this approach fails to tie projects to overall strategies of the organization. The specific goals of individual projects may fall short of balancing with the organization's culture and mission. This is where program fills the gap (Keck et al. 2010). Megaprojects, particularly in the infrastructure sector, are often being managed as a program, because megaprojects typically consist of multiple components that can be classified as sub-projects (Jeroen et al. 2014).

The PMI defines a program as "a group of related projects, subprograms, and program activities managed in a coordinated way to obtain benefits not available from managing them individually". Programs may include elements of related work outside of the scope of the discrete projects in the program (Westland 2013). The definition of a transportation program varies among state by state. In some states, a transportation program means a collection of similar-type of projects grouped together. In other states, a program was an endeavor to deliver a range of improvements (Keck et al. 2010). Transportation programs can be further categorized based on following ways: (1) type of asset (e.g., highway, rail, aviation; or roadway, railway, runway, structures, etc.); (2) transportation policy or system objectives (e.g., mobility, preservation, safety, etc.); and (3) type of improvement or solution (e.g., major capacity improvement, minor capacity/system improvement, pavement preservation, safety, operations, etc.) (Cambridge Systems 2002). The difference between a project and a program is that a project delivers output whereas a program delivers the outcome (Keck et al. 2010). A program has a larger scope than that of projects and are typically run at higher levels in the organization. Managing a program requires more sophisticated approaches to managing change in comparison with projects (Alberg 2008). The outgrowth of the planning process leads to implementation of a program (Turnbull 2006). Thus, transportation project programming is the process of selecting a final set of projects, submitted on a statewide basis, to be funded by a transportation agency (Niemeier et al. 1995). Given the limited budget, it is a challenge to select the projects to be funded and implemented from the numerous potential projects. The problem is complicated by the fact that some of the potential projects are interdependent (Huang and Kuo 2013).

A project delivery method is a system for organizing and financing design, construction, operations, and maintenance activities that facilitates the delivery of a good or service (Miller et al. 2000). A better understanding of the abilities of each delivery method provides rational decision making. There are several variations of project delivery methods ranging from traditional design-bid-build (DBB) to alternative contracting methods such as design-build (DB), construction manager or general contractor (CM/GC) and public-private partnerships (P3) that are currently used in the transportation industry. The use of alternative delivery methods seems to be driven by the transit agency's need to achieve aggressive delivery schedules for their projects (Touran et al. 2011). Determining an appropriate delivery method for highway projects is a complex decision. Similarly, selecting delivery methods for a program is a challenging task. Promoting a better understanding of project goals, risks, opportunities, and enhances alignment among project participants is one of the critical factors to select project delivery methods (Tran, et al. 2013).

To examine the strategic approach to program delivery, it is important to understand the program development process. In the 1950s, the federal transportation program was created and had a vision to build the Interstate system which was successfully accomplished. By the year 1973, legislation designated metropolitan planning organizations (MPOs) as the recipients of planning funds and as the agency

responsible for planning process. In 1975, federal guidance required that the projects be funded by the federal government had to be included in the transportation improvement plan (TIP), and that the TIP had to be endorsed by MPO. Over the past few decades, federal legislation then opened the process to require involvement by local officials, the public, and other stakeholders (Turnbull 2006). The program development process varies from state to state; but it typically involves five generic phases: planning, programming, preliminary and final design, advertise and bid, and construction (Anderson et al. 2009). A project often begins with a concept to meet an identified need. It then moves into the planning phase to determine the purpose and need of the project, whether it is an improvement project or a required project. After that, the project is programmed and moves through the design to construction phase. Table 1 summarizes typical activities associated with the first three phases that are most relevant to strategic program delivery methods. A discussion is done on the first three stages.

Table 1: Transportation Project Development Phases

Development Phases	**Typical Activities**
Planning	Purpose and need; improvement or requirement studies; environmental considerations; right-of-way considerations; public involvement/participation; interagency conditions
Programming	Environmental analysis; schematic development; public hearings; right-of-way impact; project economic feasibility and funding authorization
Preliminary Design	Right-of-way development; environmental clearance; design criteria and parameters; surveys/utility locations/drainage; preliminary plans such as alternative selections; geometric alignments; bridge layouts
Final Design	Right-of-way acquisitions; PS&E development—final pavement and bridge design, traffic control plans, utility drawings, hydraulics studies/drainage design, and final cost estimates

Source: (Anderson, Molenaar and & Schexnavder 2009)

Strategic decision making is a key element for success of the transportation program. For transport projects, a complex decision making process is almost inevitable. For more complex situations, modeling, organization, and structuring tools provide an enhanced device for the decision makers (Macharis and Bernardini 2015). Transportation program decision makers face challenge with the multi-objective and multi-criteria process of decision-making of transportation program. The typical characteristics of programs include a significant change in the organization, environmental change, as well as change in program, longer duration than projects, deliverables with a strategic intent, and benefits that are achieved throughout the duration of the program. The success of the program is evaluated based on the benefits it provides (Keck et al. 2010).

Through an exhaustive literature, we recognized that very few studies specifically focused on program delivery and identifying its benefits. To address this knowledge gap, this study attempts to address the following research question:

1. What are the current state of practice of implementing program delivery?
2. What are the observed benefits of program delivery?

Given that there is a dearth of the literature on this topic, this study presents one of the first attempts to identify and document the effective practice of transportation program delivery.

3 RESEARCH METHODOLOGY

To address the aforementioned research questions, the authors used exploratory research methodology. The research method involved the following steps: (1) performing a literature review to understand and document the holistic program delivery approach in highway design and construction; (2) conducting a national survey questionnaire to identify the current state-of-practice, determine program factors considered in decision, benefits and challenges of program delivery; (3) conducting structured interviews with

transportation personnel to verify the findings from survey questionnaires; and (4) analyzing data and discussing findings.

3.1 Literature Review

The research started by conducting an extensive literature review including project delivery methods, program structure, and project and program management. The authors reviewed articles, reports, guidebooks, DOTs websites, and other relevant documents. The goal was to understand a holistic approach to program delivery. The literature review revealed that there was very little guidance for program delivery. This identified knowledge gap was the basis for this study.

3.2 Survey Questionnaire

The survey questionnaire was developed by the research team based on content analysis of the available literature. An online-survey was developed with a purpose to understand the current-state-of-practice of program delivery. The survey questionnaire was distributed in web-based and paper-based forms to the members of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Highways, which includes members representing from 50 state DOTs. Responses was received from 41 DOTs. The overall response rate was 82%.

3.3 Structure Interviews and Case Studies

Based on the response of the survey questionnaire, state DOTs with rich data and experience in program delivery were further contacted to gain more knowledge on the topic. The objective of case studies was to supplement and validate the findings from the survey, obtain specific process examples of program delivery approaches, identify examples of success factors on developing program delivery, and identify common barriers and benefits of each delivery method in the context of programmatic decision.

3.4 Analyzing and discussing data

The findings from the survey were analyzed using descriptive statistics to get the frequency. Cronbach's alpha test was used to check the internal consistency on the factor that impact program establishment. In addition, the authors use Chi-square to evaluate the relationship between experience and non-experience state DOTs on the use of program delivery. The results are discussed in detail in the following section.

4 RESULTS AND ANALYSIS

The analysis of survey sought to investigate the project delivery methods used for program. It is observed that all state DOTs use the traditional DBB; 73% DOTs use DB; 44% DOTs use CM/GC; 39% DOTs use P3 (Figure 1). Additionally, 15% DOTs use a single contract that incorporates a combination of one or more project delivery method for their transportation program.

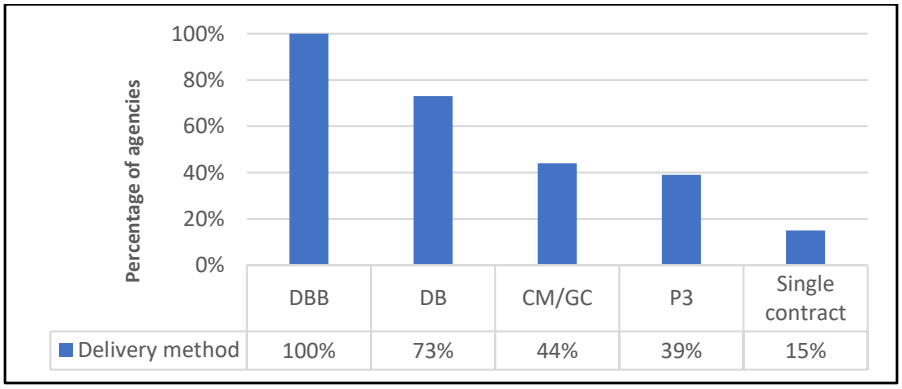

Figure 1: Project delivery methods used for program delivery

Further, the analysis of survey response investigated the differences between the experienced and non-experienced DOTs. The authors took a conservative approach to categorize state DOTs. Specifically, the DOTs which have used program delivery more than five times were categorized as the experienced DOTs.

Similarly, the DOTs which have used program delivery less than five times were categorized as non-experienced DOTs. Table 2 shows the categorization and the corresponding states.

Table 2: Experienced vs. non-experienced state DOTs on program delivery

Category	**Responding States**
Experienced DOTs *(>5 times used program delivery) n=16*	California, Delaware, Florida, Georgia, Indiana, Iowa, Louisiana, Maine, Massachusetts, Michigan, Missouri, New Jersey, Pennsylvania, Utah, Wisconsin, Wyoming
Non-experienced DOTs *(<5 times used program delivery) n=15*	Arizona, Arkansas, Colorado, Connecticut, Hawaii, Idaho, Minnesota, Nevada, New Hampshire, New York, Ohio, Oklahoma, Oregon, Rhode Island, Washington

In terms of the agencies using alternative project delivery methods, Figure 2 shows a comparison of experienced versus non-experienced DOTs in terms of their perception of using project delivery methods such as DBB, DB, CM/GC and P3 in the context of program delivery. It is observed that, 50% of the experienced DOTs use project delivery methods in context of program delivery whereas, with a marginal difference 40% of the non-experienced DOTs use project delivery methods in the context of program delivery. Figure 3 displays perception of implementing or considering a holistic approach to program delivery between experienced and non-experienced DOTs. It is observed that more than 85% of experienced DOTs in comparison to 60% of the non-experienced DOTs consider the holistic approach to delivering a group of projects.

Figure 4 shows the comparison of the project delivery method selection processes for program among the experienced and non-experienced DOTs. It is observed that in case of experienced DOTs, more than 90% of the DOTs chose a delivery method based on a case-by-case basis; more than 40% of DOTs chose a delivery method based on a group of projects; and only 12% of DOTs chose a delivery method based on a holistic approach to program delivery. However, there is difference in selecting a delivery method for a program between experienced and non-experienced DOTs. Figure 4 indicates that non-experienced DOTs preferred selecting a delivery method for a program based on a case-by-case basis. Further, the non-experienced DOTs did not consider the use of a holistic approach to selecting a project delivery method for a program.

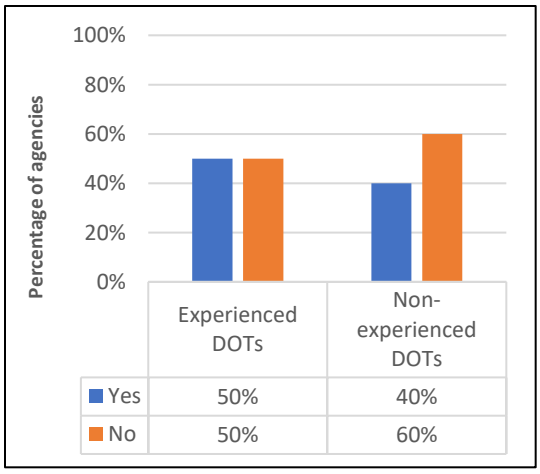

Figure 2: Project delivery methods used in context of program delivery

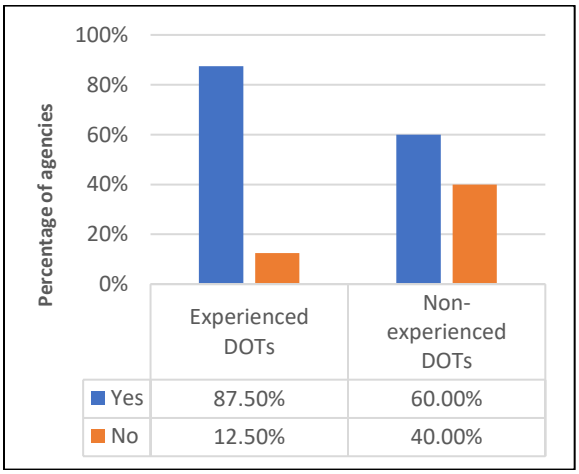

Figure 3: Agencies using holistic approach to deliver group of projects

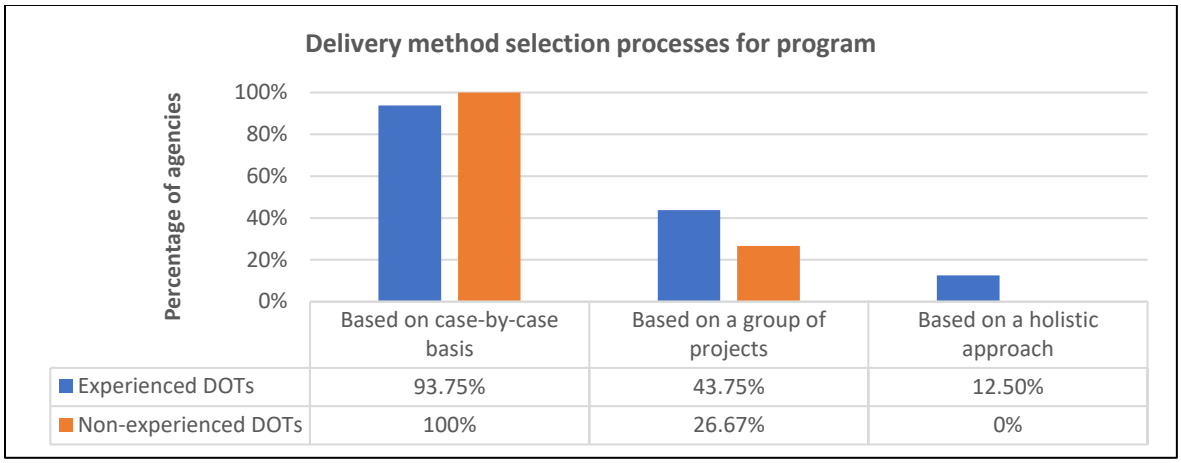

Figure 4: Project delivery method selection process for program

The survey further discovered the factors influencing program establishment using the following scale: 0 = Not Applicable; 1= Inappropriate; 2 = Slightly appropriate; 3 = Appropriate; 4 = Very appropriate; and 5 = Extremely appropriate. Table 3 summarizes the factors that influence the establishment of transportation programs.

Table 3: Factors influencing the establishment of transportation programs

Item	Factors influencing program establishment	NA	1	2	3	4	5	Weighted Average
1.	Project functionalities (bridges, maintenance, or pavement)	1	0	1	7	15	17	4.2
2.	Project construction type (rehab, preservation, or new)	1	0	2	9	16	13	4.0
3.	Funding issues	2	2	3	14	13	7	3.4
4.	Demand and urgency	4	2	1	14	12	8	3.4
5.	Stakeholders' priority and expectation	4	2	5	13	11	6	3.1
6.	Critical completion dates (schedule issues)	6	2	3	13	14	3	2.9
7.	Project location	4	2	10	14	8	3	2.7
8.	State or federal mandates/political influences	5	3	10	11	9	3	2.7
9.	Financing issues /revenue generator (tolls, special taxes)	7	9	6	7	7	5	2.4
10.	Agency personnel's experience on similar past projects	6	10	7	9	2	7	2.4
11.	Project complexity	5	6	10	12	6	2	2.3

The authors used the weighted average method after the consistency test to identify the top five factors that influence the most for the establishment of transportation program. Table 3 shows these top five factors including: (1) project functionalities, (2) project construction types, (3) funding issues, (4) demand and urgency, and (5) stakeholders' priority and expectation. All of these factors have a weighted average score greater than 3.0 or the "Appropriate" level. The authors used the Cronbach's alpha test to check the internal consistency of the items in the scale. It is observed statistically that the Cronbach's alpha coefficient value is 0.813 (Table 4), which satisfies the reasonable goal of test. The Cronbach's alpha coefficient closer to 1.0 indicates that the items in the scale are internally consistent for the response received.

Table 4: Cronbach's alpha test to check internal consistency

	N	Mean	Variance	SD
Statistics for Scale	11	35.63	50.934	7.137

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Item Means	3.239	2.630	4.259	1.630	1.620	.326
Item Variances	1.161	.430	2.063	1.632	4.795	.190
Inter-Item Correlations	.283	-.396	.697	1.093	-1.760	.057

Item Total Statistics	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item Total Correlation	Squared Multiple Correlation	Alpha If Item Deleted
Item 1	32.96	44.652	.417	.533	.816
Item 2	32.74	41.507	.615	.519	.799
Item 3	33.00	40.385	.569	.731	.803
Item 4	32.33	41.231	.718	.736	.792
Item 5	31.96	42.422	.504	.523	.809
Item 6	31.37	51.781	-.135	.401	.846
Item 7	31.63	44.858	.452	.607	.814
Item 8	32.93	39.533	.517	.602	.810
Item 9	32.89	42.256	.449	.449	.815
Item 10	32.41	41.405	.624	.718	.798
Item 11	32.07	41.148	.618	.600	.798

	Alpha	Standardized Item Alpha
Reliability Coefficients for Item 11	.824	.813

To answer the second research question, the survey respondents were asked to indicate top five benefits to programmatic decisions associated with DBB, DB, CM/GC, and P3. Table 5 summarizes the top five benefits observed from survey with respect to each delivery method. The responses from the experienced and non-experienced DOTs were then analyzed using the statistics Chi-square test. The hypothesis is stated as follows:

> H_o – There is no statistical difference between experienced and non-experienced DOTs of the benefit observed for particular project delivery method.
> H_1 – There is a statistical difference between experienced and non-experienced DOTs of the benefit observed for particular project delivery method.

Table 5 summarizes the results of Chi-square test between experienced and non-experienced DOTs. The significance values are denoted with asterisk (*) symbol. For example, accelerated project delivery as a benefit of design-build (chi-square = 7.258 and p-value = 0.007). The null hypothesis was rejected given that *p-value < 0.05.* Thus, there is statistically significant difference between how experienced and non-experienced DOTs perceive the benefit of accelerated project delivery. The remaining benefits were tested and the *p-value > 0.05,* indicated that the null hypothesis should be retained and there is no statistically significant difference in perceptions of the experienced and non-experienced DOTs.

Table 5: Benefits associated with each project delivery method

Delivery method	Benefits	Chi-square	Significance (p-value)
Design-bid-build	Increased control of scope, schedule, and cost	0.806	0.369
	Greater and/or earlier cost certainty	0.032	0.857
	Effectively managing changes	3.903	0.048*****
	Managing and leveraging resources	7.258	0.007*****
	Flexibility in delivering scheduling	5.452	0.020*****
Design-build	Accelerated project delivery	7.258	0.007*****
	Flexibility in innovation	0.032	0.857
	Flexibility in delivery scheduling	3.333	0.068
	Greater and/or earlier cost certainty	7.258	0.007*****
	Cost savings	5.452	0.020*****
Construction Manager/ General contractor	Flexibility in innovation	1.581	0.209
	Flexibility in reassessing and reassigning risk	3.903	0.048*****
	Greater partnership between the public and private sector	7.258	0.007*****
	Greater and/or earlier cost certainty	10.800	0.001*
	Cost savings	16.133	0.000*****
Public – private partnership	Greater partnership between the public and private sectors	9.323	0.002*****
	More choices in funding and delivery methods	14.226	0.000*****
	Flexibility in delivery scheduling	11.645	0.001*****
	Accelerated project delivery	14.226	0.000*****
	Flexibility in innovation	14.226	0.000*****

As noted previously, the findings from the survey were verified through conducting structured interviews and case studies. Based on the survey questionnaire results, seven case studies were conducted. Table 6 summarizes key findings from case studies. The following section discusses these benefits in detail.

Table 6: Benefits of program delivery

Benefits	Department of Transportation (DOTs)					
	Florida	Utah	Missouri	Oregon	New York	Washington
Flexibility in scheduling of projects			✓	✓		
Shortened delivery schedule			✓	✓	✓	
Increased innovation	✓	✓	✓	✓	✓	
Standardized design	✓		✓		✓	✓
Less risk exposure	✓					

Flexibility in scheduling of projects and Shortened delivery schedule

It is a benefit which is observed when using DB. The DB method allows design–builders to have total control over design, scope, and budget, it is more likely that DB projects will be completed within budget and schedule. (Chen et al. 2015). Missouri DOT initiated the use of several incentives/disincentives within the DB contract to accelerate the program schedule for their bridge maintenance program. Oregon DOT adopted the practice to significantly reduce permitting timeline along with use of DB. New York DOT used DB bundling of projects practice in which each bundle utilized overlapping of design and construction to shorten the overall project and program schedule.

Increased innovation

For larger projects within a program, a Utah DOT official stated, “Innovation influences the overall success of the program.” UDOT has realized that projects relying on innovative processes or procedures would benefit from the use of alternative contracting methods. Typical D-B-B processes limit innovation, which is not a problem for small and standard projects. Florida DOT officials stated in the interview process that “innovation is a huge benefit of using alternative delivery programs.” One advantage to using D-B delivery is that the designs are not as conservative as the department’s. Design–builders tend to infuse more innovation and design elements that really improve the overall program. Thus, increase in innovation was a result of the use of alternative contracting methods within a program. Alternative contracting methods used included D-B, CM/GC, P3, and other innovative techniques, which all included the early involvement of key participants. With the hiring of design and construction firms early in the project development process, more innovation and value engineering was realized.

Standardized design

Standardization of design elements helped several state DOTs streamline the design and material procurement processes. In relation to bundling of projects, the projects included in a bundle could be designed to utilize similar materials and construction means and methods. Missouri DOT purposefully began designing similar bridges in the same manner so that similar materials and methods could be used. This allowed for design to be streamlined and the ability to procure materials in bulk to increase cost savings and stage projects in advance of the contractor commencing the work. In Washington DOT, committees aided with creating a level of design criteria, architectural standards, and other design items to help WSDOT be consistent with projects in the program. Having the basics for design criteria in place helps WSDOT maintain each project within an overall master plan and footprint of the program.

Less risk exposure

Florida DOTs had an opinion that use of D-B and P3 for programs can alleviate some of the department’s risks. During the development of a program, enterprise-wide risks are often identified. The Florida DOT summarizes the typical risk associated with program delivery are due to: unfunded federal mandates; diversion of funds to high-profile projects; staff turnover and loss of expertise/experience; poor data management systems and strategies; poor management; statute requiring capacity-related investment and unpredicted variation in construction costs

5 CONCLUSION

The intent of this study was to provide the current state-of-practice of transportation program delivery. The study found that the factors influencing program establishment are program functionalities; project construction type; funding issues; demand and urgency; and stakeholders’ priority and expectation. In general, the benefits that measure the success of program are flexibility in reassessing and reassigning risk; flexibility in delivery scheduling; increased control of scope, schedule, and cost; accelerated project delivery; and flexibility in innovation. This study was largely an exploratory study in that it was the first attempt to examine the practice of program delivery based on preliminary analysis. The findings from this study will help state DOTs and federal agencies to better understand the concept of program delivery. This study also provides the basics of the use of alternative contracting methods to deliver a program. Future research should expand the findings from this study by examining different aspects of program delivery and how the cultural and organizational structure of state DOTs influence the success of program delivery.

References

Alberg, A. 2008. *Definition of Program vs Project - Making Things Happen.* April 9. Accessed February 21, 2016. https://thesavvypm.wordpress.com/2008/04/09/definition-of-program-vs-project/.

Anderson, S., K. Molenaar, and C & Schexnavder. 2009. *Procedures Guide for right-of-way cost estimation and cost management.* NCHRP Report 625, Washington, D.C.: Transporation Research Board of National Academics.

Bakht, M.N., and T.E. El-Diraby. 2015. "Synthesis of decision-making research in construction." *Journal of Construction Engineering and Management, 141(9).*

Cambridge Systems, Inc. 2002. *Transportation Asset Management Guide.* Guidebook, Washington, D.C: American Association of State Highway and Transportation Officials.

Chen, Q., Z. Jin, B. Xia, P. Wu, and M. & Skitmore. 2015. "Time and cost performance of design-build projects." *Journal of Construction Engineering and Management* 1-7.

Department of Transportation. 2001. "Transportation Decision Making: Policy Architecture for the 21st century."

Huang, K., and Y. Kuo. 2013. "A transportation programming model considering project interdependency and regional balance." *Procedia - Social and Behavioral Sciences 80* 416-426.

Jeroen, R, H. Sebastiaan, C. Zevenbergen, R. Ashley, M. Hertogh, and & Ernst ten Heuvelhof. 2014. "Adaptive programme management through a balanced performance/strategy oriented focus." *International Journal of Project Management (32)* 1197-1209.

Keck, D., H. Patel, and A.J and Scolaro. 2010. *Accelerating Transportation Project and Program Delivery: Conception to Completion.* NCHRP Report 662, Washington, D.C: Transportation Research Board.

Macharis, C, and A. Bernardini. 2015. "Reviewing the use of Multi-Criteria Decision Analysis for the evaluation of transport projects: Time for a multi-actor approach." *Transport Policy 37* 177-186.

Miller, J.B., M.J. Garvin, C.W. Ibbs, and S.E. Mahoney. 2000. "Toward a new paradigm: Simultaneous use of multiple project delivery methods." *Journal of Management in Engineering, 16(3)* 58-67.

2013a. "Missouri Department of Transportation." *MoDOT.* Accessed Feb 11, 2016. http://www.modot.gov/safeandsound/Facts.htm.

Niemeier, D.A., Z.B. Zabinsky, Z. Zeng, and G.S. Rutherford. 1995, 121(1). "Optimization Models for Transportation Project Programming Process." *Journal of Transportation Engineering* 14-26.

Project Management Institute. 2013. *A Guide to the Project Management Body of Knowledge - Fifth Edition.* Newton Square: Project Management Institute, Inc.

Touran, A., D.D. Gransberg, K.R. Molenaar, and K. Ghavamifar. 2011. "Selection of Project Delivery Method in Transit: Drivers and Objectives." *Journal of Management in Engineering, 27(1)* 21-27.

Tran, D., C.M. Harper, K.R. Molenaar, N.F. Haddad, and M.M. Scholfield. 2013. "A Project Delivery Selection Matrix for Highway Design and Construction." *Journal of the Transportation Research Board* 3-10.

Turnbull. 2006. *Key Issues in Transportation Programming.* Summary of Conference, Washington, D.C.: Transportation Research Board of the National Academies. Accessed July 25, 2016. http://www.trb.org/Main/Blurbs/158197.aspx.

Turnbull, F.K. 2006. "Key Issues in Transportation Programming." Seattle: Transportation Research Board.

Westland, J. 2013. "Managing Projects of all sizes." *projectmanager.com.* Accessed November 26, 2015. https://www.projectmanager.com/books/managing-projects-of-all-sizes.

Zeng, Z., E. Minchin, L. Ptschelinzew, and Y. and Zhang. 2014. "Multi-objective decision-making to select multiple project delivery methods for multi-project transportation systems." *Sustainable Solutions in Structural Engineering and Construction.* Bangkok, ISEC Press. 477-482.