

BENEFITS AND CHALLENGES OF PROGRAMMATIC APPROACHES TO ALTERNATIVE CONTRACTING METHODS IN HIGHWAY INFRASTRUCTURE PROJECTS

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ABSTRACT: Many state departments of transportation (DOTs) have used alternative contracting methods (ACMs) in addition to the traditional design-bid-build delivery method. Despite the growing adoption of ACMs, the research on the benefits and challenges of using programmatic approaches to ACMs in highway infrastructure projects is still limited. This study aims to address the existing knowledge gaps and provide a comprehensive understanding of various aspects related to the benefits and challenges of programmatic implementation of ACMs in highway infrastructure projects. The research methodology employed in this study involves three primary steps: (1) a comprehensive literature review on ACMs and programmatic delivery, (2) conducting a survey questionnaire of state DOTs in the U.S., and (3) data analysis and discussions. The analysis showed the top five benefits of programmatic approaches to ACMs include better management of risk and uncertainty, flexibility in delivery schedule, flexibility in innovation, more significant and/or earlier cost certainty, and effective management of changes. The top five barriers to implementing an ACM programmatic approach are limited internal agency resources, lack of prior expertise, organizational changes required for ACMs, lack of ACM training, and limited outsourcing capacities. The findings also indicated that the majority, 64% out of 42 state DOTs, did not have any established formal process for measuring benefits of using ACM programmatic approaches. The study contributes to the body of knowledge by providing up-to-date and valuable information about the benefits and challenges of programmatic approaches to ACMs in highway infrastructure projects.

1. INTRODUCTION

State departments of transportation (DOTs) encounter several challenges in administering and managing transportation programs (Chini et al. 2018; Gransberg 2014; Le et al. 2024a). Key obstacles include ensuring the timely and cost-effective delivery of projects, efficiently allocating funding to maximize impact, and effectively coordinating with various stakeholders, including other organizations, interest groups, and the public, to prioritize projects and funding decisions. Overcoming these challenges is essential for enhancing the efficiency and effectiveness of transportation programs (Le et al. 2024b). A commonly used contracting method, often referred to as the "traditional method," involves a separate designer, a general contractor (responsible for construction only), and a fixed-price or unit price lump-sum contract determined through competitive bidding (Assaf and Assaad 2024a; FHWA 2019; Hashem M. Mehany et al. 2018; Mostaan and Ashuri 2017; NDOT 2024). The traditional project delivery approach involves a linear process, where construction follows the design and bidding. However, when a project does not adhere to this approach, owners should consider alternative contracting methods (ACMs). The primary ACMs include

design-build (DB), progressive DB (PDB), construction manager/general contractor (CM/GC), public-private partnerships (P3), and other innovative techniques (e.g., alternative technical concepts (ATC), A+B (or Cost + Time) contracting, or a best-value procurement approach to Design Bid Build (DBB) projects).

Chini et al. (2018) emphasized the increasing use of ACMs as viable alternatives to traditional low-bid procurement practices. The demonstrated advantages of ACMs, including shortened project duration, improved construction quality, and enhanced delivery processes, have underscored their value to the public. Strategies such as A+B bidding, DB, Incentive/Disincentive (I/D) provisions, No Excuse Bonuses (NEB), and Lump Sum (LS) contracting have been broadly adopted to optimize project outcomes. The Florida Department of Transportation (FDOT) has been at the forefront of innovative contracting strategies, continuously evaluating a diverse range of ACMs to improve the efficiency of highway construction project delivery. Likewise, the New York State DOT (NYSDOT) has shared its experiences with driver impact considerations and A+B contracting, highlighting the importance of selecting suitable ACMs based on specific project requirements. Conversely, different ACMs exhibit varying risk profiles based on the unique characteristics of each method and the specific context of the project being executed. Factors such as project complexity, scope, timeline, location, and stakeholder involvement all influence how risks are allocated and managed under different ACMs. These variations highlight the importance of aligning the choice of contracting method with the project's particular needs and challenges to ensure effective risk management and successful project delivery (Alleman et al. 2016; Assaf and Assaad 2024; GDOT, 2022a; GDOT, 2022b; TxDOT, 2023).

Despite the growing use of ACMs in highway construction, limited research has explored the benefits and challenges of programmatic approaches to ACM implementation. Although ACMs provide potential advantages such as faster project delivery, cost efficiency, and innovation, their systematic adoption at the program level poses unique challenges, including regulatory hurdles, resource constraints, and the necessity for standardized best practices (GDOT, 2022a; TxDOT 2023; WSDOT 2025; NDOT 2024). Understanding how state DOTs incorporate ACMs into their overall project delivery programs is crucial for optimizing their effectiveness. This study aims to fill this research gap by examining the programmatic implementation of ACMs across state DOTs, uncovering key advantages and challenges. The research methodology involves a comprehensive literature review and a national survey of state DOTs to evaluate current practices, barriers, and opportunities for enhancing the programmatic use of ACMs.

2. LITERATURE REVIEW

2.1 Programmatic Approach to ACMs

This study outlines a programmatic approach to ACM use as a strategic method related to organizational structures, selection methods, procurement and administration processes, documentation, and post-construction evaluations of ACM projects. The programmatic approach to ACM use is also considered an agency-wide strategy for selecting, delivering, and managing ACM projects. The management of ACMs in transportation projects varies among state DOTs, resulting in a lack of standardization and consistency. A wide range of ACMs deliver highway design and construction projects. This section briefly explores four primary ACMs: DB, PDB, CM/GC, and P3. The following section discusses these methods in the context of programmatic approaches.

2.1.1 Design-build delivery method

The DB method is an alternative, expedited, and efficient project delivery approach for infrastructure projects. In DB projects, a single entity, known as the design-builder, is responsible for engineering and construction, giving the owner a single point of accountability. Unlike traditional delivery methods, DB permits construction to commence before the design is fully completed, accelerating project timelines. Furthermore, the integration of design and construction facilitates constructability feedback from the contractor during the design phase, which helps to reduce change orders and delays during the execution phase (Assaf and Assaad 2024b; GDOT, 2022a; TxDOT 2023).

2.1.2 Progressive design-build delivery method

The PDB method is an emerging project delivery approach in the transportation sector that facilitates greater agency involvement in design and scope development. Unlike traditional DB, where the design-builder merely fulfills contractual design requirements, PDB requires the agency to review and approve the evolving design actively, ensuring it meets or exceeds proposed solutions. This approach creates pre-construction staffing needs, fostering more collaborative decision-making between the owner and the design-builder (Alleman and Tran 2021).

2.1.3 Construction manager/general contractor delivery method

The CM/GC project delivery method entails a contractual agreement in which a construction manager provides input during the design phase and subsequently assumes the risk for the project's final cost and schedule as the general contractor. The owner either completes the design using its assets or hires a consultant to manage the design work. Generally, the contractor is selected based on best value through a request for proposal (RFP) process or a qualifications-based selection, which is conducted through a request for qualifications (RFQ) process. The CM/GC project delivery method consists of two separate contracts: one for preconstruction services during the design phase and another for the construction phase. CM/GC promotes enhanced collaboration, risk management, and project efficiency (Gransberg 2014; GDOT 2022b).

2.1.4 Public-private partnerships

This ACM is structured by a contractual agreement between a public agency and a private entity (which may entail a consortium of multiple firms) to deliver a transportation project. The level of the private sector participation in the design, construction, finance, operation, and/or maintenance of a transportation asset depends on the public agency's priorities in cash outlay, the timing of the owner's monetary obligations, performance needs, short and long-term risk allocation, and resource availability (FHWA 2019).

2.2 Benefits and Challenges of ACMs

Different state DOTs have highlighted various benefits and challenges of ACMs. For example, the Nebraska DOT's *Guidelines for Alternative Project Delivery (2024)* emphasize that project size and complexity influence the selection of the most advantageous project delivery method. Large projects offer significant benefits from ACMs due to opportunities for innovation but also due to more significant risks that may accompany these projects, and this may limit the pool of proposers due to resource requirements. DB and P3 are often the only viable options for large projects due to NDOT staffing constraints. Smaller projects can benefit from DB for specialty work or ITS projects. At the same time, CM/GC, DB, or PDB methods can provide advantages such as compressed schedules, lower contracting costs, and increased opportunities for smaller firms. Complex projects require greater coordination but can yield higher benefits from ACMs by allowing innovative design and construction solutions tailored to project-specific needs (NDOT 2024).

Similarly, Washington State DOT (WSDOT) noted that with the use of Job Order Contracting (JOC), agencies establish a single contract that covers multiple small, time-sensitive projects requiring little to no design and pricing work based on an established price book as projects arise (WSDOT 2025). This approach allows agencies to access contractors once a basic scope of work is developed, eliminating the time-consuming and costly aspects of the traditional DBB process, which requires separate contracts for each small project. One key benefit of JOC is that local governments can complete smaller projects more efficiently by streamlining the sequencing, coordination, and management of the work without individual bidding. Additionally, plans and specifications are only required to the extent necessary for securing permits, and using a unit price book ensures fair locally adjusted costs. However, JOC challenges include needing local government staff to be well-versed in price book usage and comfortable negotiating scopes and quantities without traditional bids. Furthermore, JOC is less effective for projects requiring extensive design and multiple technical disciplines due to dollar limits per work order (WSDOT 2025).

3. METHODOLOGY

The research is structured into three phases to systematically investigate the programmatic approaches to ACMs. Phase 1 involves a literature review to synthesize existing research on ACMs in highway projects and assess the benefits and challenges reported by state DOTs. Phase 2 focuses on data collection and analysis, beginning with identifying and classifying widely used programmatic approaches to ACMs in the transportation industry, then conducting a survey to gather insights from industry professionals, and analyzing the collected data. Phase 3 presents the results and discussion, highlighting the key benefits and challenges associated with programmatic approaches to ACM adoption, as shown in Figure 1.

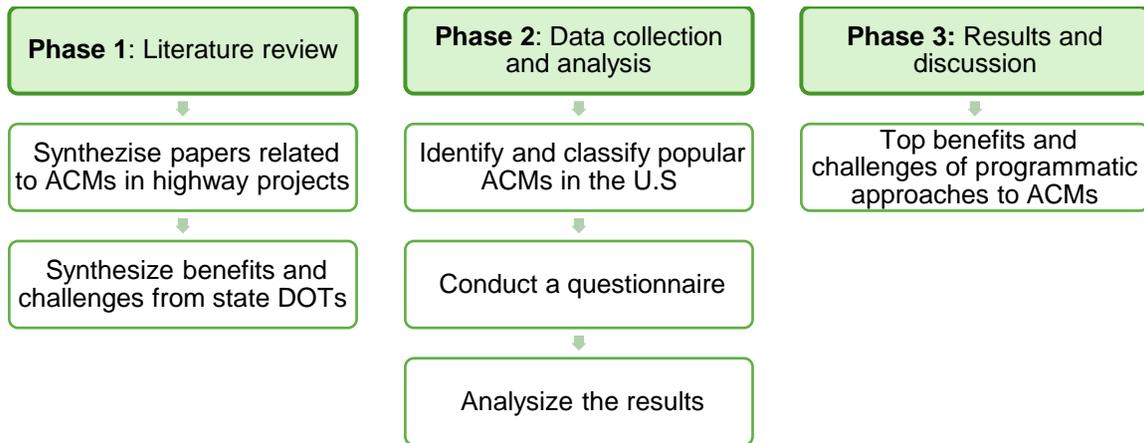


Figure 1: Research method.

3.1 Literature Review

The first phase of this research involved a comprehensive literature review to establish a foundational understanding of ACMs in highway projects. This included synthesizing academic papers, industry reports, and case studies related to programmatic approaches to ACM implementation and performance. This phase provided critical insights into how ACMs have been utilized, their effectiveness, and the key factors influencing their success at a programmatic level. By analyzing previous studies and industry practices, the literature review helped to identify knowledge gaps that this research aims to address. Furthermore, this phase set the groundwork for subsequent data collection (Phase 2) by informing the research design and thoroughly exploring relevant issues and trends.

3.2 National Survey

The second phase centers on gathering and analyzing data to assess the current use of ACMs across the U.S. transportation sector. Initially, widely used programmatic approaches to ACMs were identified and classified based on their adoption by state DOTs. A web-based questionnaire was distributed to collect data for this study. The questionnaire was developed through a comprehensive literature review of programmatic approaches to ACMs. The survey was designed to explore the benefits and challenges of programmatic approaches to ACMs for highway projects. The survey questionnaire was distributed electronically to voting members of the American Association of State Highway and Transportation Officials (AASHTO) Committee on Construction, which includes representatives from all 50 highway agencies and the District of Columbia DOT (DDOT). This study commenced with a comprehensive review of the existing literature to identify key factors influencing the implementation of ACM. Subsequently, meetings were conducted within the research team to refine the scope and ensure the relevance of identified factors. Additionally, discussions with representatives from highway agencies provided practical insights and

validated the applicability of these factors in real-world scenarios. Accordingly, responses from 42 highway agencies were received (82% response rate). The survey data were then analyzed to investigate the current practices of factors influencing ACM and inferential analysis for risk score distributions between agencies with low and high percentages of ACM projects. The authors referred to a range of peer-reviewed journal articles, technical reports, and previous studies to validate the results of the study. An example question from the national survey is shown in Table 1.

Table 1: Example question from the national survey.

Benefits of programmatic approaches to ACMs	D-B	PDB	CM/GC	P3
Improved consistency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility in delivery schedule	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More choices in funding and delivery methods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cost savings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More excellent and/or earlier cost certainty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distributed funding efficiently and equitably	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Managing and leveraging resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced workforce management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility in innovation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better managing risk and uncertainty/ Flexibility in reassessing and reassigning risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Effectively managing changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved trust and agency reputation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fostered relationships among agencies (local, regional, and department)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More excellent partnerships between the public and private sectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved quality parameters of simultaneous projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ability to select multiple firms under a single contract	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3.3 Results and Discussion

The final phase emphasized synthesizing findings and drawing meaningful conclusions regarding the programmatic use of ACMs. The key benefits and challenges identified through the literature review and survey analysis are highlighted, providing a comprehensive view of programmatic approaches to ACM across state DOTs. This phase aimed to transform research insights into actionable recommendations for guiding policymakers, transportation agencies, and industry stakeholders in refining their ACM programmatic approaches. By showing both the advantages and limitations of programmatic approaches to ACMs, this study adds to ongoing discussions on enhancing procurement efficiency, project quality, and overall infrastructure development.

4. FINDING AND DISCUSSION

4.1 Benefits of Using Programmatic Approaches to ACM Selection

Table 2 shows the survey responses, identifying the benefits of programmatic approaches to the most common ACMs, including DB, Progressive DB, CM/GC, and P3. The survey results showed the main advantages of implementing ACMs include (1) Better managing risk and uncertainty, (2) Effectively managing changes, (3) Flexibility in delivery schedule, (4) Greater and/or earlier cost certainty, (5) Flexibility in innovation, (6) Managing and leveraging resources; and (7) Cost savings.

One of the key advantages of implementing programmatic approaches for the four main ACMs is flexibility in the delivery schedule. This flexibility is highly valuable as it empowers DOTs to customize the delivery of the ACMs based on specific project timelines, unique client requirements, and any unforeseen changes that may emerge throughout the process. Consequently, by ensuring that the ACMs are provided in a manner that precisely aligns with the evolving needs of DOT projects and the expectations of DOT clients, they can strategically optimize the delivery process (Alleman et al. 2016). However, the different benefits of each ACM may also derive from the inherent characteristics of individual projects (NDOT 2022; TxDOT 2023). Alleman et al. (2016) provided empirical evidence of how ACMs relate to small project successes, specifically D-B successes. The characteristics and processes of each project delivery method result in preconceived notions of their ability to be used on small projects. Furthermore, by involving the contractor in the design process, the agency benefits from contractor ingenuity and contractually transfers the risk for the final cost and construction time. CM/GC is well-suited for high-risk, complex projects and is chosen based on monetary size and budgetary control concerns (GDOT 2022b).

Table 2: Benefits of using programmatic approaches to ACMs.

No.	Benefits	ACMs			
		D-B (n=38)	PDB (n=19)	CM/GC (n=24)	P3 (n=20)
1	Improved consistency	34%	11%	33%	5%
2	Flexibility in delivery schedule	58%	32%	46%	20%
3	More choices in funding and delivery methods	24%	16%	13%	30%
4	Cost savings	42%	5%	29%	15%
5	More excellent and/or earlier cost certainty	50%	21%	46%	20%
6	Distributed funding efficiently and equitably	11%	16%	8%	5%
7	Managing and leveraging resources	47%	21%	38%	15%
8	Enhanced workforce management	21%	0%	8%	15%
9	Flexibility in innovation	47%	16%	46%	20%
10	Better managing risk and uncertainty/flexibility in reassessing and reassigning risk	39%	32%	46%	20%
11	Effectively managing changes	42%	21%	50%	10%
12	Improved trust and agency reputation	26%	16%	29%	15%
13	Fostered relationships among agencies	26%	11%	25%	15%
14	More excellent partnerships between the public and private sectors	24%	16%	29%	30%
15	Improved quality parameters of simultaneous projects	21%	5%	21%	5%
16	Ability to select multiple firms under a single contract	8%	0%	0%	5%
17	Other: Onboard new staff efficiently	3%	0%	4%	0%

The top benefits of using programmatic approaches to the DB delivery method include flexibility in delivery schedule (22 DOTs, 58%); Greater and/or earlier cost certainty (19 DOTs, 50%); Flexibility in innovation (18 DOTs, 47%); Managing and leveraging resources (18 DOTs, 47%); Effectively managing changes (16 DOTs, 42%); Cost savings (16 DOTs, 42%).

The top benefits of using programmatic approaches to progressive DB include Better managing risk and uncertainty (6 DOTs, 32%); Flexibility in delivery schedule (6 DOTs, 32%); Effectively managing changes (4 DOTs, 21%); Managing and leveraging resources (4 DOTs, 21%); and Greater and/or earlier cost certainty (4 DOTs, 21%)

The top benefits of using programmatic approaches to CM/GC include Effectively managing changes (12 DOTs, 50%); Better managing risk and uncertainty (11 DOTs, 46%); Flexibility in innovation (11 DOTs, 46%); Greater and/or earlier cost certainty (11 DOTs, 46%); and Flexibility in delivery schedule (11 DOTs, 46%).

The top benefits of using programmatic approaches to P3 include Greater partnership between the public and private sectors (6 DOTs, 30%); More choices in funding and delivery methods (6 DOTs, 30%); Better managing risk and uncertainty (4 DOTs, 20%); Flexibility in innovation (4 DOTs, 20%); Greater and/or earlier cost certainty (4 DOTs, 20%); and Flexibility in delivery schedule (4 DOTs, 20%).

4.2 Challenges and Risks to The ACM Programmatic Approach

The survey respondents were asked to rate the impact of risk factors on programmatic approaches of using ACMs via a five-point scale (“0” = Not Applicable or NA; “1” = Very Low; “2” = Low “3” = Moderate; “4” = High; and “5” = Very High). Table 3 summarizes survey respondent feedback on 17 risk factors and their impacts on programmatic approaches to ACMs. The aggregated risk score (RS) is calculated using Equation (1).

$$RS_j = \frac{\sum n_{ij} * r_i}{\sum n_{ij}} \quad (1)$$

Where RS_j = The risk score of the factor j ;

n_{ij} = The total number of responses to the risk factor j associated with the risk rating r_i ;

r_i = The risk rating of the factor j .

Table 3: Risk factors for ACM programmatic approaches (n=42)

No.	Risk Factor	Very Low (1)	Low (2)	Moderate (3)	High (4)	Very High (5)	NA (0)	Ranking
1	Utility issues	-	2	14	13	3	1	3.53
2	Environmental permits and approvals	1	2	14	11	4	1	3.47
3	Schedule/phasing issues	-	3	14	12	2	1	3.42
4	Coordination with government agencies or other authorities having jurisdiction	-	5	13	11	3	1	3.38
5	Change in scope	1	5	11	12	3	1	3.34
6	Right-of-way and easements		5	15	7	4	1	3.32
7	Railroad involvement	5	4	3	11	6	2	3.31
8	Constructability issues	2	6	13	9	2	1	3.09
9	Incomplete project scope definition/design uncertainty	1	10	9	8	3	1	3.06
10	Geotechnical conditions	1	9	11	9	2	1	3.06
11	Market conditions	2	8	13	3	4	1	2.97
12	Staff experience/availability	1	9	13	7	1	1	2.94
13	Use of new procurement methods/contracts	3	9	9	7	2	1	2.87
14	Financial issues	5	7	8	9	1	2	2.80
15	Political risks/opposition	2	9	13	4	1	2	2.76
16	Conformance with regulations/guidelines/design criteria	5	11	8	7	1	1	2.63
17	Legal challenges and changes in law	12	9	6	2	1	1	2.03

Table 3 presents the top risk factors with an aggregate score of more than “3” (e.g., moderate risk), including (1) utility issues, (2) environmental permits and approvals, (3) schedule/phasing issues (aggressive

schedule; restricted work window), (4) coordination with government agencies or other authorities having jurisdiction, (5) change in scope (e.g., due to coordination with third parties, late change requests), (6) right-of-way and easements, (7) railroad involvement, (8) constructability issues, (9) incomplete project scope definition/design uncertainty, and (10) geotechnical conditions. These results are consistent with the findings of (Chini et al. 2018; Molenaar 2005). Chini et al. (2018) indicated that inspectors mention the importance of utility coordination because they are commonly impactful, the use of contingencies to ensure bonus pay, and that emergencies pose a lot of risk and have too many unknowns. Inspectors cite the problems with unforeseen conditions, utility conflicts, and inclement weather. DOTs should provide better assistance for projects in which permitting, utility, and ROW issues exist (Chini et al., 2018).

Figure 2 summarizes organizational barriers to implementing programmatic approaches to ACMs. The three main organizational obstacles include:

- Lack of internal agency resources (23 DOTs, 55%)
- Lack of prior expertise (23 DOTs, 55%)
- Organizational changes required for ACMs (20 DOTs, 48%)

Other barriers to ACM programmatic implementation are a lack of training (12 DOTs, 29%) and outsourcing capacities (six DOTs, 14%). In addition, Georgia DOT indicated that varied interests in ACM markets are barriers to implementing its ACM programmatic approach. Mississippi DOT mentioned state procurement laws are the main challenges in implementing ACMs.

Nyström et al. (2016) indicated that one limitation on DB projects regarding the degrees of freedom is the client's request for verification of the quality of an innovative idea. This creates cost for a bidder, and the more conclusive evidence that the client demands, means the less innovation that should be expected. Furthermore, anecdotal evidence indicates that the client's project manager can bend the strict formal rules of third-party evidence. This would allow the manager to accept proposals for non-standard design from contractors they trust.

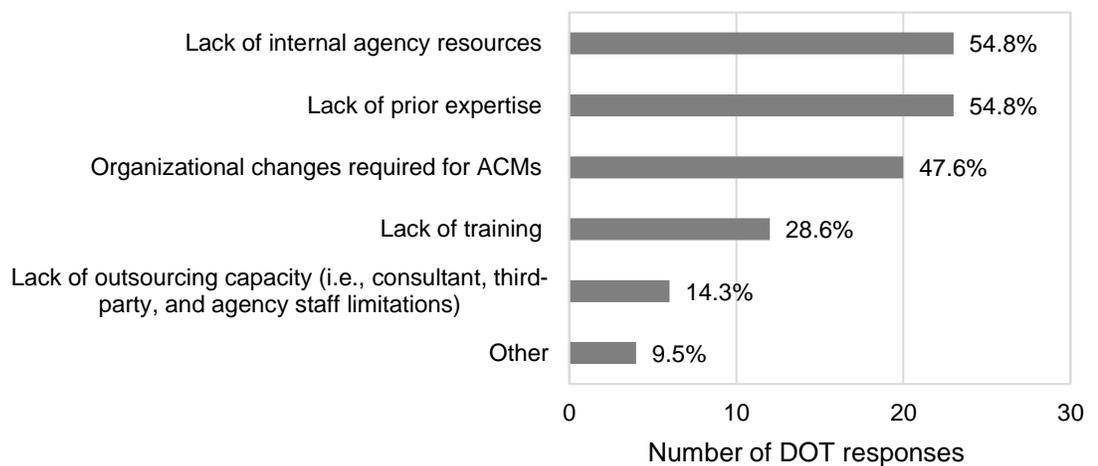


Figure 2: Organizational barriers to implementing ACM programmatic approaches (n=42)

5. CONCLUSIONS

Despite the increasing adoption of ACMs, research on the benefits and challenges of using programmatic approaches to ACMs in highway infrastructure projects remains limited. This study aimed to fill these knowledge gaps by offering a comprehensive understanding of the various aspects related to the benefits and challenges of programmatic implementation of ACMs in highway infrastructure projects. The research methodology for this study is meticulously designed to be robust and multi-faceted, encompassing three main steps. These steps include a comprehensive literature review, rigorous data collection, and analysis by using a web-based survey.

Among the survey responses received, 25 state DOTs (60%) have implemented or considered programmatic approaches to ACMs. However, nine state DOTs (21%) have not yet explored programmatic approaches for ACM delivery. The survey respondents were also asked to identify whether they had a formal process or any examples of measuring the benefits of ACMs. The results revealed that a significant majority, 64% (27 DOTs of 42 DOTs), reported not having any formal process in place. The results showed that 43% of state DOTs had established systems in place to monitor and evaluate the performance of these projects, reflecting a significant portion of DOTs that recognize the importance of performance tracking in improving project outcomes. Programmatic approaches to ACMs offer key benefits across different delivery models. For DB, the most cited advantages include flexibility in delivery schedules (58%), cost certainty (50%), and innovation (47%). Progressive DB primarily enhances risk management (32%) and schedule flexibility (32%). CM/GC benefits focus on change management (50%), risk mitigation (46%), and innovation (46%). For P3s, programmatic approaches foster stronger public-private partnerships (30%), expand funding and delivery options (30%), and improve risk management (20%). These findings highlight the value of structured, programmatic implementation in optimizing project delivery outcomes.

The most considerable challenges of using a programmatic approach to ACMs, as reported by 54.8% of the survey responses, include a lack of internal agency resources and prior expertise. Additionally, 47.6% of DOTs identified the need for organizational changes as a major obstacle. Training deficiencies (28.6%) and limited outsourcing capacity (14.3%) further hinder ACM adoption. These findings underscore the importance of addressing resource constraints, expertise gaps, and structural adjustments to enhance the effectiveness of ACM programmatic approaches.

There are several limitations in this study that warrant future research. There is a need for guidance on implementing and sustaining programmatic approaches to ACMs to enhance consistency, reduce costs, and mitigate risks in procurement and contract administration. Second, research is needed to develop methods for measuring ACM performance, including key metrics such as innovation, cost savings, and schedule impact from design to construction. Third, A potential direction for future research involves examining how state DOTs manage ACM projects at the programmatic level. This includes analyzing the specific challenges and benefits associated with implementing ACMs within a structured, statewide program to inform more effective policy development and program management strategies.

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