Guidehouse

EX. B

Arkansas Department of Transportation Performance Review

Current State Assessment

March 13th, 2020

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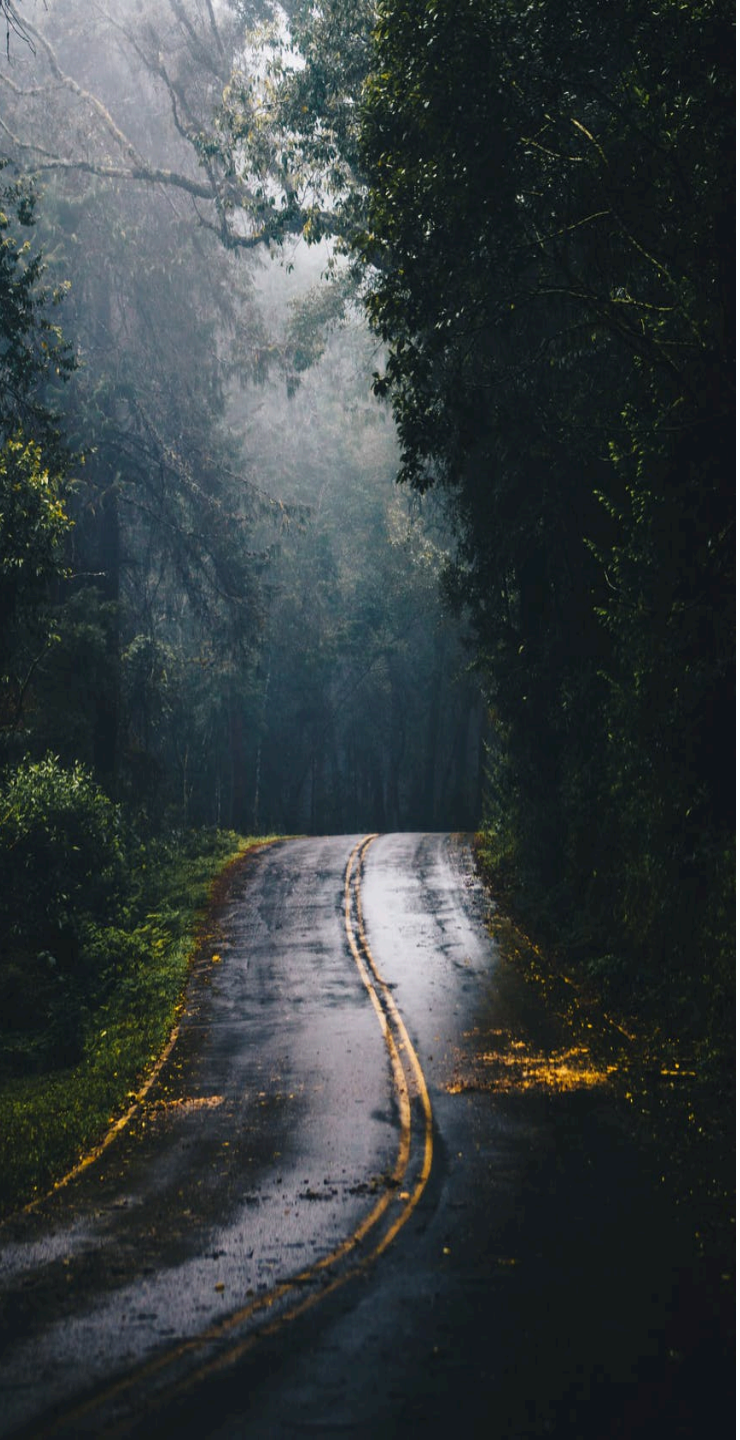


Acknowledgements

Guidehouse appreciates and wants to acknowledge the cooperation that the Arkansas Department of Transportation provided during the course of this review. We were impressed with the knowledge and level of engagement that ArDOT staff at all levels were able to provide

This report would not be possible without the countless individuals who agreed to be interviewed and provide documentation assistance. The quick and effective coordination with ArDOT staff was critical to the success of this report.

Lastly, Guidehouse would also like to take time to acknowledge any other external stakeholders that contributed to this assessment

Executive Summary

| The findings included in the report are a point in time representation and are subject to change.
Please see the assumptions slide in the appendix for further details.

Background

The Arkansas Legislature selected Guidehouse LLP to conduct an efficiency review of the Arkansas Department of Transportation, authorized by Act 298 of 2019.

This report details the current state of the Department's functions and processes, and identifies areas of potential improvement within the areas of portfolio planning, procurement, expenditures, organizational structure and people capabilities, and information technology.

Report Objectives

Synthesize findings on ArDOT's key functions and operating platform

Analyze alignment with corresponding regulatory environment (preliminary)

Document and substantiate findings

ArDOT Snapshot

In FY18:

16,467
state highway miles

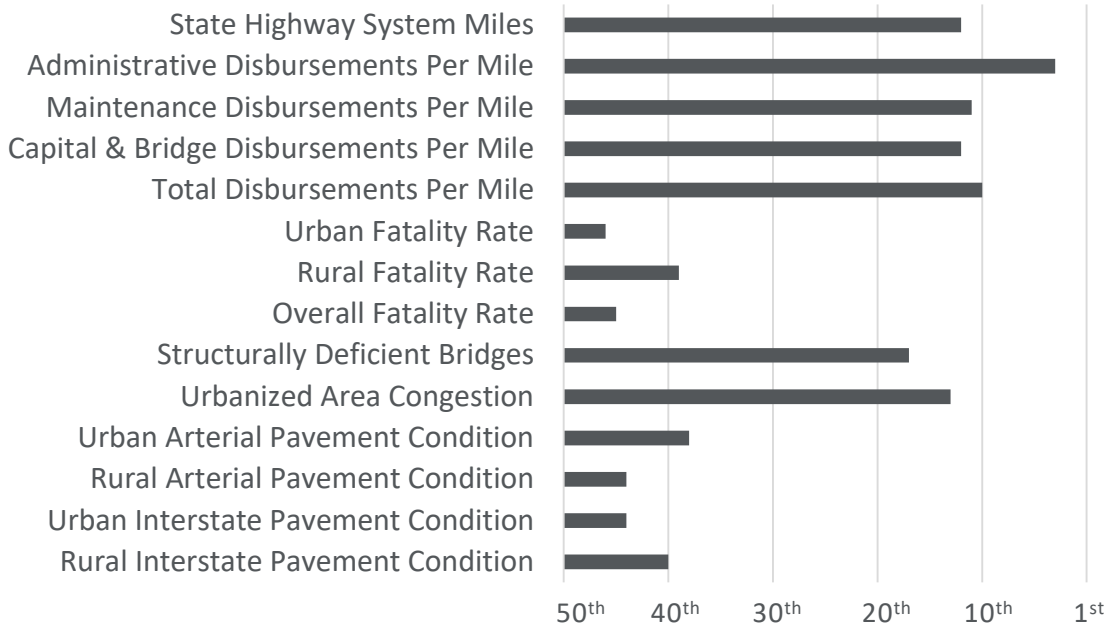
7,299
state bridges

3,705
full-time workforce

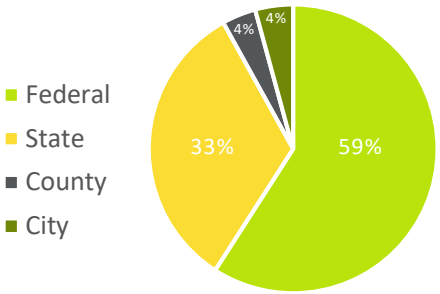
129
highway projects

$1.5B
annual spending

ArDOT National Rankings, 2016



Construction Lettings by Funding, FY18



	Daily Vehicle Miles Traveled	% of Total
District 1	7,097,015	7%
District 2	6,592,130	7%
District 3	5,556,299	6%
District 4	13,670,622	14%
District 5	6,727,875	7%
District 6	24,908,981	25%
District 7	5,424,680	5%
District 8	9,638,117	10%
District 9	10,976,813	11%
District 10	9,006,109	9%
Total	**99,598,641**	**100%**

Source: Guidehouse analysis of ArDOT documents and data

Source: ArDOT

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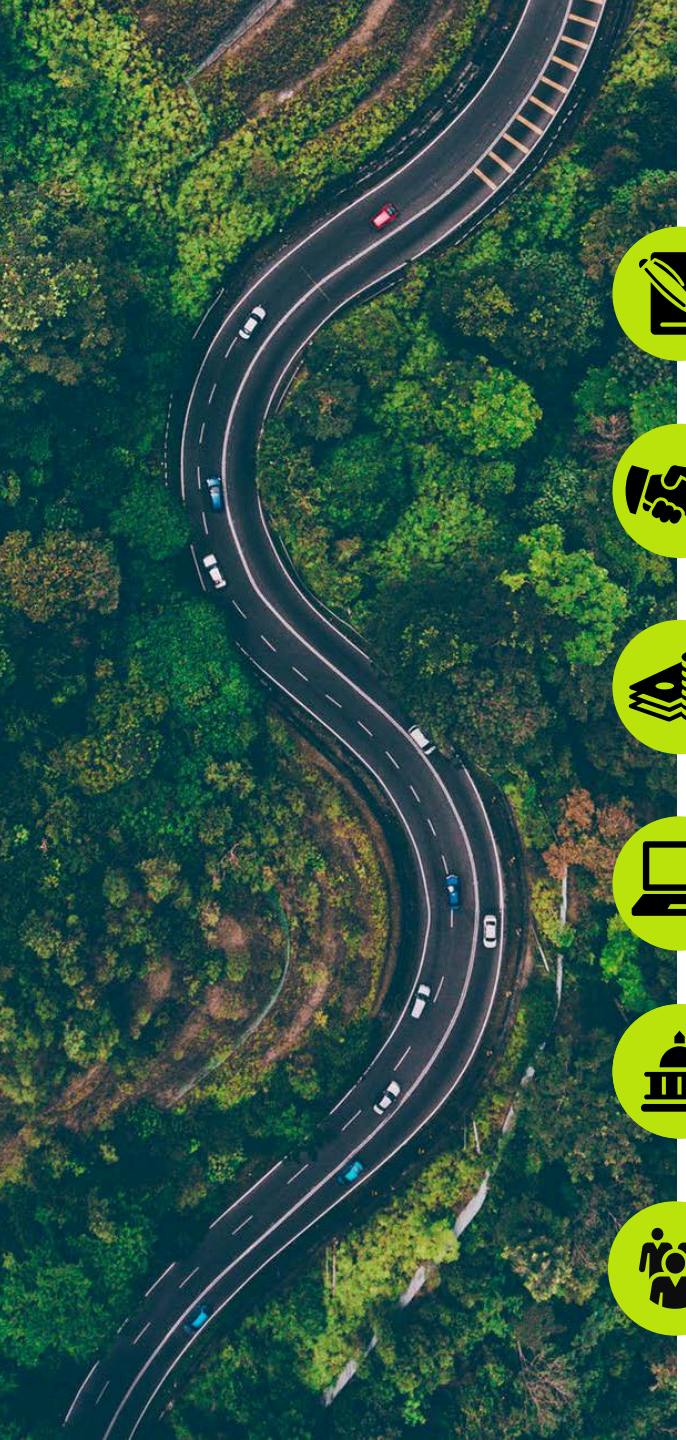

Focus Areas

PORTFOLIO PLANNING
Identification and prioritization of construction and maintenance projects

PROCUREMENT
Selection of contractors, project delivery methods, and contracting strategies

EXPENDITURES
Project and portfolio management to effectively utilize financial, human capital, and IT resources

INFORMATION TECHNOLOGY
Information systems and infrastructure

ORGANIZATIONAL STRUCTURE
Governance, knowledge management, and key performance indicators

PEOPLE CAPABILITIES
Implementation of competitive compensation, career advancement, training, and supports

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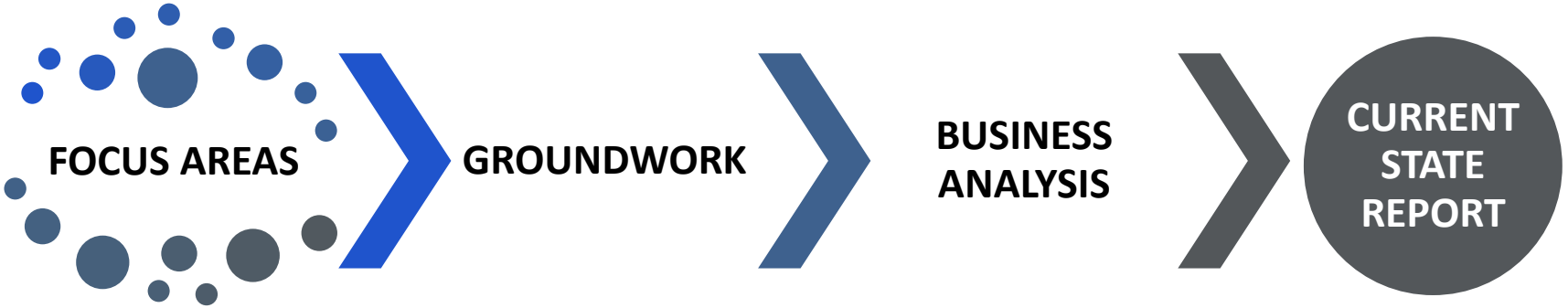
Approach



Portfolio Planning
Procurement
Expenditures
Information Technology
Organizational Structure
People Capabilities

Conducted 64 interviews during 4 site visits with 86 people, including: ArDOT staff across 4 branches, 18 divisions, 3 sections, and 4 districts, as well as Federal Highway Administration (FHWA) staff and utility owners

Reviewed ~1,100 documents on policies and procedures, and analyzed data to assess performance in focus areas

Developed 23 key findings and identified 23 initial leading practices to be considered in future recommendations

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Summary of Key Findings

1 PORTFOLIO PLANNING

- ArDOT lacks a methodology to proactively communicate changes in construction and maintenance projects.
- ArDOT approaches maintenance projects based on allocated "resources" rather than Level of Service.
- There are no comprehensive processes to receive, track, and address public comments or measure their impact on ArDOT's project plans.

2 PROCUREMENT

- ArDOT's unique governance structure affords it some flexibility in procurement.
- Procurement methods do not consider past performance of construction contractors.
- Use of alternative contracting and project delivery methods have been successful to date.
- ArDOT lacks formal systems to identify and implement procurement efficiencies outside of construction.

3 EXPENDITURES

- ArDOT lacks formalized project and portfolio management tools at the enterprise level and for specific core functions.
- There may be opportunities to improve cost efficiencies through design and project management frameworks.
- Several internal and external audits are undertaken to ensure that ArDOT funds are spent appropriately.

4 INFORMATION TECHNOLOGY

- ArDOT is focused on addressing IT deficiencies, yet more needs to be done to implement long term operational efficiencies.
- ArDOT has developed a strategic 3-year IT roadmap, but lacks maturity with some of the enabling pillars that compromise effective delivery of that plan.

5 ORGANIZATIONAL STRUCTURE

- ArDOT's governance structure is unique when compared to other state DOTs.
- ArDOT uses KPIs for system condition, aligning with federal requirements for funding. Other KPIs are in their infancy.
- Some aspects of ArDOT's knowledge management are extensive, while others are not sufficiently mature.

6 PEOPLE CAPABILITIES

- ArDOT struggles to compete for talent, a challenge shared by many DOTs.
- The Department's compensation, learning pathways, and career pathways fall short for staff.
- Staff value the positive relationships with managers and flexible work strategies facilitated by ArDOT.

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Portfolio Planning

Themes: Lack of proactive transportation program and project transparency; Need for Maintenance portfolio planning recalibration

Key Findings	Sample Benchmarks
• ArDOT has a process for identifying and prioritizing its Construction Projects; however, it does not have a methodology to communicate changes and progress against schedule and budget. • ArDOT approaches maintenance project identification and prioritization based on allocated "resources" rather than Level of Service. Proactive communication of projects is largely absent. • There are no comprehensive processes to receive, track, and address public comments or measure the impact on ArDOT's Construction and Maintenance plans.	• Virginia Department of Transportation (DOT) provides real time, interactive updates on construction projects. • Missouri DOT uses a 3 year maintenance work plan documenting activities for each of its 7 Districts. • Texas DOT tracks public inquiries and complaints and reports on responsiveness via a real time performance dashboard.

Procurement

Themes: Limited oversight; Need for trend analysis; Importance of quality vendors

Key Findings	Sample Benchmarks
• ArDOT's unique governance structure affords it some flexibility in procurement. • Procurement methods do not consider past performance of prospective construction contractors. • Working with quality contractors is essential to ArDOT's long-term objectives, and the Department has identified this as a risk. • Use of alternative contracting and project delivery methods have been successful for ArDOT, and can be expanded. • ArDOT lacks formal systems to identify and implement procurement efficiencies outside of construction.	• New Mexico DOT uses a pre-qualification approach that weights a contractor's bid amount based on the quality of their work. • Michigan DOTs uses a rubric to advise when to use certain strategies based on the construction project objectives.

Expenditures

Themes: Lack of project and portfolio management tools and protocols

Key Findings	Sample Benchmarks
• ArDOT does not have the protocols and tools to conduct enterprise project portfolio management. • There are opportunities to strengthen ArDOT's frameworks for making design decisions to promote improved system performance and cost savings. • There may be opportunities to improve cost efficiencies in ArDOT's project development process. • ArDOT lacks formalized project management tools in: project development, construction, and maintenance. • Several internal and external audits are undertaken to ensure that ArDOT funds are spent appropriately.	• California Department of Transportation (DOT) implemented a project resourcing and schedule mgmt. system, and independently evaluated its usage. • Missouri DOT saved an estimated $400M in its first year of using practical design. • Wisconsin DOT uses integrated 3D modeling tools to minimize redesign and change orders, saving costs up to 25%.

Information Technology

Themes: Focus on stabilizing current IT infrastructure has limited long term IT planning

Key Findings	Sample Benchmarks
• ArDOT is focused on addressing deficiencies in the IT platform; however, addressing these deficiencies alone will not allow the Department to implement long term operational efficiencies. • ArDOT has developed a strategic 3-year IT roadmap but lacks maturity with some of the enabling pillars that compromise effective delivery of that plan.	• Oregon's Enterprise Information Services document and reports on its service catalog and corresponding service level performance metrics. • Texas' Department of Information Resources provides their Project Management Framework and supporting tool set to all state agencies, and reports on the status of all major IT projects.

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Organizational Structure

Themes: Unique governance structure; Informal KPIs and knowledge management

Key Findings	Sample Benchmarks
• ArDOT's governance structure is unique when compared to other state DOTs. • ArDOT uses KPIs for system condition and meets required federal benchmarks. Other KPIs are in their infancy. • Some aspects of ArDOT's knowledge management are extensive, while others are not mature.	• Oklahoma Department of Transportation (DOT) has budget performance measurements established by legislative appropriations subcommittee • Maryland DOT publishes an annual report that describes performance against mission aligned KPIs • TRB National Cooperative Highway Research Program provides a knowledge management framework

People Capabilities

Themes: Industry competition; Increasing turnover; Informal learning and career pathways

Key Findings	Sample Benchmarks
• ArDOT struggles to compete for talent, a challenge shared by peer DOTs. • The Department's compensation plans fall short, driving turnover of staff with few years of tenure. • Staff value the positive relationships with managers and flexible work strategies facilitated by ArDOT. • Staff are uncertain of their professional development within the Department. • The Department lacks formalized learning pathways that integrate with skill development opportunities and can be provided via practical, hands-on methods.	• New Mexico DOT assists maintenance staff to obtain certifications like GEDs • Texas DOT measures cost savings from flexible work schedules to justify expanding the practice as a recruiting and retention tool • Minnesota DOT deploys a van equipped with technical equipment to deliver hands-on, practical training directly to maintenance crews

Next Steps

- Socialize Findings with ArDOT
- Formalize Leading Practice Research
- Finalize Recommendations and Create Road Map

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Focus Area Analysis: Portfolio Planning

| See the assumptions slide in the appendix for background information on the findings

Key Takeaways

1 ArDOT has a process for identifying and prioritizing its construction projects; however, it does not have a methodology to communicate changes and progress against schedule and budget.

2 ArDOT approaches maintenance project identification and prioritization based on allocated "resources" rather than Level of Service. Proactive communication of projects is largely absent.

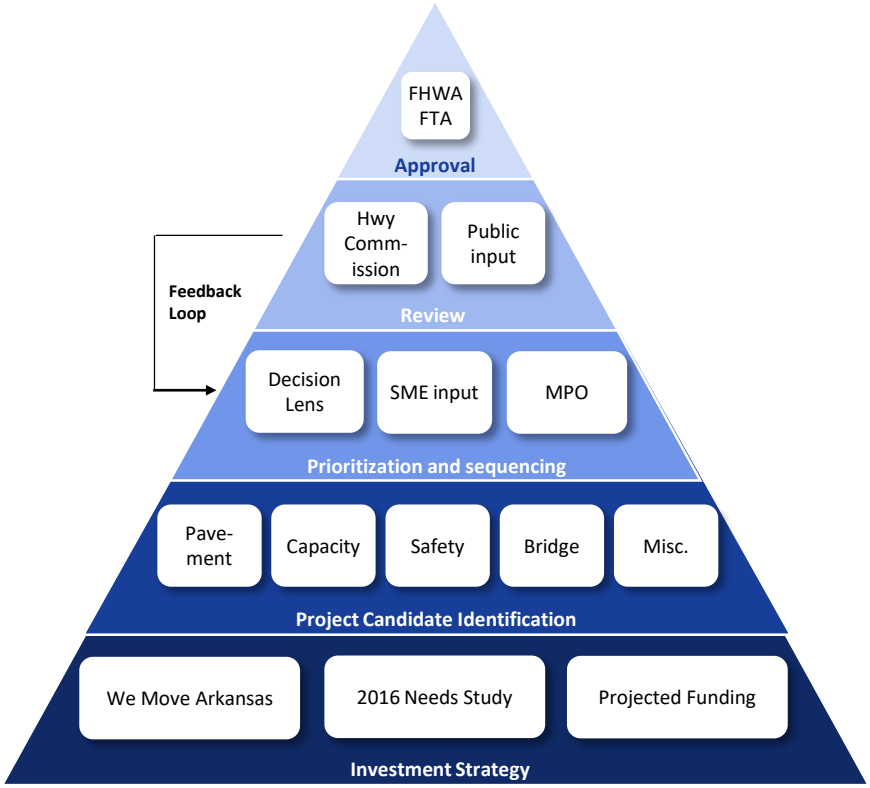
3 There are no comprehensive processes to receive, track, and address public comments or measure the impact on ArDOT's construction and maintenance plans.

ArDOT has a process for identifying and prioritizing its construction projects; however, it does not have a methodology to communicate changes and progress against schedule and budget.

ArDOT has a formal and quasi-objective process to identify construction projects, prioritize those projects, ensure public involvement, and secure required approvals.

- ArDOT has adopted a "System Preservation" investment strategy that aims to deploy funding according to the following protocol: 80% of funding on system preservation projects; 20% on capital improvements; with 90% of projects on the Arkansas Primary Highway Network.[1]
- ArDOT consults with various internal and external stakeholders to identify project candidates to be included in the Statewide Transportation Improvement Plan (STIP).[2]
    - Stakeholders: ArDOT: Transportation Planning and Policy (TPP), System Information and Research (SIR), Maintenance, Bridge, district Offices; Metropolitan Planning Organization (MPOs); and the General Public
    - Project Types: Pavement preservation, Capacity Improvement, Safety, Bridge, and other miscellaneous
- ArDOT employs a combination of Decision Lens software and stakeholder consultation to prioritize and sequence candidate projects within four broad categories: Pavement, Capacity, Bridge, and Safety; and a miscellaneous category.[2,3]
- Projects Identified by the 8 MPOs must be included without modification within the STIP.[4]
- ArDOT must demonstrate that the STIP is financially constrained.[5]
- There are several rounds of review by ArDOT executive leadership and the Highway Commission prior to the STIP being released to the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) for final approval.[2]
- ArDOT affords public commentary via the 8 MPOs who conduct extensive public review and prior to final review by FHWA and FTA.[2,6]

Statewide Transportation Improvement Plan (STIP) Development Framework



Source: Guidehouse analysis of ArDOT provided documents[2,7,8]

Governing Regulations

1. *Long Range Transportation Plan: 23 CFR 450.216*
2. *STIP Requirements and development process: 49 U.S.C. 5304(g); 23 USC 135; 23 CFR 450.218*
3. *Metropolitan Planning Organizations (MPOs) TIP development: 23 USC 134*
4. *MPO TIP inclusion without modification: 23 CFR 450.218(b)*
5. *Requirement for STIP to be financially constrained - 23 CFR 450.218(i)*
6. *FTA and FHWA Approval Requirements: 23 CFR 450.220*
7. *Four lane Grid System - ArDOT Commission MO: MO 2009-084*

ArDOT has a process for identifying and prioritizing its construction projects; however, it does not have a methodology to communicate changes and progress against schedule and budget.

ArDOT's public communication related to project status, schedule and budget is disjointed and inconsistent. It requires the public to navigate different sources to secure information.

- Since December 2016, ArDOT has implemented ~56 Statewide Transportation Improvement Plan (STIP) Amendments that impact a project's delivery timeline, cost, prioritization, or even inclusion on the STIP.[10]
  - Administrative amendments require public communication and solicitation of public input.
- ArDOT has approved numerous STIP administrative modifications but has not formally communicated these to the public until FY2020. [11,12]
  - Administrative Modifications pertain to changes in project funding, and/or cost and schedule with less than a 20% impact.
- From CY2015 – CY2019 ArDOT issued ~11,150 Change Orders (CO).[13]
- ArDOT has a multitude of communication vehicles to provide project status updates to the general public (see table below), of which the most comprehensive and user friendly is produced by a contractor (Garver).
- ArDOT's public communications meet regulatory requirements, however, it is not clear that the Department has assessed whether it meets the needs of it stakeholders, constituents, and the general public.[14]

Virginia DOT (VDOT)

VDOT provides real time and interactive access to the progress of all of its construction projects against schedule and budget at the Department, district, and individual project levels. ArDOT currently provides similar functionality with the CAP portfolio of projects.

Source: VDOT[15]

STIP Communications – Sample Reports

Report	Format	Audience	Content
STIP	Primarily Hardcopy (online)	General Public	Comprehensive listing of all projects identified on STIP, STIP Amendments and (recently) Modifications
iDrive Arkansas	Interactive Website	General Public	Real time traffic, travel conditions, and basic construction project information including length, start date, estimated completion time, cost, and contractor
Connecting Arkansas Program (CAP)	Interactive Website (Garver)	General Public	CAP Program Overview; Project Status Update per Project that includes (Recent and upcoming work, lane closures, construction progress, project overview); Interactive Map to view projects; and dedicated Contact line and email address
IRP	Primarily Hardcopy (online)	General Public	Interstate Rehabilitation Program (IRP) overview and several project lists: Commitment, Completed, Upcoming, Under Construction
Annual and Biennial Reports	Primarily Hardcopy (online)	General Public	High level summary of Top contracts and Programs, Construction highlights, Public involvement, Recognition; and detailed financial summaries

Source: Guidehouse analysis of ArDOT provided documents

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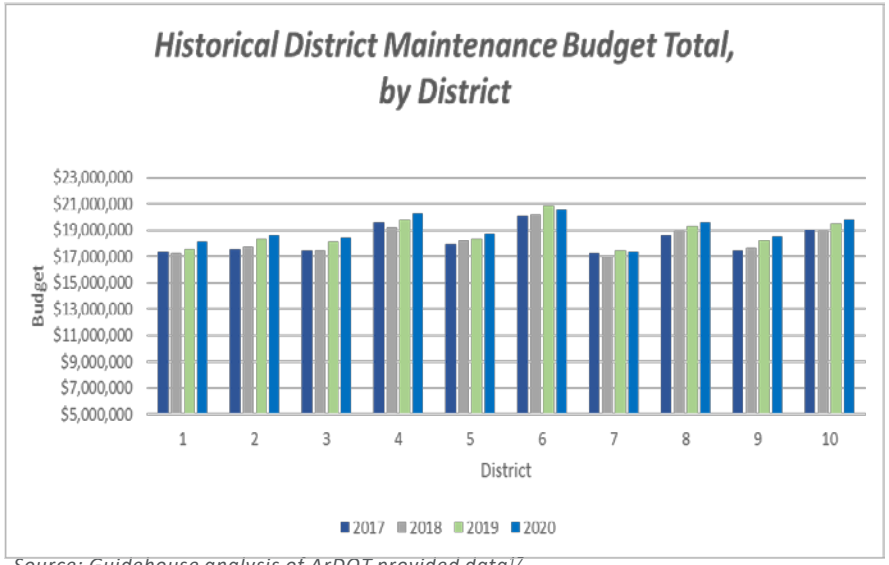
ArDOT approaches maintenance project identification and prioritization based on allocated "resources" rather than Level of Service; proactive communication of projects is largely absent.

The Annual maintenance budgeting process is based on Historical Precedent.

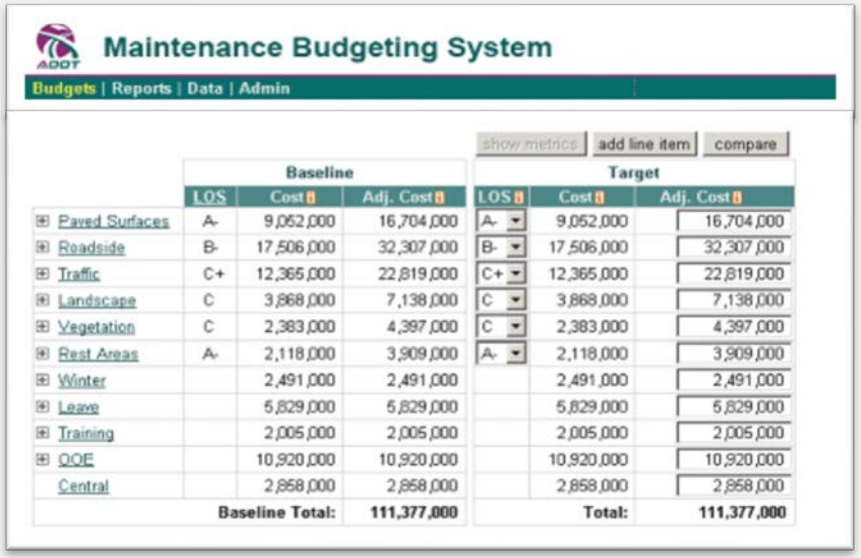
- ArDOT must manage ~ 16,467 miles broken out amongst 10 districts, and budgets ~ $190M at the district level per year for those activities.[16,17]
- Maintenance activities, resources, and supplies at all three levels of the organization (Central Office, district, Area) are tracked against ~36 Counties, ~41 districts, and ~3 Statewide Function or Activity Codes. [18]
- Interviews revealed that in March of every year, Fiscal Services furnishes the districts with Expenditures against these function codes to prepare a new budget. [19]
- District maintenance budgets have remained relatively stable over time. Since FY2017, annual growth rates have ranged from 0.2% - 1.9%. [17]
- Interviews revealed that districts need to manage their maintenance activities to these Budgets.[19]



Source: Guidehouse analysis of ArDOT provided data[17]

Arizona DOT (ADOT)

ADOT's maintenance budgeting protocol relates maintenance expenditures to asset conditions. With the assistance of an automated maintenance management system ADOT can project the level of funding required to meet specific performance standards



	Baseline			Target		
	LOS	Cost	Adj. Cost	LOS	Cost	Adj. Cost
Paved Surfaces	A-	9,052,000	16,704,000	A-	9,052,000	16,704,000
Roadside	B-	17,506,000	32,307,000	B-	17,506,000	32,307,000
Traffic	C+	12,365,000	22,819,000	C+	12,365,000	22,819,000
Landscape	C	3,868,000	7,138,000	C	3,868,000	7,138,000
Vegetation	C	2,383,000	4,397,000	C	2,383,000	4,397,000
Rest Areas	A-	2,118,000	3,909,000	A-	2,118,000	3,909,000
Winter		2,491,000	2,491,000		2,491,000	2,491,000
Leave		5,829,000	5,829,000		5,829,000	5,829,000
Training		2,005,000	2,005,000		2,005,000	2,005,000
OOE		10,920,000	10,920,000		10,920,000	10,920,000
Central		2,858,000	2,858,000		2,858,000	2,858,000
	Baseline Total:		111,377,000	Total:		111,377,000

North Carolina DOT (NC DOT)

NCDOT engaged SAS to identify baseline unit costs for 10 maintenance activities to inform division/district maintenance budgets and control costs

Table 10: Maintenance Activity Baseline Unit Costs

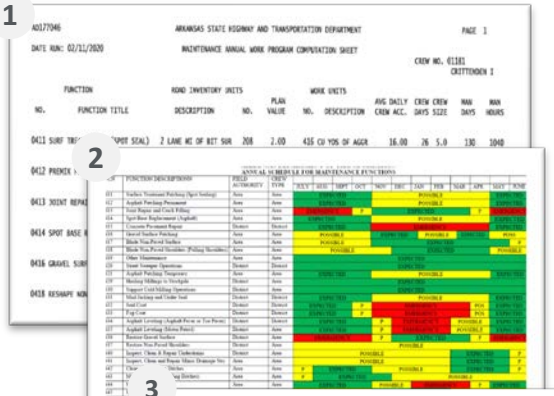
Maintenance - Statewide Baseline			
	Primary	Secondary	Unit of Measure
2817-Mechanical Asphalt Patching	$250.32	$222.53	per ton
2900-Grass Mowing	$63.34	$39.41	per shoulder mile
2912-Mechanical Brush and Tree Control	$698.81	$684.19	per shoulder mile
3104-Litter Removal	$279.65	$334.91	per shoulder mile

Source: ADOT (top)[20]; NCDOC (bottom)[21]

ArDOT approaches maintenance project identification and prioritization based on allocated "resources" rather than Level of Service; proactive communication of projects is largely absent.

Maintenance Work Plans are designed to deliver historically rooted activities rather than specific service conditions.

- Although Asset condition data exists and is furnished to districts, it does not appear that formalized Level of Service (LOS) targets have been established for every critical feature within each district (with Bridges and signs as a notable exception).
- Annual district level maintenance planning translates into:[22,27,28]
  - An Annual Work Program Computation Analysis that articulates proposed person-hours and resources per Activity Code for cyclical activities (e.g. mowing) and reactive work (e.g. debris cleanup).
  - A set of special projects for which dedicated funding has been set aside.
- Maintenance Supervisors are responsible for identifying projects, within given resource constraints and guided by the Annual Activity Schedule, in an annual work program, however, it is not clear how this translates into achieving a target level of service (except with Bridge and Sign Crews).[24]
- ArDOT is in the process of acquiring a maintenance management system to transition to a needs based maintenance planning system, however, that process is in it's infancy and an underlying framework that links maintenance activities to Level of Service has not been established.[24,25]



1 *Sample County Annual Work Plan*

2 *Annual Activity Schedule*

3 *Sample District Annual Work Plan*

Washington Department of Transportation (WSDOT)
WSDOT recently defined its maintenance Level of Service (LOS) targets, and communicates its performance against those targets

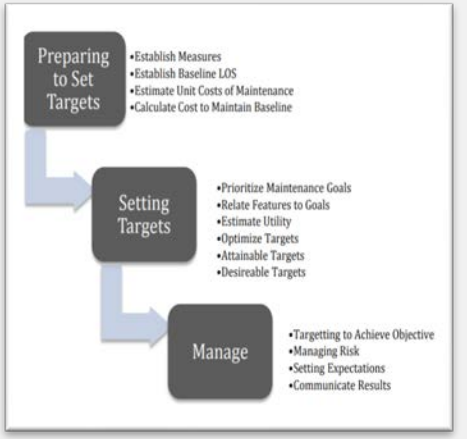
Maintenance Accountability Process
Activity Level Targets
CY 2018 - Statewide

Activity	A	B	C	D	F
Group - 1 Roadway Maintenance and Operations					
1A3 Shoulder Maintenance			✓⊙		
1A4 Sweeping and Cleaning	⊙	✓			
Group - 2 Drainage Maintenance and Slope Repair					
2A1 Ditch Maintenance		✓⊙			
2A2 Culvert Maintenance				✓⊙	
2A3 Catch Basin and Inlet Maintenance	✓⊙				
2A4 Stormwater Facility Maintenance	✓⊙				
2A5 Slope Repair	⊙		✓		
Group - 3 Roadside and Vegetation Management					
3A1 Litter Pickup				✓⊙	
3A2 Noxious Weed Control		⊙	✓		
3A3 Nuisance Vegetation Control				✓⊙	
3A4 Vegetation Obstruction Control			✓⊙		
3A5 Landscape Maintenance			✓	⊙	
Group - 4 Bridge and Urban Tunnel Maintenance and Operations					
4A3 Bridge Cleaning		✓⊙			
4B1 Special Bridge and Ferry Operation	✓⊙				
4B3 Urban Tunnel Systems Operation		⊙			

Key: ⊙ Projected Delivery; ✓ Service Level Delivered; ⊙ Missed Target

February 5 2019

National Cooperative Highway Research Board (NCHRP)
The NCRHP provides a comprehensive framework, guide, and supporting toolkits to establish establishing LOS targets to guide Maintenance work planning



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Source: ArDOT[22,27,28]

Source: WSDOT (top)[23]; NCHRP (bottom)[26]

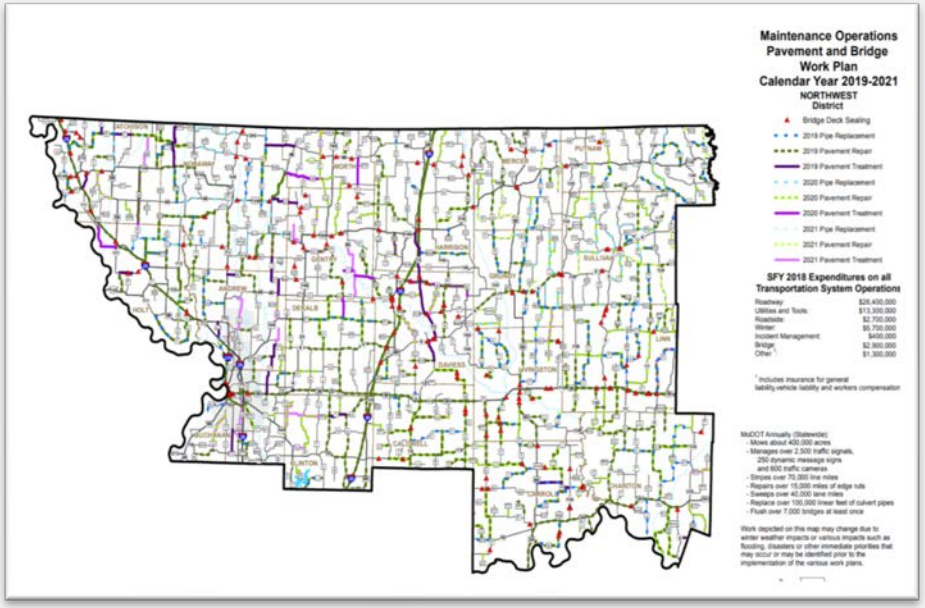
ArDOT approaches maintenance project identification and prioritization based on allocated "resources" rather than Level of Service; proactive communication of projects is largely absent.

There is no formal structure to coordinate Workplans within or across districts, or communicate these workplans to the General Public.

- Interviews revealed that Area Maintenance Supervisors meet on a monthly basis to discuss plans, however, it's not clear if there is a formalized process to align Workplans across Counties or Maintenance Job Superintendents.[28]
- Beyond limited ArDOT Press releases, Message Boards, and static maintenance project updates on ArDOT's websites there does not appear to be a formal and coordinated process nor resources to communicate maintenance workplans to the general public.[28,29,30]

Missouri DOT (MODOT)

In its recently released maintenance and operations plan, MODOT has created and released a 3 year maintenance work plan documenting planned maintenance activities for each of its 7 districts



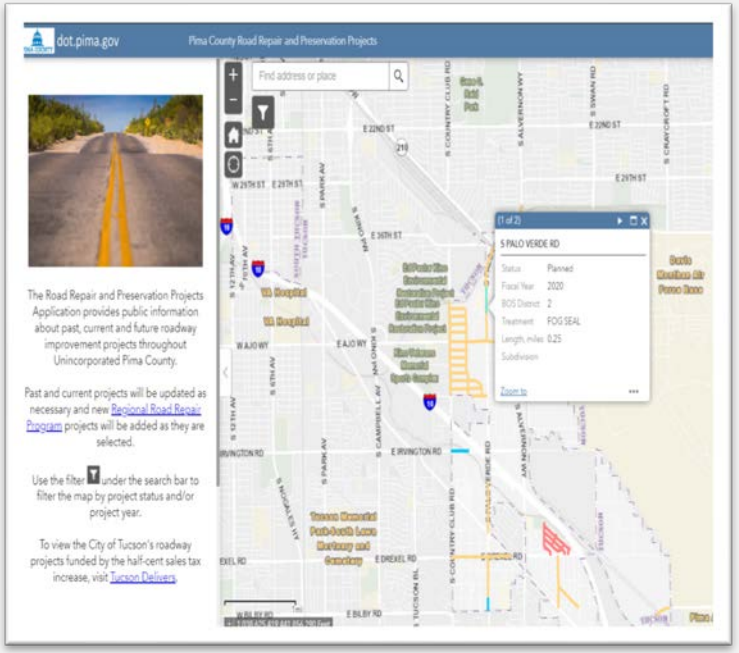
Source: MODOT[33]

Pima County DOT (AZ)

Pima County DOT makes its road repair and maintenance current and projected workplans available via a static list and an interactive map

2020 Regional Priority and Recreational Gateway Road List

Pavement Management Section	Start	End	AADT	District	Miles	PCI	Treatment
E CHULA VISTA RD	N 1ST AV	N MOONGLOW DR		1	0.66	19	MILL AND THICK OVERLAY
E RIVER RD	END OF ROAD	END OF ROAD	30,427	1	0.20	78	FOG SEAL
E RIVER RD	S ALVERNON WY	N PONTATOC RD	11,941	1	0.28	91	SEAL CRACKS
E RIVER RD	N SUTTON LN	S DOOGE BL	11,941	1	0.12	91	SEAL CRACKS
E SKYLINE DR	E CAMINO CIELO	E CHULA VISTA RD	32,236	1	0.13	77	SEAL CRACKS
E SKYLINE DR	E CHULA VISTA RD	E CALLE LOS ALTOS	32,236	1	0.19	85	SEAL CRACKS
E SKYLINE DR	E CALLE LOS ALTOS	W ORANGE GROVE RD	32,236	1	0.30	77	SEAL CRACKS
E SKYLINE DR	W ORANGE GROVE RD	S CAMPBELL AV	39,844	1	0.50	85	SEAL CRACKS
E SKYLINE DR	S CAMPBELL AV	N TIERRA DE LAS CATALINAS	34,531	1	0.26	77	SEAL CRACKS
E SKYLINE DR	N TIERRA DE LAS CATALINAS	E SUNRISE DR	34,531	1	0.19	85	SEAL CRACKS
E SNYDER RD	N VALLE	N HIDDEN VALLEY RD		1	0.63	21	MILL AND THICK OVERLAY
E SUNRISE DR	E SKYLINE DR	N CAMINO ESPLENDORA	34,531	1	2.30	77	SEAL CRACKS
N ALVERNON WY	END OF ROAD	END OF ROAD	5,157	1	0.02	64	MICRO SEAL
N CAMINO DE OESTE	END OF ROAD	W MARS ST	3,430	1	0.06	23	MILL AND THICK OVERLAY
N CAMINO DE OESTE	W MARS ST	W MARGE ST	3,430	1	0.15	34	MILL AND THICK OVERLAY
N CAMINO DE OESTE	W MASSINGALE RD	W IVORY ROSE DR	3,430	1	0.66	34	MILL AND THICK OVERLAY



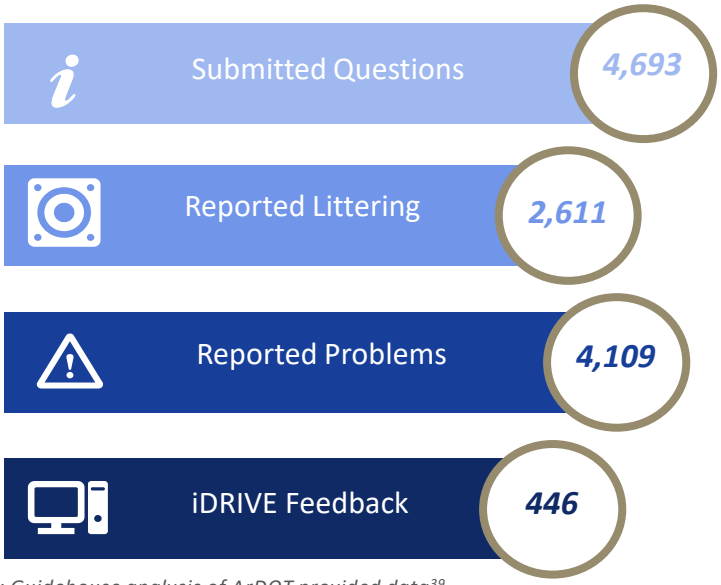
Source: Pima County DOT[31, 32]

There are no comprehensive processes to receive, track, and address public comments or measure the impact on ArDOT's construction and maintenance plans.

Although ArDOT is responsive to public inquiries, it only offers a limited number of tools to capture and track them.

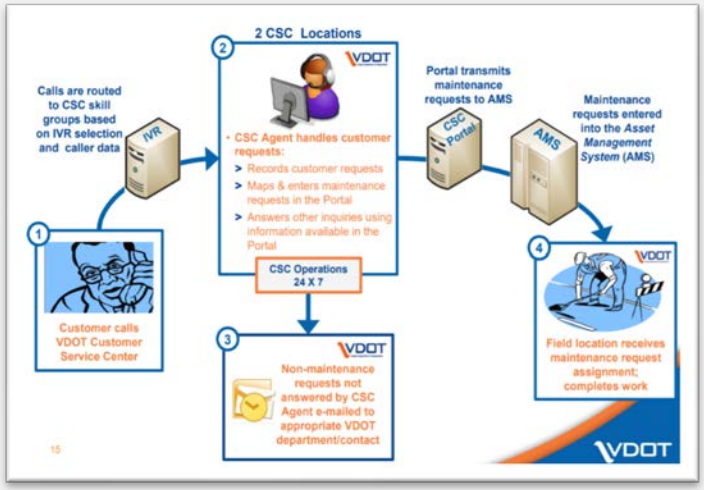
- Although iDrive Arkansas, and the Connecting Arkansas Program (CAP), provides mechanisms to capture customer inquiries and reports of problems, interviews with ArDOT district Level staff revealed that there is no comprehensive Department wide protocol or tool to capture these customer inquiries and problems, manage these inquiries, or track a resolution.[34,35,36]
- Interviews with ArDOT staff members indicated that public commentary and inquiries sometimes impacted project/maintenance delivery, however, they reported that no comprehensive protocol or tool allowed them to assess and document the corresponding impact to in-progress or planned work. [34]

iDrive Arkansas
Customer Utilization Statistics since 2013

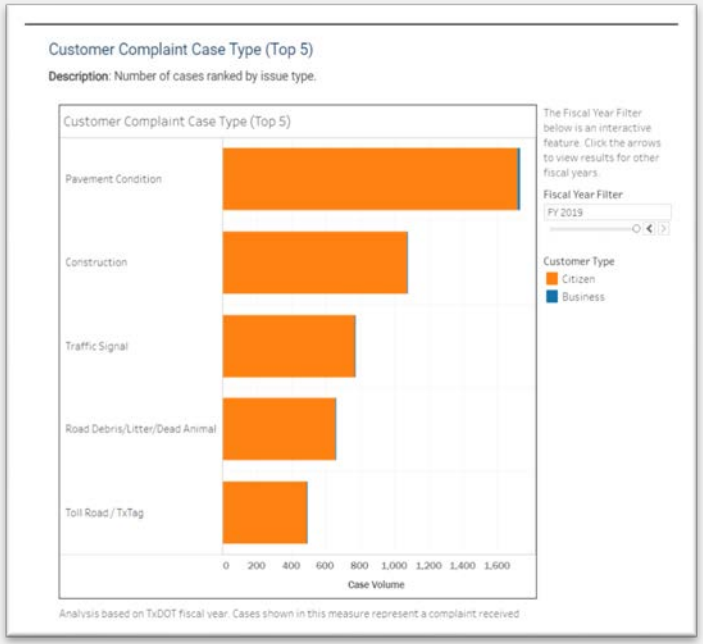


Source: Guidehouse analysis of ArDOT provided data[39]

Virginia DOT (VDOT)
In 2011, VDOT fundamentally shifted its customer service protocol to route all customer inquiries through centralized customer support centers to better resolve customer requests and provide better customer service



Texas DOT (TxDOT)
TxDOT tracks all of its customer inquiries and complaints via its TRACK system regardless of origin and reports on the Department's responsiveness to those inquiries and complaints as part of its real time performance dashboard. TxDOT resolves ~80% of customer complaints within 10 days



Source: VDOT (top)[37]; TxDOT (bottom)[38]

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

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Focus Area Analysis: Procurement

| The findings included in the report are a point in time representation and are subject to change.
Please see the assumptions slide in the appendix for further details.

Key Takeaways

1. ArDOT's unique governance structure affords it some flexibility in procurement.
2. Procurement methods do not consider past performance of prospective construction contractors.
3. Working with quality contractors is essential to ArDOT's long-term objectives.
4. Use of alternative contracting and project delivery methods have been successful for ArDOT, and can be expanded.
5. ArDOT lacks formal systems to identify and implement procurement efficiencies outside of construction.

ArDOT's unique governance structure affords it some flexibility in procurement.

ArDOT adheres to state procurement and transportation laws that limit its flexibility and do not necessarily apply.

- State procurement law excludes constitutional Departments and construction projects. Both exclusions apply to ArDOT, which resides under the constitutional office of the Highway Commission and conducts significant procurement for construction.[1]
- State and federal transportation law require procurement for construction projects, and award to the lowest responsive bidder meeting established criteria. Yet both allow exceptions for engineering and design services related to construction and for design-build and construction manager / general contractor construction projects.[2]
- Further, state transportation law suggests the Commission has authority to "award a project contract on a qualification basis that offers the greatest value for the state."[3]
- Separately, this law requires equipment and supply purchases "be awarded to the lowest and best bidder, price, quality, delivery cost, and time being considered."[4]
- Though exempt, ArDOT views state procurement law as a best practice and has aligned its policies and procedures to it, specifically its prioritization of low bid procurement. As a result, ArDOT does not take full advantage of the flexibility that the governing laws may allow for in order to consider qualifications and best value.[5]

Low bid procurement is viewed by staff as a cultural and financial necessity.

- Anecdotally, staff across construction and non-construction divisions believe that low bid procurement is imperfect but impartial, which is essential to public trust.[6]
- Staff shared concerns that strategies that give preference based on other criteria, such as vendor past performance, would be subjective and, therefore, unreliable.[7]
- For equipment and supplies, staff also reported a tension between maintaining annual budgets and investing in higher-quality products with a lower cost of ownership.[8]
- For construction, staff pointed to the pre-qualification process, bonding requirements, and the Standard Specifications for Highway Construction as existing criteria that fulfill a comparable function as qualifications-based procurement strategies.[9]

"We're so governed by Arkansas state procurement law… that's what we have to hang our hat on."

"We tend to write very specialized specifications."

"The only way to [procure] construction as qualifications-based is through alternative projects."

"[Vendor] performance is measured by meeting the specifications."

Source: Guidehouse interviews with ArDOT staff[10]

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

Procurement methods do not consider past performance of prospective construction contractors.

Pre-qualification and bonding approximate likelihood of project completion, but do not screen for quality.

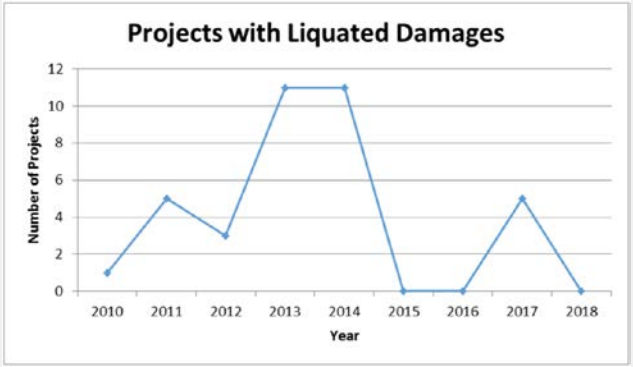
- Construction contractors are screened through pre-qualification and by receipt of bid, performance, and payment bonds, but these do not consider quality of past work.[11]
- ArDOT's pre-qualification review determines if a contractor can complete a project based on their completed and ongoing projects, history of incomplete projects, financial stability, equipment condition, and officer information.[12]
- ArDOT also requires contractors to obtain performance and payment bonds, a federal requirement. Bonding companies evaluate "character, capacity, and capital" to determine if they will complete the project and pay their subcontractors.[13]
- However, performance bonds provide "no guarantee against a contractor's marginal quality of work, so long as the contractor's failures are not large enough to trigger a default," according to an Federal Highway Administration's (FHWA) report.[14]
- Consultant contractors for engineering and design-related services and for equipment and supplies must apply to be added to bidder's lists. Bid bonds and performance bonds are also used as part of ArDOT's standard bid conditions.[15]

The Standard Specifications mandate certain performance criteria, but do not screen for quality.

- ArDOT's 2014 Standard Specifications for Highway Construction establishes exhaustive guidelines for construction and standards of acceptability, and is updated as needed.[16]
- ArDOT's Qualified Products List includes pre-approved products for construction.[17]
- Contractors are required to comply with these specifications and guidelines.[18]
- The Department rigorously validates the quality through testing and site inspections.[19]
- Contractors that do not meet thresholds may need to redo work at no cost to ArDOT. As appropriate, ArDOT will adjust the unit price for contract items based on quality.[20]
- Yet these measures only come into play after the bidder has been selected. Current policies do not limit the ability of poor-quality contractors to compete for bids.
- If contractors frequently repeat tasks until they reach the quality level sought by ArDOT, there may be indirect costs to the Department due to delays and staff time, as well as public safety concerns and economic impacts.

New Mexico DOT (NMDOT)

NMDOT is piloting a pre-qualification system that adjusts a contractor's bid amount based on the quality of their past performance (i.e, a high performing contractor's bid amount will be reduced, while a low performing contractor's will be increased). The system has encouraged contractors to improve performance on NMDOT contracts. This is exemplified in the graphs below depicting sharp declines in disincentives and liquidated damages since its 2014 implementation.



Source: NMDOT[21]

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Working with quality contractors is essential to ArDOT's long-term objectives.

Anecdotes and data suggest some existing quality issues that may be improved through alternate contractor strategies.

- ArDOT's 2019 Transportation Asset Management Plan (TAMP) identifies pavement materials quality and poor quality construction work as "very high impact" risk factors for asset management. Quality materials are linked to managing lifecycle costs and achieving performance targets, while quality construction work is linked to achieving desired outcomes.[22]
- Yet the Department does not formally monitor contractor quality through such measures as: long-term maintenance and repair costs, repeated delays, repeated overruns, repeated poor performance on Standard Specifications quality measures, etc.[23]
- Maintaining quality contractors should be a priority for ArDOT, since between 2014 – 2019, ArDOT released over $6B of projects into the bidding pool; in that time, 10 bidders controlled 46% of the value of those projects.[24]
- ArDOT construction staff anecdotally report challenges with contractor workmanship and mitigating contractor disputes, but these issues are not formally tracked.[25]
- The Department quantifies the costs of construction delays through its Road User Cost, which considers the economic impact and safety risks of work zone activity. It is applied as a disincentive: a "site use" fee to contractors who are behind schedule at a key milestone.[26]
- The tables (right) provide detail on one indicator of quality issues: high volumes of change orders overall, and total change orders issued related to disincentives.[27]
- District construction and maintenance staff also report challenges with equipment procurement that favors lower capital outlays over lower lifetime costs. These anecdotes suggest the lack of cost-benefit analysis in equipment procurement. For one, a piece of equipment procured by low bid did not have a corresponding parts supplier in the vicinity, reportedly increasing costs for maintenance and repair.[28]

ArDOT Projects with Highest Total Change Orders, 2014-2019

Project	Total Change Orders	Bid Amount	CO % of Bid Amount
VANDENBERG BLVD. - HWY. 5 (WIDENING) (S)	$13,710,681.83	$79,264,377.02	17%
HWY. 112-I-49 (S)	$7,563,274.17	$100,620,381.24	8%
REDMOND RD. & MAIN ST. STRS. & APPRS. (JACKSONVILLE) (F)	$7,256,015.40	$41,943,453.44	17%
ARKANSAS RIVER STR. & APPRS. (BROADWAY) (LR/NLR) (F)	$5,581,773.14	$98,404,049.69	6%
ARK. RIVER BRIDGE - I-40 (S)	$5,531,376.64	$38,371,201.18	14%
BAPTIST HOSPITAL - UNIVERSITY AVE. (WIDENING) (F)	$5,046,037.44	$87,384,772.06	6%
HWY. 70 - SOUTHLAND DR. (WEST MEMPHIS) (S)	$4,916,565.46	$11,347,360.69	43%
BALD KNOB - NEWPORT (S)	$4,811,190.84	$18,692,509.65	26%
HWY. 65B - HWY. 65 (F)	$4,180,557.98	$67,232,300.00	6%
I-430/HWY. 10 INTERCHANGE IMPVT. (L.R.) (S)	$3,693,863.38	$22,892,895.53	16%

Source: Guidehouse analysis of ArDOT provided data [29]

Total ($) Disincentives and Item Deductions Charged by ArDOT, 2014-2019

Disincentive	Total Value	Average Yearly Value
Disincentive	$(711,500.00)	$(118,583.33)
Item Deduction – ACHM Mix Properties	$(1,801,999.24)	$(300,333.21)
Item Deduction	$(3,447,962.63)	$(574,660.44)
Disincentive-Site Use/A+C Bidding	$(14,068,266.55)	$(2,344,711.09)

Source: Guidehouse analysis of ArDOT provided data [30]

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Use of alternative contracting and project delivery methods have been successful for ArDOT, and can be expanded.

ArDOT takes advantage of legislation that allows consideration of qualifications in some procurement.

- Qualifications-based procurement enables DOTs to consider factors beyond cost and time during bid evaluation. Absent this approach, low and high performing contractors may have equal standing in evaluation.
- ArDOT is permitted to use qualifications-based procurement for design-build projects and construction manager/general contractor projects. [31]
- The advantages of design-build are well documented: fewer engineering and inspection costs, design errors and omissions, and overruns.
- ArDOT's 30 Crossing project was procured through design-build, and the Department recently released Construction Manager/General Contractor RFQs (a similar method) for Independent Cost Estimating. [32]
- ArDOT also uses qualifications-based procurement for engineering and design related services, managed by Consultant Contracts. [33]
- Some divisions have developed qualifications-based approaches to screen for contractors that provide the best value. For example, Surveys requires consultants to complete its in-house certification program. [34]
- Others have developed ratings systems to track vendor performance, and use tools like score cards to consider such ratings in bid evaluation.[35]

Alternative contract methods have allowed ArDOT to influence contractor behavior.

- Construction contractors are not able to bid on new projects if they have uncompleted contracts with ArDOT, incentivizing on-time completion.[36]
- Incentive/Disincentive (I/D) bidding is used for projects with a high public value of early completion (i.e., traffic). Contractors are awarded bonuses for early completion and penalized for delays, based on a preset value.[37]
- ArDOT issued ~$7.3M per year on average in such incentives, between 2014 and 2019. Disincentives averaged $3.4M per year during this time.[38]
- A+C bidding is used to evaluate contractors based on their proposed cost and schedule, as opposed to cost only, based on a time multiplier.[39]
- Anecdotally, staff shared concerns that A+C bidding may favor larger contractors who can absorb the risk of shorter completion times.[40]
- Lane Rental is used to disincentivize unnecessary lane closures, especially during peak travel time, through an hourly lane usage charge. ArDOT charged $118K per year on average in fees, between 2014 and 2019.[41]
- However, ArDOT does not have formal protocols to standardize decision-making around when to use specific strategies, which limits their ability to evaluate the effectiveness of strategies and analyze contractor payments.

Michigan DOT (MDOT)

MDOT uses the following rubric to advise when to use certain strategies for construction acceleration, procurement, and project delivery, based on the project objective.

• = May apply	Acceleration Techniques								Procurement/Payment							Delivery Method				
Project Objective	Lane Rental	A+B Incentives	Accepted for Traffic Incentives	No Excuse Incentives	Standard Incentives	Accelerated Schedules	Interim Completion Date Incent.	Alternate Const Methods	Best Value	Project Specific Qualification	Lump Sum	Performance-Based Incentives	Alternate Pavement Bids	Fixed Price Variable Scope	Indefinite Delivery/Ind. Quantity	Design-Build	Design-Build-Finance	DBF-Operate Maintain	Alternate Technical Concepts	CMGC
Expedite construction	•	•	•	•	•	•	•	•								•	•	•	•	•
Minimize road user delay costs	•	•	•	•	•	•	•	•	•			•				•	•	•	•	•
Promote innovation [7]								•	•			•	•			•	•	•	•	•
Expedite contract award [4]																•	•	•		•
Minimize risk of claims/disputes				•												•	•	•		•
Maximize work within set budget [1]													•	•				•		•
Enhance quality [6]								•	•			•				•	•	•		•
Define construction budget early [2]																				•
Reduce design & construction time [5]									•							•	•	•	•	•
Leverage external funding sources [3]																	•	•		

Source: MDOT[42]

The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

ArDOT lacks formal systems to identify and implement procurement efficiencies outside of construction.

ArDOT is not using data to understand procurement trends and identify efficient practices.

- Equipment & Procurement (E&P) does not formally review procurement trends, such as prices or staff demand.[43]
- There is no formal mechanism to identify when term contracts would be most cost efficient. This is notable as ArDOT spends an average of $24.4M per year in purchases below $20K, some of which may be more cost efficient through term contracts.[44]
- There is no system to monitor change in commodity prices and reevaluate term contracts. E&P uses short-term contracts, but relies on districts to identify fair prices.[45]
- There is no formal protocol to check if "split purchases" are being used to circumvent the requirement for competitive bidding for purchases above $20K.[46]
- E&P lacks a formal lifecycle cost-based management system.[47]
- This may explain some dissatisfaction with the equipment available to staff: only 58% of ArDOT staff agree "I have all the tools I need to do a great job."[48]
- The Oracle implementation will bring many aspects of purchasing and self-service procurement together and provide approval and reporting capabilities, but will not in itself facilitate the level of data-driven decision-making discussed here.[49]

E&P has minimal authority to facilitate implementation of efficient procurement practices.

- E&P is the only central division with procurement oversight, but its role is primarily compliance-based. If it identified a Department-wide cost efficiency based on analysis of trends, it would not have authority to implement it across divisions and districts.[50]
- For example, current fuel expenditures suggest a gradual shift to electric and hybrid vehicles may be efficient for the Department to undertake.[51]
- There is most oversight for purchases $75K+, on which ArDOT spends an average of $24.5M per year (this excludes construction). Below this threshold, E&P conducts a compliance check. Purchases under $20K have minimal oversight, though staff report this will increase slightly with the implementation of the new Oracle system.[52]
- "If we know there's going to be a lot of buying throughout the year, we recommend they get a contract so we can get the best price in the front end… Ultimately we don't have authority to force them; we can strongly encourage, and usually folks do."[53]
- E&P also lacks authority over inventory management, which is decentralized.[54]

Wisconsin DOT (WisDOT)

Wisconsin's Dept. of Administration's State Bureau of Procurement has implemented Oracle Business Intelligence (OBIEE) to provide "business performance information on key operational indicators for procurement." WisDOT is included in this platform along with other state agencies. The table below is an OBIEE report: Percentage of Agency's Purchases that Occurred on Contract. It provides information on agency's operations and supplies purchases.

Business Unit Name	Budget Reference Code	# of Approved POs	# On Contract	% Approved On Contract
DATCP	FY2015	20	0	0.0%
	FY2016	175	96	54.9%
	FY2017	71	56	77.8%
DATCP Total		**265**	**152**	**56.9%**
DCF	FY2015	0	0	
	FY2016	330	269	81.5%
	FY2017	242	216	89.3%
DCF Total		**572**	**485**	**84.8%**
DFI	FY2016	49	47	95.9%
	FY2017	42	40	95.2%
DFI Total		**91**	**87**	**95.6%**
DHS	FY2015	119	6	5.0%
	FY2016	4664	1747	37.4%
	FY2017	1968	1069	54.2%
DHS Total		**6744**	**2822**	**41.8%**

Source: WisDOT[55]

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8. Guidehouse Interview with ArDOT E&P
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22. ArDOT 2019 Transportation Asset Management Plan
23. Guidehouse Interview with ArDOT Construction
24. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
25. Guidehouse Interview with ArDOT Construction
26. ArDOT Road User Cost Guide (provided by ArDOT)
27. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
28. Guidehouse Interview with ArDOT District Equipment Supervisor (Rural)
29. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
30. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)

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31. ArDOT Design Build & CMGC Webpages
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Focus Area Analysis: Expenditures

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

Key Takeaways

1. ArDOT does not have the protocols and tools to conduct enterprise project portfolio management.
2. There are opportunities to strengthen ArDOT's frameworks for making design decisions to promote improved system performance and cost savings.
3. There may be opportunities to improve cost efficiencies in ArDOT’s project development process.
4. ArDOT lacks formalized project management tools in: construction project development, construction, and maintenance.
5. Several internal and external audits are undertaken to ensure that ArDOT funds are spent appropriately.

ArDOT does not have the protocols and tools to conduct enterprise project portfolio management.

Project development, construction, and maintenance functions present unique resource management challenges.

Overview

- ArDOT is implementing an enterprise resource planning tool that will integrate existing systems for financials, inventory, and purchasing, among others.[1]
- Yet this is disconnected from project development and management, which require distinct approaches to better manage human capital / resource staffing, consultant, procurement, and IT resources at the project and enterprise levels.[2]
- While the Department is consistently able to execute on its project development, construction, and maintenance functions with current practices, improved resource planning may allow them to do so while saving costs.

Project Development

- At the project development phase, ArDOT should correctly identify and plan for staffing needs, particularly as it informs procurement for professional engineering and design-related services contractors.
- Further, effectively projecting the capacity required to execute project development tasks may inform cost-benefit analyses that justify the purchase of tools like software applications that improve efficiency and quality.

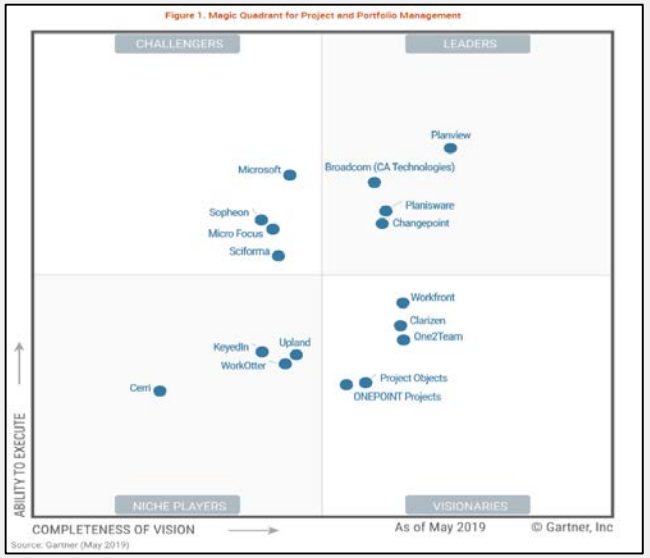
Construction

- At the construction phase, ArDOT should correctly identify and plan for staffing, particularly for entry-level positions that require extensive on-the-job training.
- The current system to determine crew complements relies on outdated technology and does not yield outputs that are easily usable by staff for resource planning.[3]

Maintenance

- At the maintenance phase, ArDOT should correctly identify and plan for staffing, equipment, and materials needs.
- Currently, crew complements are based on historical data and not level of service.[4]
- Further, effectively projecting the location, scope, and volume of the maintenance activities required may inform cost-benefit analyses that justify the purchase of equipment or services that improve efficiency and quality.

Gartner's Top-Rated Project & Portfolio Management Tools



Project Management Tools Used by DOTs

State	Project Management Software Used
California	CA PPM
Michigan	Planisware
Kansas	In-house software
Pennsylvania	In-house Oracle database
North Carolina	SAP
Utah	In-house software
Georgia	Oracle Primavera
Montana	Planisware
New Jersey	Oracle Primavera
Virginia	Microsoft Project Server

Source: Gartner (top)[5], ITS Berkley (bottom)[6]

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

There are opportunities to strengthen ArDOT's frameworks for making design decisions to promote improved system performance and cost savings.

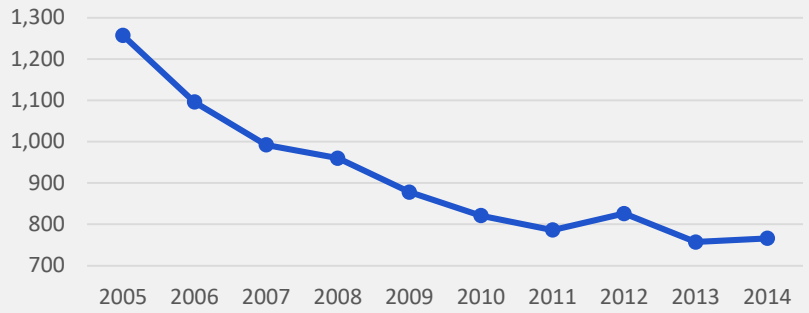
Formal protocols around the use of practical design are lacking.

- FHWA requires that state DOTs adhere to certain criteria in their plans and specifications for projects on the National Highway System. The standard for roadways is set by AASHTO's "A Policy on Geometric Design of Highways and Streets," also known as the Green Book.[7]
- Yet DOTs have some flexibility to depart from traditional designs as system performance, fiscal sustainability, and public needs demand.[8]
- Practical Design is a leading example: a context-sensitive approach through which DOTs can optimize roadway and bridge designs to obtain the maximum system benefit while still achieving project objectives.[9]
- Missouri DOT has used practical design since 2005 to generate cost savings and improve safety, implementing lower cost solutions system-wide rather than higher cost solutions in isolated areas, resulting in reduced fatalities (see graph) and $400M in cost savings in Year 1.[10]
- ArDOT applies a context-sensitive approach, but lacks formalized policies and procedures to govern and document its usage and outcomes.[11]
- Absent documentation, the Department is unable to implement best practice, show cost savings, and maintain knowledge management.

ArDOT has not taken advantage of the full benefits of Value Engineering.

- Value Engineering (VE) is a tool to analyze projects and identify opportunities to reduce costs, improve quality, and reduce completion time. It typically takes place during the planning phase.[12]
- Federal regulations require states to conduct VE for National Highway System (NHS) projects with $50M+ in project costs. For bridge projects, the threshold is $40M+.[13]
- ArDOT's Value Engineering Guidelines and Procedures dictate project selection, team selection, required training, work plan, and resources.[14]
- ArDOT conducts an average of 2.2 VE studies per year, yielding an average of 5.75 recommendations per study. However, only 2 VE recommendations have been approved since FY15, a total of ~$377K.[15]
- This puts ArDOT below the national average, as seen in the table below.[16]
- Anecdotally, staff shared the limitations of current VE practices, namely that it is conducted too late in the process to provide maximum value.[17]
- ArDOT allows construction contractors to submit VE Change Proposals (VECP) for all projects $2M+ after the contract has been executed. ArDOT approves an average of 1.5 VECPs per year, ~$904K on average.[18]
- This puts ArDOT near the national average for VECP.[19]

Missouri Annual Fatalities



Source: Guidehouse analysis of MoDOT data [20]

Value Engineering (VE) & Value Engineering Change Proposal (VECP)Across State DOTs

	# of Studies completed	# of Recs Proposed	# of Recs Approved	Value of Approved Recs
VE Total	175	1376	578	$1,148,883,369
VE Average	3.3	26.0	10.9	$21,677,045
VECP Total	n/a	n/a	200	$40,247,844
VECP Average	n/a	n/a	3.8	$759,393

On average, the value of approved VE recommendations is 157 times greater than the cost of the VE study.

Source: Guidehouse analysis of ArDOT provided data [21]

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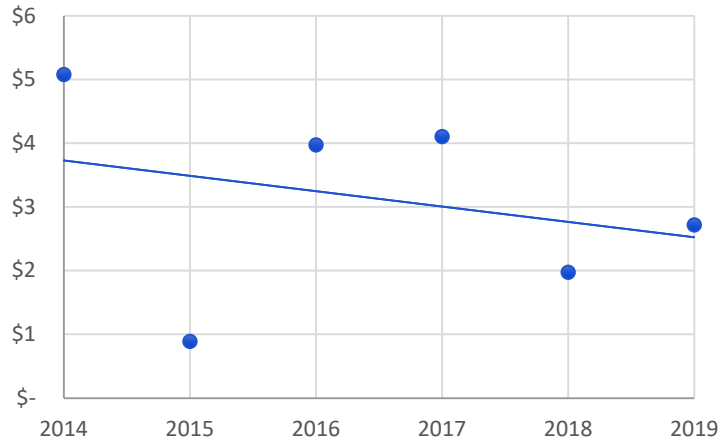
There may be opportunities to improve cost efficiencies in ArDOT's project development process.

Engineer's estimates are not formally evaluated to identify future design cost efficiencies.

- The engineer's estimate is developed based on the quantities of labor and materials required for each design. ArDOT uses an estimating software tool to complete this.[22]
- Accurate cost estimates are essential to the Department's financial accountability, constraints, project budgeting, resource planning, and contractor management.
- However, the Department does not engage in any formal evaluation of estimates against final project cost to integrate learnings that improve future cost estimates. [23]
- In contrast, other DOTs may compare the engineer's estimate to the low bid, award amount, and final contract amount to assess the accuracy of their estimates.
- The volume of change orders related to plan omission suggests some issues with the Department's current estimate approach: ~$3.1M in change orders were approved on average per year due to this reason, between 2014 and 2019. [24]
- As demonstrated in the graph (right), this trend is declining, indicating that ArDOT has taken positive steps to mitigating this issue. Yet there is still room for improvement. [25]

Change Orders due to Plan Omission (in millions of $)



Source: Guidehouse analysis of ArDOT provided data [33]

Right of Way (ROW) faces external obstacles to reducing costs.

- ROW takes the longest of any critical path steps and can be expensive. This process is hampered by external factors: negotiation delays and increasing acquisition costs.[26]
- ArDOT has ~34 ROW projects per year; each is, on average, 15 months and $834K.[27]
- State regulation allows property owners to challenge ArDOT's "just compensation" in condemnation. If the court awards an amount >20% of ArDOT's offer, they must cover the property owner's legal fees and expenses in addition to the acquisition cost.[28]
- This provision extends to other entities, including public utilities, which will increase ArDOT's costs if they are responsible for utility right of way reimbursement.[29]
- ArDOT acquisitions costs increased as a result. Before the legislation took effect in 2016, the Department paid, on average, 9% above appraisal value in condemnations; afterwards, ArDOT paid, on average, 26% above appraisal value.[30]
- ArDOT is limited in disposing surplus land due to state law requiring 3 appraisals for purchase. The total appraisal cost of ~$4,500 exceeds the value of some land.[31]
- The Department has $7.2M in surplus land, of which 11% ($764K; 912 tracts) is below $4,500 and 89% ($6.4M; 223 tracts) is above.[32]

Projects with Highest Volume of Change Orders (CO) due to Plan Omission (by Total CO Amount)

Project Name	Total CO Amount	Bid Amount	CO % of Bid Amt.
CACHE RIVER-BAYOU DEVIEW (S)	$2,543,236	$30,000,027	8%
HWY. 112-I-49 (S)	$1,350,119	$100,620,381	1%
HWY. 181-HWY. 158 (F)	$918,027	$28,983,450	3%
LEFT HAND CHUTE OF LITTLE RIVER STRS. & APPRS. (S)	$660,012	$4,705,005	14%
BRYANT ST. - CONVENTION CENTER DR. (PINE BLUFF) (S)	$527,572	$4,335,723	12%
MONETTE BYPASS (S)	$478,975	$13,719,431	3%

Source: Guidehouse analysis of ArDOT provided data [34]

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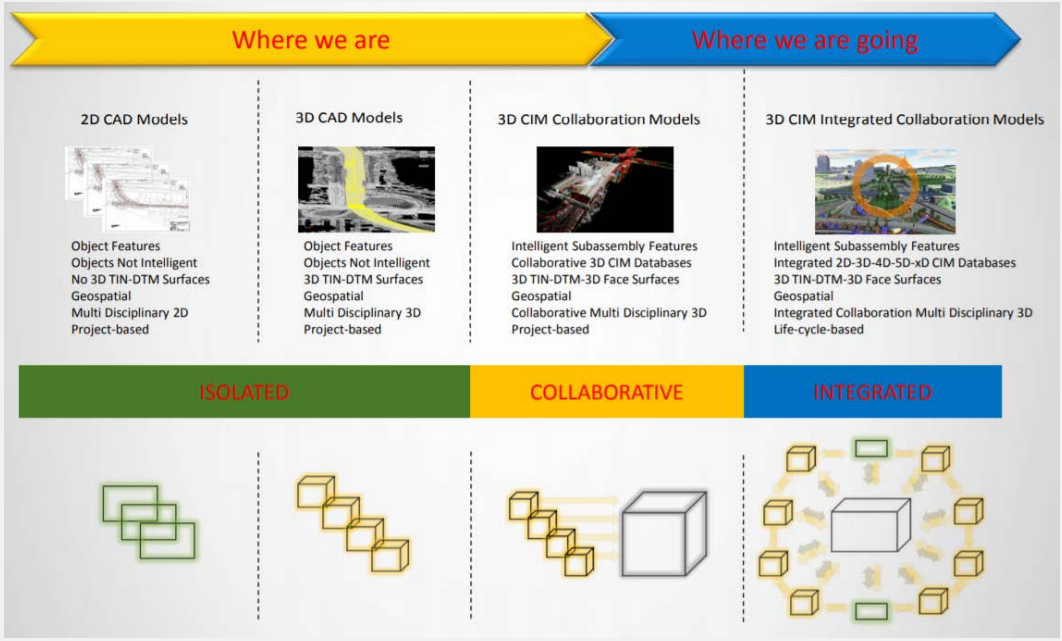
ArDOT's construction project development lacks formalized project management tools.

The construction project development process may be enhanced through formalized project management tools that increase accountability, identify process efficiencies, and facilitate collaboration across teams.

- ArDOT uses a critical path approach for pre-construction: after projects are adopted in the State Transportation Improvement Program, the path follows through the Survey, Roadway Design, Environmental, and Right of Way Divisions at determined intervals before Program Management lets it to contract.[35]
- This process is monitored via the Staff Minutes, which provides project information and tracks progress against interim milestones for each division.[36]
- Staff Minutes are maintained by Program Management and reviewed biweekly to highlight upcoming projects and troubleshoot projects behind schedule.[37]
- Yet there is no tool that offers robust project management for this process, which could increase accountability and identify process efficiencies earlier.
- Further, design, reviews, and handoffs are not necessarily conducted within the same software platform.[38]
- Some DOTs seeking to reduce project development time, increase accuracy of estimates, and reduce likelihood of future change orders have invested in tools that allow different divisions to dynamically design within an open access model.[39]
- One example of this approach is WisDOT's use of 3D Modeling and BIM, which would also facilitate coordination with construction staff (graphic below). [40]
- Anecdotally, district staff want more time for feedback on plan designs at 90% complete to potentially reduce the number of change orders down the line. [41]



Wisconsin DOT (WisDOT)
WisDOT has improved its project development workflows using integrated 3D modeling tools. 3D CIM Collaboration Models have reduced WisDOT's redesign, rework, and change orders, creating cost savings and avoidance opportunities up to 25%.

Source: WisDOT[42]

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ArDOT's construction projects lack formalized project management tools.

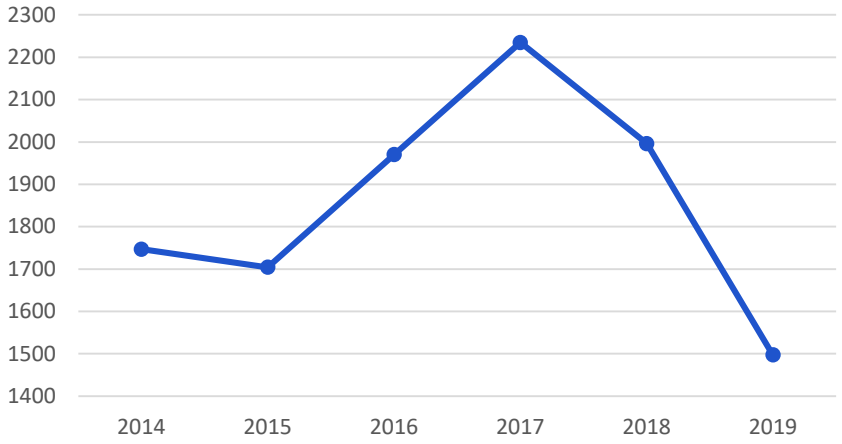
Existing project management tools may have broader applications for construction staff.

- Construction schedules are set by contractors, but Resident Engineers must efficiently coordinate construction monitoring tasks.[43]
- ArDOT lacks a project management system to fill this gap, by, for example, interfacing with the contractor's project plan to trigger construction monitoring tasks and check-ins at key milestones.[44]
- Though ArDOT uses Primavera P6, it is primarily for contractors. For ArDOT, it facilitates time impact analysis and change order analysis.[45]
- The use of this tool is limited to projects with A+C bidding.[46]
- Districts use SiteManager for contract administration, daily work reports, current and final estimates, materials management, and other functions. SiteManager is a leading information management tool, but does not provide project management support.[47]
- In the absence of a project management tool, Resident Engineers rely on daily meetings and weekly and monthly reports to plan, manage, and troubleshoot. They review major overruns, projects behind schedule, missing documentation, change orders, and more.[48]

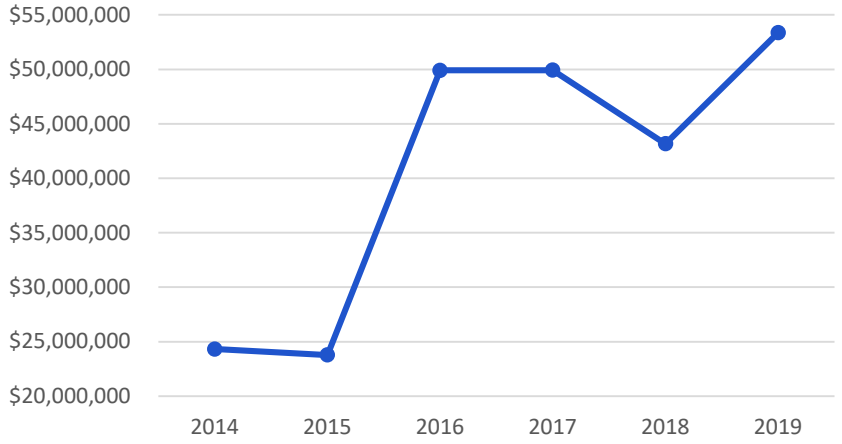
Change orders are not formally reviewed to identify potential efficiencies or problematic contractors.

- Change orders are used to approve and document changes in how contractors execute work, prompted by plan error, unexpected site conditions, and a range of other reasons.[49]
- Approval of change orders varies by type and amount. In general, Resident Engineers approve change orders <$20K, District Engineers <$75K, and Assistant Chief Engineer above that. Special considerations are made for changes to contract items, contract time, and VE.[50]
- FHWA approves change orders of $20K+ on federal oversight projects.[51]
- Change orders are documented in SiteManager, but not formally reviewed by the Department to identify trends in contractor performance, item costs (particularly those items not included in bid), or to analyze consistency of approvals and amounts across districts.[52]
- Since 2014, the total number of change orders that ArDOT has experienced has declined, however during the same time frame, the dollar value per change order has increased significantly.[53]

Number of Change Orders, by Year



Total ($) of Change Orders, by Year



Source: Guidehouse analysis of ArDOT provided data [54]

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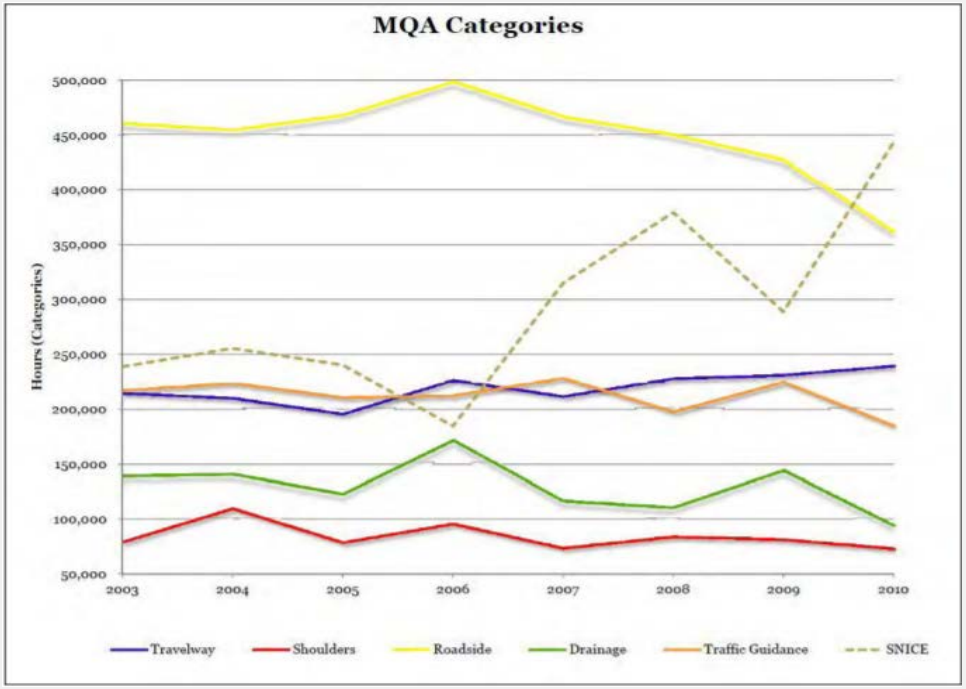
ArDOT's maintenance projects lack formalized project management tools.

Scheduling and evaluation of maintenance activities may be improved through the use of project management tools.

- Maintenance activities are broadly identified as part of the Annual Work Program, which includes a list of activities to be completed and the estimated materials, crew size, and time required.[55]
- The Annual Schedule of maintenance functions outlines during which months each activity is expected to be completed, possible, or in case of emergency.[56]
- District- and area-level maintenance staff use the annual work plans to develop bi-weekly schedules with functions, locations, materials, and crews to be used in two weeks.[57]
- Seasonality facilitates some level of project prioritization. However, of the 50+ activities listed in the Annual Schedule, nearly all are expected or possible each month, offering little guidance to staff on how to prioritize activities throughout the year.[58]
- Schedule management is conducted through comparison of actual progress against the annual work plan, reviewed once per month by district and annual staff.[59]
- Productivity is assessed through a comparison of actual productivity against historical rates (i.e., output per hour), reviewed once per month by the District Maintenance Engineer (DME) and District Maintenance Superintendent (DMS).[60]
- This review may yield a change in the maintenance crew size or other adjustment, but may be too late to make a productive change to the project in question.
- The new Maintenance Management System (MMS) should begin to address many of these issues by optimizing work plans based on system condition within financial and staff constraints.[61]
- Initial implementation of the MMS will emphasize performance-based planning and budgeting, and later phases will add in optimization capabilities.[62]

Kentucky DOT (KDOT)

KDOT uses a MMS that allows outputs such as this graph, which depicts the time spent by staff on various maintenance quality assurance (MQA) activities per year.



Source: KDOT[63]

75% *proportion of surveyed state DOTs with a performance-based approach to maintenance project management*

Source: National Highway Cooperative Research Program[64]

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Several internal and external audits are undertaken to ensure that ArDOT funds are spent appropriately.

ArDOT is taking steps to strengthen its internal audit practices.

- Internal Audit (IA) largely conducts Administrative Compliance Audits of divisions, districts, Resident Engineer Offices, and sections, including internal controls, regulatory compliance, and safeguarding of assets.[65]
- "Management findings" are communicated directly to the audited group, and "reportable findings" are included in the audit report; Audit activities are reported to the Highway Commission bi-monthly.[66]
- IA completes a risk assessment every 2 years, per Arkansas Dept. of Finance & Administration (DFA), to identify risks for fraud, waste, abuse, and controls.[67]
- IA is developing audit policies and procedures for each division and district based on their assessed risk, as part of its risk-based approach.[68]

Auditor	Purpose of Audits	Areas of Focus	Sample Audits
ArDOT's Internal Audit Division	Ensure ArDOT divisions and districts are in compliance with policies and procedures, with focus areas determined based on a DFA-required Department-wide risk assessment; report to Highway Commission bi-monthly	Internal controls, safeguarding of assets, construction documentation and reporting, and compliance; methodology reviewed every 3 years by American Association of Highway Transportation Officials (AASHTO) Internal Audit Committee	• Administrative Compliance Audits • Architectural and Engineering Indirect Cost Rate CPA Workpaper Reviews • Investigative Audits • Motor Fuel Tax Audits • International Fuel Tax Agreement Audits

Source: Guidehouse analysis of ArDOT provided documents and publicly available documents[69]

External audits are primarily conducted by Legislative Audit and FHWA.

- Legislative Audit evaluates ArDOT's financial statements annually in compliance with generally accepted government auditing standards. In addition, every 3 years, Legislative Audit conducts the State of Arkansas Single Audit: ArDOT is one of many entities included.[70]
- FHWA uses a risk-based approach to its stewardship and oversight of federal aid projects, which includes approvals and reviews at the project and program level on a quarterly, annual, and as needed basis.[71]
- FHWA has historically conducted more project-level reviews, but this has declined due to changes at the federal level.[72]

Auditor	Purpose of Audits	Areas of Focus	Sample Audits
Arkansas Legislative Audit	In accordance with state law and generally accepted government auditing standards, audit ArDOT financial statements	Financial statements, internal controls, and compliance	• Audit of Financial Statements • State of Arkansas Single Audit
Federal Highway Administration (FHWA)	In accordance with federal law and the ArDOT Stewardship & Oversight Agreement, ensure ArDOT projects and programs are in compliance with federal policies and procedures; use a risk-based approach	Systems and practices related to: financial management, estimating project costs, awarding contracts, reducing costs, staffing resources, available funding, and fund management	• Compliance Assessment Program (compliance with federal requirements) • Projects of Division Interest review (identifies projects with elevated risk)

Source: Guidehouse analysis of ArDOT provided documents and publicly available documents[73]

Expenditures Citations

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1. ArDOT Oracle Scope of Work (provided by ArDOT)
2. Guidehouse analysis of ArDOT Oracle Scope of Work (provided by ArDOT)
3. Guidehouse Interview with ArDOT Construction
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15. National Value Engineering Data by State (provided by ArDOT, analyzed by Guidehouse).
16. National Value Engineering Data by State (provided by ArDOT, analyzed by Guidehouse).
17. Guidehouse Interview with ArDOT Consultant Contracts
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21. National Value Engineering Data by State (provided by ArDOT, analyzed by Guidehouse).

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22. Guidehouse Interview with ArDOT Roadway Design
23. Guidehouse Interview with ArDOT Roadway Design
24. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
25. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
26. ArDOT ROW and Utility Data (Provided by ArDOT, Analyzed by Guidehouse)
27. ArDOT ROW and Utility Data (Provided by ArDOT, Analyzed by Guidehouse)
28. Regulation: AR Code § 27-67-317 (2017)
29. Regulation: AR Code § 27-67-317 (2017)
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31. Regulation: ACA § 27-67-322 (c)(3)
32. ArDOT Surplus Land Data (provided by ArDOT, analyzed by Guidehouse)
33. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
34. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)

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35. ArDOT Staff Minutes (sample provided by ArDOT)
36. ArDOT Staff Minutes (sample provided by ArDOT)
37. Guidehouse Interview with ArDOT Program Management
38. Guidehouse Interview with ArDOT Roadway Design
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44. Guidehouse Interview with ArDOT Resident Engineers (Rural)
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48. ArDOT Resident Engineer Manual. 2014.
49. ArDOT Change Order Policies and Thresholds
50. ArDOT Change Order Policies and Thresholds
51. ArDOT Change Order Policies and Thresholds
52. Guidehouse Interview with ArDOT Construction
53. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)
54. ArDOT Change Order Data (provided by ArDOT, analyzed by Guidehouse)

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55. ArDOT Maintenance Manual. Version 8.17
56. ArDOT Maintenance Manual. Version 8.17
57. ArDOT Maintenance Manual. Version 8.17
58. ArDOT Maintenance Manual. Version 8.17
59. Guidehouse Interviews with ArDOT District/Assistant Maintenance Superintendents (Rural) and District Engineers (Rural)
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65. ArDOT Internal Audit Manual
66. ArDOT Internal Audit Manual
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73. Stewardship and Oversight Agreement between FHWA and ArDOT. 2015.

Focus Area Analysis: Information Technology

| The findings included in the report are a point in time representation and are subject to change.
Please see the assumptions slide in the appendix for further details.

Key Takeaways

1 ArDOT is focused on addressing deficiencies in the IT platform; however, addressing these deficiencies alone will not allow the Department to implement long term operational efficiencies.

2 ArDOT has developed a strategic 3-year IT roadmap but lacks maturity with some of the enabling pillars that compromise effective delivery of that plan.

ArDOT is focused on addressing deficiencies in the IT platform; however, addressing these deficiencies alone will not allow the Department to implement long term operational efficiencies.

ArDOT appears to be approaching data center modernization phases, however, there does not appear to be a formal plan for integration.

- There appear to be 300+ databases (DBs) operating over 14 servers.[1]
- Interviews with IT indicate there is an unknown amount of data stored locally on ArDOT staff computers.
- There are several DBs for which the origin or the purpose have not been established and may be ready for decommissioning.[1]
- ArDOT's own internal analysis revealed that "Data quality is poor, data access across divisions is difficult and not real time". [2]
- Interviews with IT revealed that ArDOT has been approaching its data center modernization in phases prioritizing the Mainframe upgrade, Oracle implementation, several storage and server infrastructure upgrades and then will move to consolidate the remaining databases. Nevertheless, there is not a documented plan leaving the organization open to risks related to ensuring appropriate data capture, storage, and integration.

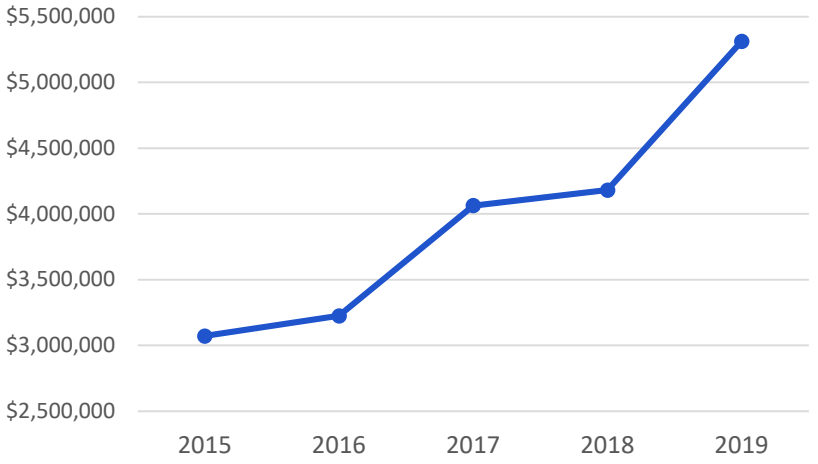
ArDOT has preliminarily identified staff's software needs but efforts to align technology purchases across the Department has not been universally implemented.

- ArDOT currently deploys approximately 263 software applications.[4]
- Support for these applications is distributed across a number of divisions including construction and maintenance as it relates to SiteManager, SiteManager Access Report System (SARS), and State Highway Police (SHP) radio communications.[5]
- ArDOT's software expenditures has increased significantly over the last 5 years, rising ~73% to ~$5.3M in FY2019.[6]
- Interviews with IT indicate that ArDOT has not conducted a software license inventory for these deployed applications which may increase IT costs and leave the Department exposed to risk/liability.
- Although in the current state IT has to approve application acquisition and enable installation, there is still a culture of divisions independently securing IT applications without IT approval.[7]
- ArDOT's own internal strategic planning documents reveal that there is lack of alignment between technology solutions purchases leading to multiple solutions for one business problem.[2]

ArDOT Staff Perspectives on Data Quality

Source: Guidehouse analysis of ArDOT provided documents[2]

ArDOT Software Expenditures by Fiscal Year



Source: Guidehouse analysis of ArDOT provided data[6]

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

ArDOT is focused on addressing deficiencies in the IT platform; however, addressing these deficiencies alone will not allow the Department to implement long term operational efficiencies.

ArDOT has enlisted a number of vendors to rapidly implement Enterprise Infrastructure upgrades.

- An Info-Tech IT Capabilities assessment in 2019 indicated the need for ArDOT to focus on Network and Communications Infrastructure.[8]
- A Converge One Data Center Resiliency assessment (in 2019) revealed the need for critical Server, Storage, and Disaster Recovery (DR) Infrastructure upgrades. [9]
- Recognizing that it needs to stabilize it's baseline infrastructure in the above areas (Storage, Servers, Hardware, Security and DR) ArDOT has secured consultants to rapidly attend to these IT Infrastructure upgrades.[10]

ArDOT recognized that IT customer support is of critical importance and is looking to secure a supporting ITSM tool.

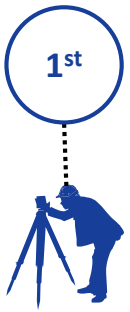
- ArDOT's internal IT Survey indicates that customer support is a critical pain point for the Business.[8]
- The IT Department is working to release an RFP to procure an IT Service Management (ITSM) tool in Q1 of 2020; and is looking to deploy this tool concurrently with the Oracle "go-live" window (July 2020).[11]
- It does not appear that IT has any frameworks to guide effective customer support, but is looking to secure this as part of the ITSM solution acquisition.
- Interviews revealed that IT is looking to broaden the utilization of this ITSM tool across numerous divisions (e.g. HR, Facilities, Construction).
- A review of the requirements indicates that ArDOT IT seeks to expand the platform's capabilities to support Change Control, Project Management, Problem resolution, and service catalog definition.[11]

In-flight Vendor Managed Infrastructure Upgrades

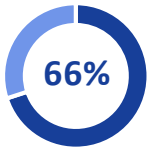
Vendor	Service
ConvergeOne	Server, Storage, Oracle Wireless, and misc. Disaster Recovery Upgrades
Presidio	VOIP, switch upgrades, and misc. server purchases
Various (<10)	Internet Connectivity
2 DBAs	Manage day-to-day needs of myriad databases
SharePoint Administrator	Support Intranet rebuild

Source: Guidehouse analysis of ArDOT provided documents[10]

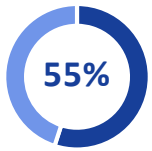
ArDOT staff rated Network and Communications 1st in Importance



ArDOT satisfaction with Network and Communications



ArDOT satisfaction with IT Help Desk



ArDOT staff rated Help Desk Support 3rd in Importance

Source: Guidehouse analysis of ArDOT provided documents[8]

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

ArDOT is focused on addressing deficiencies in the IT platform; however, addressing these deficiencies alone will not allow the Department to implement long term operational efficiencies.

Although ArDOT is making progress on developing Disaster Recovery (DR) platform, they currently lack a cyber security function, policies, and standards.

- ArDOT is addressing its DR related data storage risks via the Data Center infrastructure upgrade. This upgrade will also inform the creation of broader Disaster Recovery policies and procedures.[12]
- ArDOT has identified its Barling facility as a dedicated DR facility, but has yet to formalize the plan, or associated IT/business continuity policies and procedures.[12]
- ArDOT's plans to address the remaining DR risks (such as Fire risks, Firewalls and email security, and lack of DR environment) are in their infancy.[12]
- Interviews reveal that ArDOT is in the process of building a cybersecurity platform, and have recently hired a security architect to lead that effort.
- ArDOT has expressed a desire to align with the Criminal Justice Information Services (CJIS) cybersecurity policies, but an ArDOT specific policy has not been developed.[12]
- ArDOT's Security Architect has put in a platform to conduct threat monitoring and detection, and ArDOT is partnering with Arkansas Department of Emergency Management (ADEM) to understand best practices on cybersecurity training, but ArDOT is not currently conducting any cybersecurity audits across the Departments and divisions.[1]

Infrastructure Downtime

Several studies indicate that the cost of Infrastructure downtime can average between $2,300 to $9,000 per minute

Cyber Security Threat

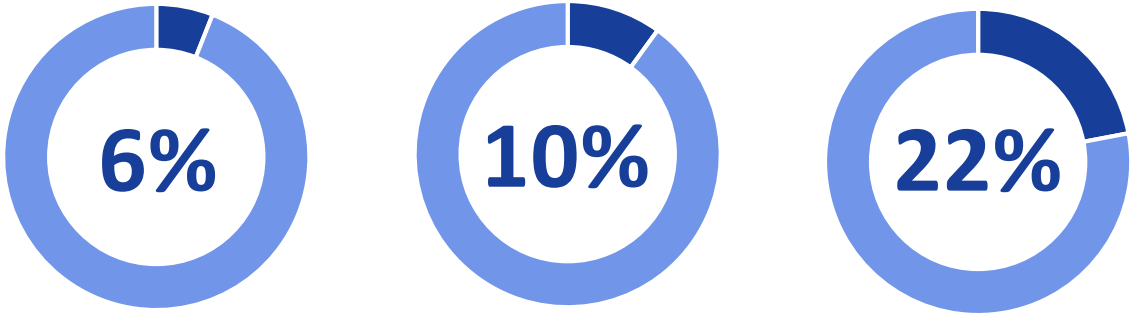
The Average Cost of a security breach is $5.85M

Case Study

In 2012 a security breach at South Carolina's Dept. of Revenue exposed the records of ~ 70M people, costing the state $41M

Source: Guidehouse analysis of documents from Atlassian, Inc (top) and Governing Institute (middle, bottom)[13,14]

ArDOT Data Resiliency Evaluation - ConvergeOne Analysis



Disaster Center Storage Score | *Disaster Recovery Score* | *Data Security Score*

The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

Source: Guidehouse analysis of ArDOT provided data[13]

ArDOT has developed a strategic 3-year IT roadmap but lacks maturity with some of the enabling pillars that compromise effective delivery of that plan.

ArDOT has not developed a Governance Structure to ensure IT investments support objectives, manage enterprise risk, and meet external stakeholder needs.

- IT staff meet with division and districts to catalog IT needs and gather requirements, the project intake process is not formalized nor documented (beyond capturing needs through customer initiated IT service tickets).[16]
- ArDOT recently implemented the use of a Project and Prioritization tool, however it does not appear to complete, tied to an enterprise strategy, or connected to a governance structure. [16,17]
- Beyond a long and short term initiatives document, it does not appear that ArDOT has an operational plan that supports the implementation of the 3 Year IT Strategic Plan. [16,18]
- There does not appear to be a formal decision making body related to IT investments, nor formal policies to govern and/or prioritize any investments. Interviews revealed that the Assistant Chief of Administration ultimately approves project prioritization.[16]
- ArDOT has created a Data Governance Plan to help operationalize how data is managed across the organization however, this document is in its infancy and only supported by three draft policy documents: Data Management, Backup, and Access. [16,19]
- ArDOT continues to increase its IT investment as the IT Budget has increased dramatically from ~$9.2M in FY16 to ~$23.5M in FY20 with Operating Expenses and Equipment costs being the biggest Drivers. [20]

There is no overarching Enterprise architecture or "Blueprint" to standardize and organize IT infrastructure and solutions to align with business goals.

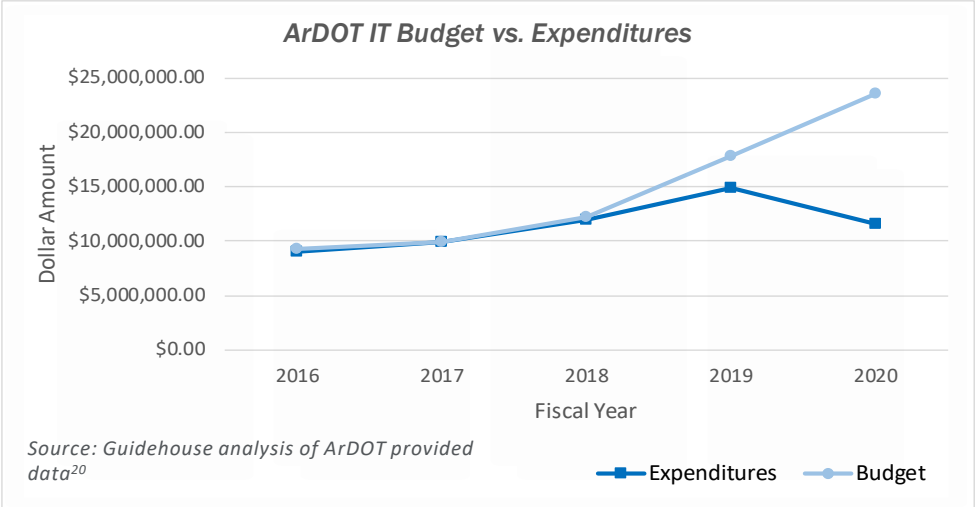
- Enterprise Architecture is siloed organizationally with this responsibility residing with each of the divisions and districts that primarily "owned" their respective IT platforms and solutions. [16]
- Within the IT division, architecture responsibility is distributed across various teams and is siloed on a project by project basis, and in many cases outsourced to external vendors.[16]

Info-Tech Report: Identified IT Threats

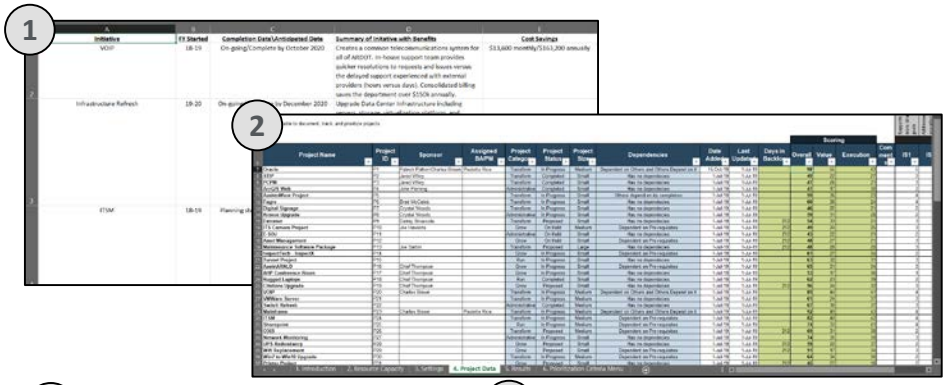
"Unclear accountability and decision-making process – No IT Governance."

"Technology decisions being made in isolation"

Source: Guidehouse analysis of ArDOT provided documents[22]



Source: Guidehouse analysis of ArDOT provided data[20]



1 *Short and Long Term IT Plans* 2 *Project prioritization tool*

Source: ArDOT[17,18]

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ArDOT has developed a strategic 3-year IT roadmap but lacks maturity with some of the enabling pillars that compromise effective delivery of that plan.

ArDOT has not adopted a service catalog nor defined service level expectations which has led to confusion on what IT will deliver, when it will deliver it, and how support is distributed.

- ArDOT's own internal strategic planning documents reveal that there is lack of clarity around core IT service offerings.[24]
- Interviews with IT revealed that IT has informally identified its core service offerings, however, it is not clear that a robust analysis has led to this determination nor whether this set of core service offerings has been formally adopted or communicated. [25]
- Interviews with IT revealed that determination of service offerings is handled on a case by case basis, however, a formalized Cost Benefit Analysis (CBA) has not historically been utilized to aid decision making.[26]
- It does not appear that the IT division has established service level agreements (SLA), nor tracks performance against any service level measures.

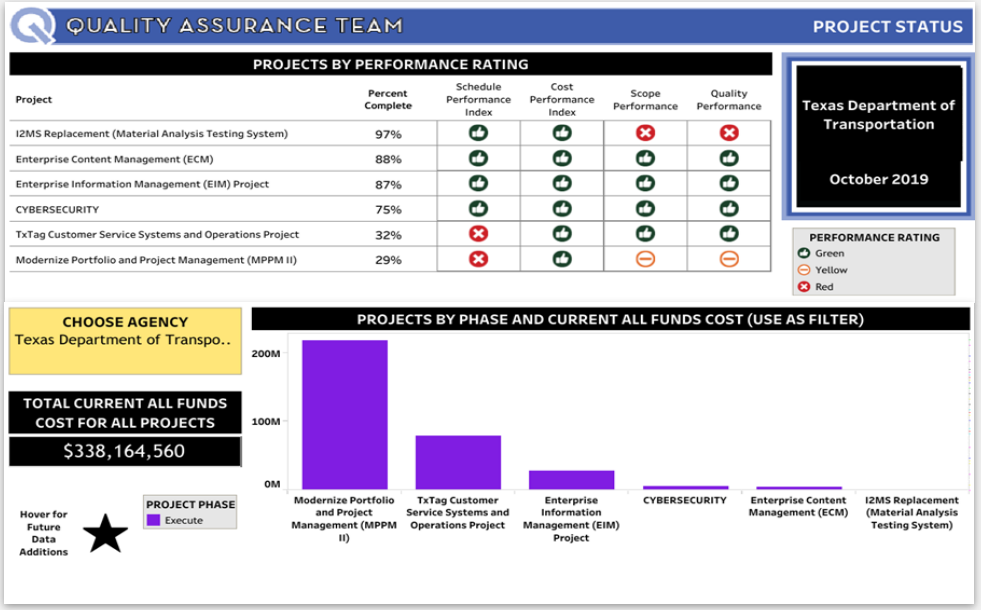
ArDOT's efforts to establish a Project Management (PM) infrastructure to ensure effective delivery of IT projects is still in its infancy.

- ArDOT has recently restructured its IT Department to include a Project Management Office (PMO) with five positions, but as of 10/25/2020 it still has 2 vacancies. [23,27]
- ArDOT has not adopted any formal Project Management (PM) guidelines, standards, or protocols to help drive IT Project delivery. Interviews with IT Staff indicated that they employ a "Waterfall" approach to project management. [23]
- Beyond templates to report on project status, ArDOT does not have core technology project planning execution and evaluation documents such as Project Charter, Risk Management Plan, Stakeholder Registers and Requirements Identification Templates. [27]

*The **State of Oregon's Enterprise Information Services** (EIS) has enshrined its service catalog, corresponding service level performance metrics in it's Service Level Agreement Document. EIS reports on these metrics on a quarterly basis*

Measure #	Performance Measure	Target	4 Previous Quarters				Current Quarter
			Q3 2017 (Jul-Sep)	Q4 2017 (Oct-Dec)	Q1 2018 (Jan-Mar)	Q2 2018 (Apr-Jun)	Q3 2018 (Jul-Sep)
1	% of times the server is available for use by the customers(ETS Sites)	≥99.9%	99.94%	99.94%	99.92%	99.60%	99.93%
2	% of times a router is available for use by the customers	≥99.7%	99.79%	99.81%	99.76%	99.55%	99.75%
3	% of server instance requests delivered on time	≥90%	92.1%	97.8%	99.0%	99.4%	99.8%

*Both **Michigan's Dept. of Technology, Management and Budget** (DTMB) and **Texas' Department of Information Resources** (DIR) provide their Project Management Framework and supporting Tool set to all state agencies. Additionally, DIR reports the status and progress of all major IT projects*



Source: State of Oregon Enterprise Information Services (top)[29], Texas Department of Information Resources (bottom)[30,31]

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Information Technology Citations

Page 42
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2. ArDOT 3 Year IT Strategic Plan (ArDOT provided, Guidehouse analyzed).
3. ArDOT Infrastructure Project Summary and Vendor SOW (ArDOT Provided, Guidehouse Analyzed).
4. ArDOT IT Application Catalog (ArDOT provided, Guidehouse analyzed).
5. ArDOT Detailed Organizational Chart (ArDOT provided, Guidehouse analyzed).
6. ArDOT IT Budget Report (ArDOT provided, Guidehouse analyzed).
7. Listing of applications acquired by ArDOT without IT approval (ArDOT provide, Guidehouse analyzed).

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8. ArDOT 3 Year IT Strategic Plan (ArDOT provided, Guidehouse analyzed).
9. ConvergeOne Data Center Resiliency Workshop Report (ArDOT provided, Guidehouse analyzed).
10. Various Infrastructure SOW documents and Infrastructure Refresh Project Summary (ArDOT provided, Guidehouse Analyzed).
11. ArDOT Draft IT Service Desk RFP (ArDOT provided, Guidehouse analyzed).

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12. Guidehouse Interviews with IT
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18. ArDOT Short and Long Term Initiatives Document (ArDOT Provided, Guidehouse analyzed).
19. Various Data Governance policy documents (ArDOT provided, Guidehouse analyzed).
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21. Various Infrastructure SOW documents and Infrastructure Refresh Project Summary (ArDOT provided, Guidehouse Analyzed).
22. ArDOT 3 Year IT Strategic Plan (ArDOT provided, Guidehouse analyzed).

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23. Guidehouse Interviews with IT
24. ArDOT 3 Year IT Strategic Plan (ArDOT provided, Guidehouse analyzed).
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Focus Area Analysis: Organizational Structure

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.

Key Takeaways

1. ArDOT's governance structure is unique when compared to other state DOTs.

2. ArDOT uses KPIs for system condition and meets required benchmarks for federal funding. Other KPIs are in their infancy.

3. Some aspects of ArDOT's knowledge management are extensive, while others are not mature.

ArDOT's governance structure is unique when compared to other state DOTs.

ArDOT shares several characteristics with other state DOTs; some are unique to Arkansas.

- About half of state DOTs have a commission, board, or other independent body with some level of oversight over the DOT. In Arkansas, this is the Highway Commission.[1]
- Arkansas is one of only 6 states in which the DOT Director is appointed by the commission without any input from the governor or legislature, and one of only 2 states in which DOT Directors are not members of the Governor's cabinet (among states that use cabinet systems).[2]
- Federal funds are allocated to ArDOT through legislative appropriation, rather than directly to the Department. About two-thirds of states share this practice.[3]
- HCRAS reviews proposed rules from the Highway Commission. Most states have a similar practice to ensure proposed rules from DOTs comply with relevant statutes.[4]
- HCRAS reviews progress reports from the Commission on ArDOT projects exceeding $10M+. Half of other state legislatures play a more substantial role in approving projects.[5]
- Arkansas requires a financial audit of the state DOT (by Legislative Audit), as do most states.[6]

Performance Oversight Practices of State DOTs

Performance Oversight Practice	States Requiring this Oversight
Require inclusion of performance measures in DOT transportation plan	Vermont and Virginia
Review performance goals or progress as part of the budget process	Georgia, Kansas, Louisiana, Maine, Minnesota, Mississippi, Missouri, Nevada, New Hampshire, New Mexico, Oregon, Tennessee, Texas, Washington, and Wisconsin, and D.C.
Budget performance measurements established by legislative appropriations subcommittees	Oklahoma
Advisory bodies advise on certain aspects of performance management	Maryland, Massachusetts

Source: Guidehouse analysis of American Association of Highway And Transportation Official's (AASHTO) Report "A 50-State Review of State Legislatures and Departments of Transportation"[7]

Highway Commission Background[8]

In November 1952, the Highway Commission was reorganized by constitutional Amendment 42, approved by the voters. This established the Commission as an independent constitutional entity, rather than a traditional state agency. Prior to this, all changes related to the Commission were undertaken by legislative acts.

The desire for a politically independent Highway Commission at the time was borne from public dissatisfaction with how a large highway construction program had recently been implemented.

The amendment established a 5-member Commission with representation from each of the state's congressional districts. Members of the Arkansas Highway Commission are appointed for 10-year terms by the Governor with approval by the legislature, as is the case for the majority of states with such independent governing bodies.

Select Reporting by ArDOT to the Legislature & Executive[9]

1. *Biennial Report to General Assembly*
2. *Progress of Public Road Projects of $10 million or more to General Assembly*
3. *Annual Report to Governor*
4. *Maintenance of "Motor Vehicle and Traffic Laws and State Highway Commission Regulations"*

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ArDOT uses KPIs for system condition and meets required benchmarks for federal funding. Other KPIs are in their infancy.

Current Key Performance Indicators (KPIs) are limited to system condition. Operational effectiveness is not yet being measured.

- ArDOT has KPIs in support of its 2017-2022 Strategic Plan and 2040 Long Range Intermodal Transportation Plan. Many align with federal reporting requirements, and reflect FHWA's and FTA's emphasis on system condition and safety.[10]
- However, there is no formal implementation plan to operationalize the Department's Strategic Plan.
- The Department is required to meet federal performance targets in Pavements, Bridges, Travel Time Reliability, Freight Reliability, and Congestion Mitigation and Air Quality. ArDOT is on track to meet targets in all areas with financial penalties attached to below-target performance.[11]
- Department KPIs on operational effectiveness are in development, but have not been finalized or tracked and analyzed. This includes: rate of employee turnover and percent of customers who feel ARDOT provides clear information.[12]
- Division- and district-level KPIs have not been identified.
- Identifying and tracking performance metrics is essential to accountability, and may in some cases facilitate improvements, as demonstrated by some DOTs who saw such changes after implementing mature performance management systems.[13]

ArDOT System Performance from 2019 Transportation Asset Management Plan (TAMP)

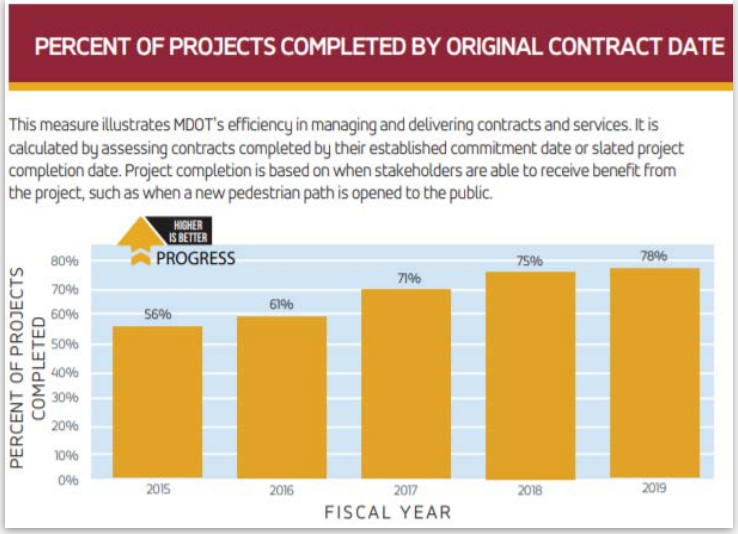
Arkansas NHS Pavement Inventory and Condition Summary Based on FHWA Thresholds

Owner/System	Centerline Miles	Lane Miles	Good	Fair	Poor
NHS Total	**3,365**	**10,931**	**41%**	**57%**	**2%**
Interstate (All State Owned)	749	3,221	72%	27%	1%
Non-Interstate NHS	2,616	7,710	29%	68%	3%
State Owned	2,581	7,609	29%	68%	3%
Non-State Owned	35	101	10%	84%	6%

Source: ArDOT[14]

Maryland Department of Transportation (MDOT)

MDOT publishes an annual Attainment Report that describes the Department's performance against mission aligned KPIs.



Source: MDOT[15]

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Some aspects of ArDOT's knowledge management are extensive, while others are not mature.

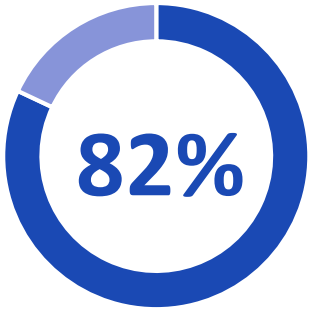
Standard operating procedures (SOPs) are extensive, but not regularly updated.

- ArDOT has 50+ Standard Operating Procedures documents, including job-specific manuals, approved criteria and specifications, and policies and procedures.[16]
- Yet there are no standard protocols for developing and maintaining SOPs. Instead, each division and district has their own internal protocol, filling gaps as identified.[17]
- Anecdotally, district staff report benefitting from network building and idea sharing with peers, although few such events are held frequently for most staff.[18]
- The recently published construction inspector's manual, which "fills in the blanks" for new hires, is an example of this. It was developed from the ground up by districts.[19]
- Knowledge management gaps may not be readily apparent to staff, who leverage positive working relationships to fulfill work tasks. 82% of staff say: "I know who/where to go to get the information I need to do my job effectively."[20]
- However, with retirement and turnover issues common at state DOTs, knowledge management practices are needed to maintain institutional knowledge.[21]

Minimizing knowledge loss is a priority for ArDOT, but efforts are not mature.

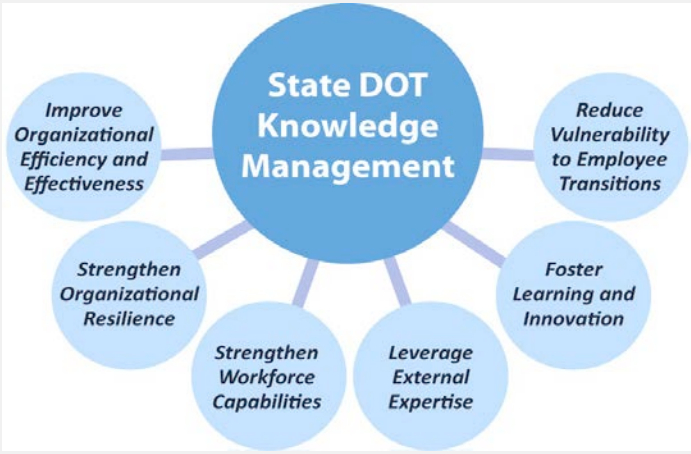
- About 26% of staff are or will be eligible for retirement in the next 10 years. On par with broader demographic trends, about 74% of these staff are based in districts.[22]
- As such, the 2019 Transportation Asset Management Plan (TAMP) rated knowledge transfer a High Priority Asset Management-Related Risk, and identified high priority actions to mitigate this risk.[23]
- However, these efforts are not yet mature. HR has developed a matrix to identify key positions at risk for knowledge loss, but the next steps have not been finalized.[24]
- ArDOT advertises anticipated open positions due to retirement well in advance to allow time for retiring staff to train their replacements, but it is not always possible.[25]
- The Department does not have a policy of hiring back retired staff for temporary, part-time roles, as there is no enabling legislation to allow such a practice.[26]
- Some DOTs have enacted such policies: Facing recruitment challenges for qualified bus operators, City of Annapolis DOT began hiring retirees part-time. With capacity needs met, the DOT could promote existing part-time operators to full-time.[27]

"I know who/where to go to get the information I need to do my job effectively."



Source: Guidehouse analysis of ArDOT provided data [28]

TRB National Cooperative Highway Research Program Knowledge Management Framework



Source: TRB National Cooperative Highway Research Program [29]

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Focus Area Analysis: People Capabilities

| The findings included in the report are a point in time representation and are subject to change.
Please see the assumptions slide in the appendix for further details.

Key Takeaways

1. ArDOT struggles to compete for talent, a challenge shared by peer DOTs.
2. The Department's compensation plans fall short, driving turnover of staff with few years of tenure.
3. Staff value the positive relationships with managers and flexible work strategies facilitated by ArDOT.
4. Staff are uncertain of their professional development within the Department.
5. The Department lacks formalized learning pathways that integrate with skill development opportunities and can be provide via practical, hands-on methods.

ArDOT struggles to compete for talent, a challenge shared by peer DOTs.

Employee engagement and retention are challenges for ArDOT.

- The 2019 Transportation Asset Management Plan (TAMP) identified maintaining experienced staff as a High Priority Asset Management-Related Risk, and recommended flexible work strategies, improved staff training, and employment incentives. However, these efforts are not yet mature.[1]
- Only 54% of staff believe "Employee retention is important at the Department," and only 47% say ArDOT "values its employees."[2]
- Just one-third of staff are likely to recommend ArDOT as an employer to friends and family -- a common measure of job satisfaction.[3]
- The Department has seen an increase in turnover, potentially driven by staff choosing to leave earlier in their tenure than previously.[4]
- This is most pronounced among central office staff: average tenure of resigning staff dropped from 6.0 to 2.5 years between FY15-19.[5]
- Accordingly, surveys indicate engagement among staff with employment tenure of 3 to 5 years is the lowest of any group.[6]
- Yet staff shared anecdotally it takes ~5 years to fully train new hires. ArDOT may be losing staff just as they become fully capable.[7]
- ArDOT's staffing challenges are shared by other DOTs: in regional survey, Louisiana, New Mexico, Oklahoma, and Texas DOTs all reported challenges recruiting and retaining engineers. Most also reported challenges retaining maintenance staff.[8]
- However, the Department has a foundation from which to build on to improve its retention challenges: 63% of ArDOT staff who responded to the survey reported being unlikely to leave the Department in the next five years, compared to 45% at Oklahoma DOT.[9]

$4,129

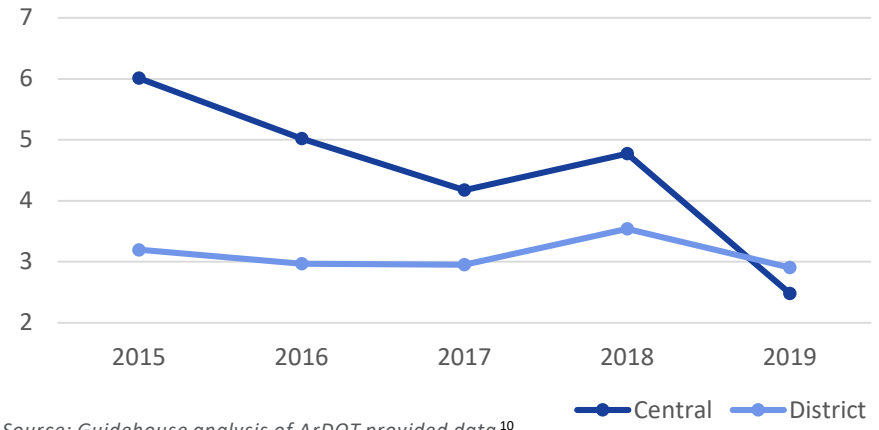
cost to fill open positions for typical company, 2016

42 days

time to fill open positions for typical company, 2016

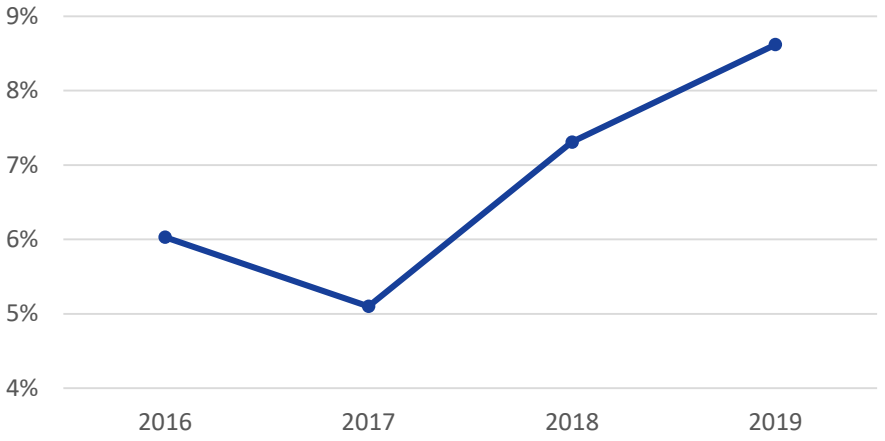
Source: SHRM [12]

Average Tenure of Staff Resigning from ArDOT (in Years of Experience)



Source: Guidehouse analysis of ArDOT provided data [10]

ArDOT Turnover Rate by Year



Source: Guidehouse analysis of ArDOT provided data [11]

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The Department's compensation plans fall short, driving turnover of staff with few years of tenure.

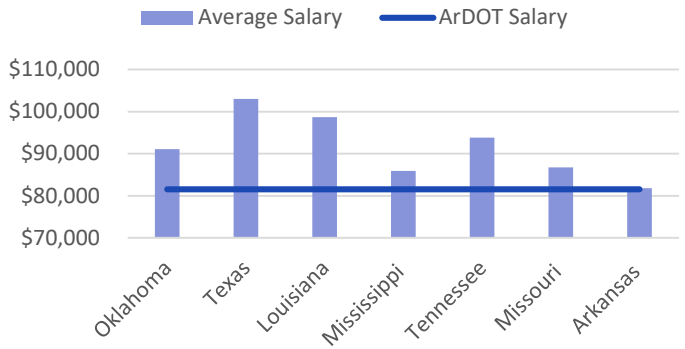
ArDOT staff value the Department's benefits, but dissatisfaction with compensation is widespread.

- Most staff cite benefits and stability as the main reasons they joined ArDOT.[13]
- More than 80% view the annual leave, sick leave, and retirement plan favorably, though only half are satisfied with the Department's insurance benefit.[14]
- ArDOT employs a leading practice by quantifying its benefits package, showing applicants how the combined salary and benefits package compares to competitors.[15]
- Despite this effort, lack of satisfaction with compensation is widespread. Less than half of staff are satisfied with their compensation and even fewer expect pay increases.[16]
- Only 56% believe the Department's performance-based pay practice will translate to wage progression, if their job performance meets or exceeds expectations.[17]

ArDOT faces strong competitors who offer higher wages for both entry-level and experienced professionals.

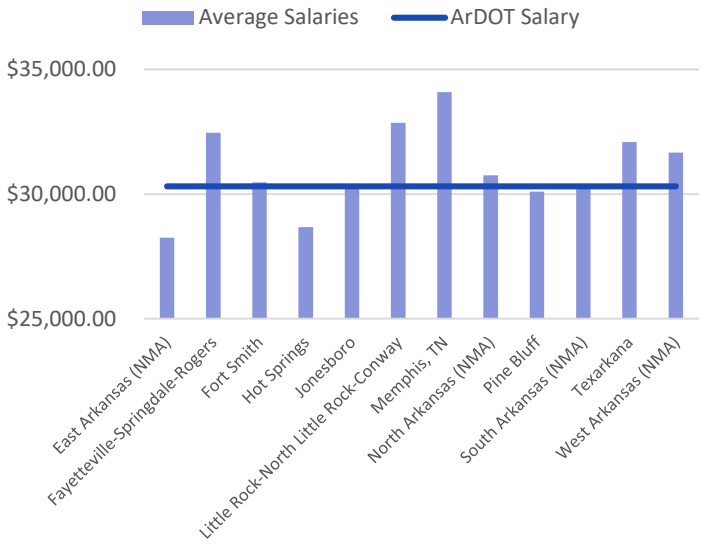
- Staff believe other employers can offer better compensation, with only 38% agreeing "My salary is competitive with similar jobs I might find elsewhere."[18]
- Labor market reports validate this claim, particularly for the two position categories reported to have the worst retention issues: engineering and maintenance.[19]
- The gap between public and private sector engineering salaries has been estimated to be $15,500 on average. For oil and gas specifically, the gap increases to $47,500.[20]
- ArDOT's engineer salaries are above average in the majority of Arkansas cities and nonmetropolitan areas surveyed in this report. However, Arkansas has the lowest civil engineer salaries of neighboring states, on average, as depicted in the graph.[21]
- Competitors for maintenance staff span many industries. DOTs in the region report that some private sector jobs with low barriers to entry have salaries that are much higher than DOTs', although few provide the same level of benefits as DOTs.[22]
- These DOTs report losing staff to oil and gas when the industry is expanding. ArDOT district staff have also reported losing entry-level staff to high-paying pipeline jobs.[23]
- ArDOT's Maintenance Aide salaries are at or below average compared to similar positions in Arkansas cities and nonmetropolitan areas, as depicted in the graph.[24]
- ArDOT is the only one among south-central DOTs to not provide tuition reimbursement.[25]

ArDOT Average Civil Engineer Salary vs. Comparable Jobs in Nearby States



Source: Guidehouse analysis of ArDOT data & Bureau of Labor Statistics data[26]

ArDOT Average Maintenance Aide (I and II) Salary vs. Comparable Jobs in Arkansas, by Area



Source: Guidehouse analysis of ArDOT data & Bureau of Labor Statistics data[27]

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Staff value the positive relationships with managers and flexible work strategies facilitated by ArDOT.

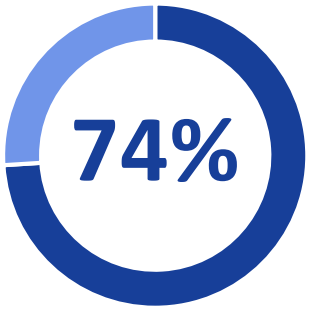
Staff have positive relationships with managers, but lack confidence in leadership.

- Nearly 70% of staff believe in ArDOT's mission, yet fewer than 60% believe the Department can execute to have "a bright future." [28]
- Favorability of division and district leadership exceeds that of executive leadership: there is a ~10% gap in measures of trustworthiness, decision-making, acting on employee feedback, and recognizing employees.[29]
- In contrast, staff report positive relationships with managers in measures of: fairness, trustworthiness, communication, and addressing conflicts.[30]
- Most staff credit ArDOT's culture for these positive relationships.[31]
- One investment has been sponsorship of employees to complete Dale Carnegie courses. About 1,000 courses were completed per year over the past 5 years, roughly equivalent to a minimum of 68 staff participating.[32]
- However, ArDOT recently discontinued this practice. The Department instead plans a new leadership development program involving mentorship, executive coaching, and 1-2 years of online coursework. Yet the planned program will serve many fewer staff: 20-30 per year.[33]
- In support of district managers and leaders, the Department has also hired HR specialists for staff disciplinary issues and 1:1 coaching.[34]

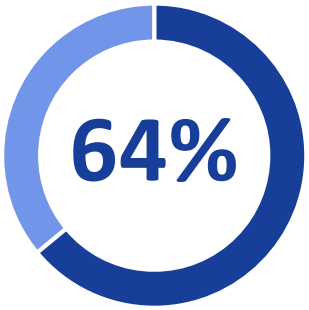
ArDOT is exploring flexible work strategies to alleviate staffing challenges.

- ArDOT joins many regional DOTs in offering flexible schedules to retain staff. Such practices have been shown to be widely well received by employees and to positively impact moral, productivity, and retention.[35]
- Three-quarters of staff believe "My manager allows for flexibility in how work is accomplished" and even more report having work-life balance.[36]
- Based on employee feedback, ArDOT expanded flex-time in 2019.[37]
- District staff shared positive anecdotes from their use of the 4/10 model, in which employees work 4 days per week, 10 hours per day, with any additional coverage provided on Fridays eligible for overtime. This practice is widespread and formalized across the Department.[38]
- This practice yielded nearly $20K in cost savings when implemented by Texas DOT for maintenance crews. With fewer days, staff spent more time per week on productive tasks, and less time staging equipment and traveling. The result was 52K fewer vehicle and equipment miles logged, which reduced fuel and supplies costs, as well as vehicle wear and tear.[39]
- District staff have struggled to make use of other flexible work strategies like telecommuting given the field-based nature of many roles.[40]

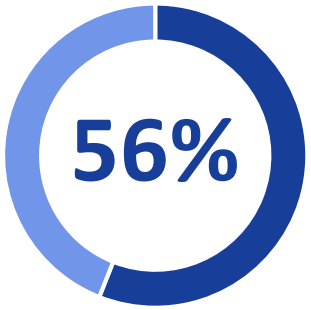
"I trust my manager."



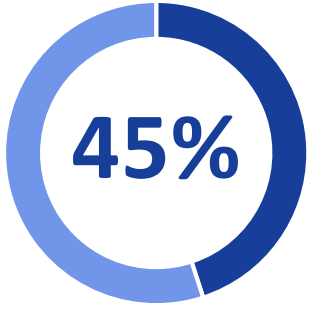
"I trust my District Engineer or Division Head."



"I trust the members of the executive leadership team."



"The Department Director inspires me."



Source: Guidehouse analysis of ArDOT provided data[41]

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Staff are uncertain of their professional development within the Department.

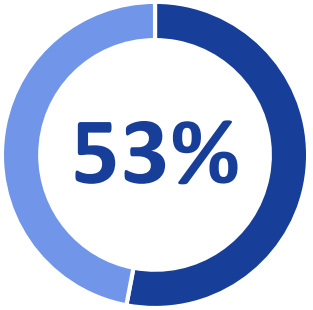
Career pathways are not defined or clearly communicated to staff.

- Just over half of staff believe they can advance their careers at ArDOT or that they are encouraged to pursue such career development activities at the Department.[42]
- The reported low engagement among staff with tenure of 3 to 5 years, and the increase in staff resigning with 3 years of tenure on average, support the need for career pathways that allow staff to grow within and beyond their roles.[43]
- As one example, district managers shared that entry-level staff cannot advance until there is an opening, which means that staff may remain in entry-level roles beyond the appropriate amount of time if staff above them do not leave until retirement.[44]
- Central to this issue is the lack of documentation and communication of accessible career pathways. Although career paths are known informally, staff lack clarity on precisely how their career can develop over time with the Department.[45]

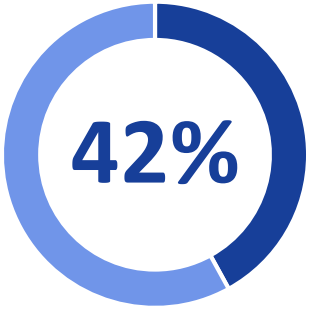
Staff lack confidence in the performance evaluation process.

- District staff shared during interviews that their direct reports found the performance evaluations difficult to understand, and were unsure how they related to their roles.[46]
- While 65% of staff say they understand how their performance is evaluated, less than half say "I believe it is worth my time and effort to complete the self-evaluation."[47]
- This likely connects to the previously reported observation that staff do not believe that a positive performance evaluation will translate to an increase in compensation.[48]
- About half of staff agree that good work is recognized and rewarded, yet only 38% say "If I exceed expectations, I receive rewards that I value."[49]
- Exemplifying this disconnect: only 42% of ArDOT staff agree "Promotions in my division/district go to those who deserve them the most."[50]
- Although staff have negative perceptions of the formal evaluation process, they speak positively of informal assessments: 62% of staff report that their manager regularly provides useful feedback related to their work product.[51]

"I can advance my career in this organization."



"Promotions in my Division/District go to those who deserve them the most."



Source: Guidehouse analysis of ArDOT provided data[52]

The Department lacks formalized learning pathways that integrate with skill development opportunities and can be provide via practical, hands-on methods.

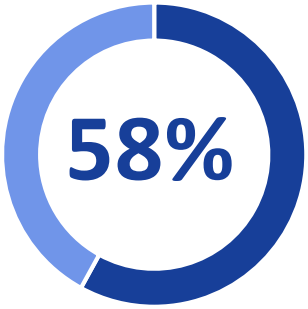
While training is offered, there are no formal learning pathways that define training plans.

- 6,160 optional trainings were completed by staff in FY19.[53]
- This represents a decline following years of increasing trainings from 3,786 in FY15 (1 per employee) to 9,486 in FY18 (2.6 per employee).[54]
- The largest training area is maintenance and construction with an average of 2,600 trainings completed yearly. Most trainings include courses related to Commercial Driving Licenses (CDL) and national programs like NPDES, as well as the Center for Training Transportation Professionals.[55]
- Only 58% of staff agree "In the last year, I have received an adequate amount of training," and only slightly more found the training useful.[56]
- Yet there are no formal learning pathways that align training with job competencies, performance evaluations, or career ladders.[57]
- Managers are unsure which courses should be required for staff at various points in their development, and will informally assign Achieving Career Excellence (ACE) trainings or on-the-job learning as needed.[58]
- The maintenance training academy may provide this in later phases, but those are not yet defined. The current focus is entry level training.[59]
- In a survey of 14 DOTs, Arkansas was the only to not provide project management training. Most developed in-house trainings.[60]

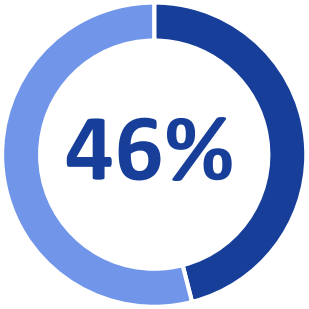
On-the-job training is often preferred, but difficult to institutionalize.

- Staff perspectives on ACE are mixed: while 65% report having used the system, only 46% say it provides valuable learning opportunities.[61]
- Managers shared that ACE offers generalized introductions to topics, but is not specific to ArDOT construction and maintenance plans.[62]
- Many reported a preference for training new staff by pairing them with experienced staff for on-the-job training and mentorship, which they find particularly useful given lack of computer literacy among some staff.[63]
- Staff find this approach useful: 65% of staff agree "My manager works with me to develop my skills to do my job effectively."[64]
- Yet on-the-job training is difficult to schedule and prioritize amid ongoing demands of construction and maintenance work.[65]
- Some districts make use of the at-times lighter project schedules in winter to conduct training then, but this is not a formalized practice.[66]
- There are alternative strategies to meeting training needs of district staff. For example, Minnesota DOT deploys a van equipped with technical equipment to deliver hands-on, practical training directly to maintenance crews. Courses cover maintenance of asphalt pavement, culverts, gravel roads; managing vegetation and erosion sediment; and several more.[67]

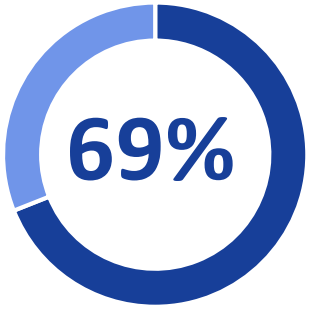
"In the last year, I have received an adequate amount of training."



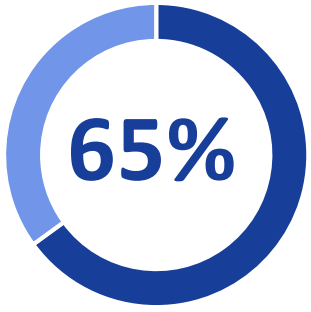
"I believe the ACE system provides more learning opportunities."



"I frequently learn from my co-workers"



"My manager works with me to develop my skills to do my job effectively"



Source: Guidehouse analysis of ArDOT provided data [68]

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Appendix

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Please see the assumptions slide in the appendix for further details.

Acronym Glossary

Abbreviation	Definition
A+C	A type of construction project bidding protocol in which both cost and project time are considered in the evaluation process
AASHTO	American Association of Highway and Transportation Officials
ACE	Achieving Career Excellence - ArDOT's Performance Management and Professional Development platform
ADEM	Arkansas Department of Emergency Management
AMS	Area Maintenance Superintendent
APHN	Arkansas Primary Highway Network
CAP	Connecting Arkansas Program ($1.8B program financed through a 1/2 cent sales tax increase)
CDL	Commercial Driver's License
CJIS	Criminal Justice Information Services
CMGC	Construction Manager/General Contractor (Alternative contracting method for Construction Projects)
CO	Change Order
D/B	Design Build (Alternative contracting method for Construction Projects)
DB	Database
DCE	District Construction Engineer
DE	District Engineer
DFA	Arkansas Department of Finance and Administration
DME	District Maintenance Engineer
DMS	District Maintenance Superintendent
DOT	(State) Department of Transportation
DR	Disaster Recovery
E&P	ArDOT Division - Equipment and Procurement
ERP	Enterprise Resource Planning
FHWA	Federal Highway Administration
FTA	Federal Transit Authority
Green Book	AASHTO's Policy on Geometric Design of Highways and Streets

Acronym Glossary

Abbreviation	Definition
I/D	Incentives/Disincentives for vendors who meet specific Construction Project schedule and quality goals
IA	ArDOT Division - Internal Audit
IRP	Interstate Rehabilitation Program (Financed through up to $575M in GARVEE Bonds)
ITSM	IT Service Management Tool (primarily to manage IT customer service)
KPI	Key Performance Indicator
LD	Liquidated Damages applied to contractors for Construction Projects
LOS	Level of Service
LRITP	Long Range Intermodal Transportation Plan
MPO	Metropolitan Planning Organization
NHS	National Highway System
PM	Project Management
PMO	Project Management Office
QPL	Qualified Products List (for Construction Projects)
RE	Resident Engineer
ROW	Right of Way; or ArDOT Division - Right of Way
SARS	SiteManager Access Reporting System
SIR	ArDOT Division - System Information and Research
SM	SiteManager - ARDOT's application to aid in monitoring Construction Projects
SME	Subject Matter Expert
SOP	Standard Operating Procedure
Specs/Specs Book	2014 Standard Specifications for Highway Construction
STIP	Statewide Transportation Improvement Program
TAMP	Transportation Asset Management Plan (as of 2019)
TIP	Transportation Improvement Program (Generally developed by a Metropolitan Transportation Organization)
TPP	ArDOT Division - Transportation Planning and Policy
TRP	Transportation Research Board
VE	Value Engineering
VECP	Value Engineering Change Proposal

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Assumptions

1. The findings included in the report are a point in time representation based on interviews conducted with the Arkansas Department of Transportation (ArDOT) staff members and various external stakeholders and a review of documents ArDOT provided to Guidehouse from September 2019 – February 2020. Findings are subject to change based on mitigating documentation and clarifications provided by ArDOT subsequent to the publication of this report.

Questions?

Guidehouse

| The findings included in the report are a point in time representation and are subject to change. Please see the assumptions slide in the appendix for further details.