Performance-Based Management: State-of-the-Practice White Paper

2009 CEO Leadership Forum

prepared for

University of Minnesota Center for Transportation Studies for the 2009 AASHTO CEO Leadership Forum

prepared by

Cambridge Systematics, Inc.

2009 CEO Leadership Forum
April 19-21, 2009
Minneapolis, Minnesota

Conducted By

Center for Transportation Studies, University of Minnesota

In Association With

American Association of State Highway and Transportation Officials (AASHTO)
Federal Highway Administration (FHWA)
Transportation Research Board (TRB)

May 12, 2009

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Executive Summary

INTRODUCTION

This white paper serves as a catalyst for discussion at the DOT CEO Leadership Forum. In particular, it addresses three key areas:

1. The business process referred to as "Performance Management," focusing on six basic components: goals and objectives, performance measures, targets, resource allocation, measuring and reporting results, and data quality;

2. The current state of the practice among state DOTs, with examples of performance-based decision-making; and

3. The issues that need to be addressed in adopting a performance-based Federal-aid Program, focusing on six performance categories: preservation, freight/economic development, safety, congestion, system operations, and environment.

Several recent NCHRP projects have developed guiding principles for establishing performance measures and documented case-study examples of performance management systems implemented by DOTs and other transportation agencies. AASHTO's Performance-Based Highway Program Task Force documented the current state of the practice of performance management. Further, a survey of performance management practices was distributed to state DOT CEOs; there were 23 respondents. This white paper builds on all of this material and implementation experience with a number of DOTs.

PERFORMANCE-BASED MANAGEMENT IN PRACTICE

Performance management is a policy-directed, data-driven, performance-based business practice that links organization goals and objectives to resources and results. The outcomes of performance-based management include more efficient distribution of limited resources and a focus on accountability of decision-making.

Over the last 15 years, there has been a dramatic increase among state departments of transportation (DOTs) in the use of performance management principles to plan, prioritize, track, and improve the effectiveness of nearly all DOT functions to achieve the agency's fundamental goals. Performance information helps to guide decisions about priorities and resource allocation, not just for capital project delivery but also for internal agency management and operations.

At one end of the spectrum are agencies that have limited data mining and reporting capabilities or practices beyond those needed to meet Federal requirements. At the other end are a handful of agencies with well-developed performance management programs that help drive every aspect of the organization

including budgeting and project selection processes. In between are the rest of the state agencies with some level of predictive capability. These agencies have a commitment to using system and agency performance data to improve effectiveness and efficiency but with only some elements of a comprehensive performance management system in place. Progress and improvements in the performance management process are cyclical and occur incrementally over time, requiring sustained leadership over a number of years to achieve full implementation.

Despite institutional differences among agencies, several elements of best practice are frequently noted among the most advanced performance-based systems:

- The application of performance measures throughout the agency that are integrated vertically, horizontally, and among processes;

- The application of performance measurement in a systematic, documented way;

- Strong executive/managerial support and involvement in performance reviews and decisions on reallocating resources, in central and district offices, as well as among program and key business unit managers;

- Recognition that performance measurement can involve a culture change within the agency, with steps taken to focus on the positive aspects of this change while mitigating the potentially negative aspects;

- Transparency of performance results and their implications for transportation customers and stakeholders, as well as the owning/operating agency; and

- Several agencies link organizational performance and transportation system performance. This concept has existed for some time in the private sector, but now is being considered by public sector DOTs.

A "performance management framework" has been developed to illustrate the basic performance management principles that can be integrated into all of the critical functions and operations of a transportation agency (Figure ES.1). Actually using performance to drive resource allocation (the fourth box in the framework), such as budgeting or project prioritization, is the lynchpin of actual performance management. Table ES.1 shows examples of state DOTs that allocate resources based on performance. It should be noted that in addition to identifying states with transportation system performance measures, the table also identifies states, such as Ohio and Virginia, that have organization measures for staff accountability.

Figure ES.1 Performance Management Framework

Table ES.1   Resource Allocation Examples from Select Agencies

Agency	Examples of "Action" Based on Performance
Arizona DOT	Prioritization of capacity expanding projects outside of urban areas
California DOT	Allocation of resources for State Highway Operations and Protection Program
Florida DOT	Prioritization of program funding levels
Minnesota DOT	Capital budgeting decisions at the district level Funding allocation across districts Adjust types of investment in program
Montana DOT	Capital funding allocations to districts, systems, and work types, and project programming consistency
Ohio DOT	Assessment of staff performance Allocation of funding across districts "Face-to-face" meetings to develop action plans to address performance deficiencies
Pennsylvania DOT	Identification of actions in district and bureau annual business plans to improve performance Quarterly "face-to-face" meetings between district engineers and Deputy Secretary for Highway Administration to review performance and identify actions to meet targets Similar face to face meetings between Bureaus and Deputy Secretaries
Virginia DOT	Staff accountability, performance bonuses Monthly video conference with Commissioner to review project status for major projects (based on "Dashboard")
Washington DOT	Quarterly meeting to review performance with 25-30 senior staff. Project prioritization Funding allocation across districts

Source: NCHRP Report 8-36(47).

ISSUES AND CHALLENGES

Several high-level issues and challenges have emerged from performance management research and case studies:

- The degree to which state DOTs have influence over what is being measured relative to external factors;

- Funding availability;

- Data collection resources;

- Integration with, and influence of, external processes, legislative requirements, and other external elements;

- Deciding the "level" for targets, to make sure they're not too easy or impossible to reach, as well as short-term versus long-term targets, and what to do if the targets are met or not met;

- The degree to which targets are made public; and

- Consistency in reporting between regions and, at the national level, between states.

A national performance management system provides several challenges at the state level:

- National goals that are relevant to each state;

- Performance measures and targets that are relevant to each state;

- The ability in terms of resources and funding of each DOT to develop data management systems to support performance-based decisions; and

- The level to which state and Federal government is accountable, and the way in which funding is tied to performance and targets.

CONCLUSION AND FUTURE DIRECTIONS

The trend towards states adopting performance management has been the result of several factors, including the demand for more accountability from government programs and agencies, the pressure of scarce financial resources, and the recognition of best business practice. These factors will largely shape the upcoming Authorization discussions in Congress.

WSDOT has recognized the following key lessons over its long process of developing a performance-based management system:

- **Keep perspective.** Performance measurement is one of several decision-making tools.

- **Timing is everything.** Don't delay until you have the perfect data, framework, or IT system.

- **Lead, don't follow.** Tell your story before someone else tells it for you.

- **Don't tolerate silos.** Strive for a "One DOT" mentality.

In general, survey respondents and participants at the 2009 CEO Leadership Forum agreed with these conclusions. In particular, in terms of timing, it is important to get started with available tools and measures and refine them over time. State DOTs feel that any national performance management system should focus on areas of existing expertise, especially safety and preservation; other areas, particularly environment, freight, and economic development, need more research and development. Increased sharing of best practices and training will be required for states to reach the levels of performance management likely to be required by any national performance-based system.

In the Congressional Authorization discussions, it will be important to recognize that even though performance management is recognized as a best business practice, it alone will not guarantee that a desired or acceptable level of performance will be achieved. Most importantly, total funding available for transportation will limit the performance that is possible to achieve even with a comprehensive performance process in place. As AASHTO has stated, "if sufficient funding is not available, performance management does not make up the difference." What performance management can help to achieve is the best level of performance possible given the resources that are available. However, available resources must be spread across a range of performance areas. Performance management involves balancing performance with resources and making tradeoffs to reflect local priorities. Achieving the best level of performance depends on several factors:

- Consistency in, and understanding of, goals, objectives, performance measures, and targets;

- High-quality data to support performance management decisions;

- The ability of managers, and the availability of analytic tools, to identify performance impacts of projects realistically and efficiently; and

- The ability to use performance information to inform as well as manage expectations among the political leadership, stakeholders, and the public.

Successful implementation will continue to result in:

- Improved system and organizational performance;

- Greater results with constrained resources and fewer investments with low performance benefits;

- Strengthened accountability with elected officials and stakeholder groups; and

- Improved communication with the full range of stakeholders.

1.0 Introduction and Background

1.1 CEO FORUM OBJECTIVES

Performance management is the topic of the 2009 DOT CEO Management Forum. Performance management is defined as an ongoing process that translates strategic goals into performance measures and targets used to guide investments of both human and capital resources. The process provides continuous feedback to determine the impact of those investments on achieving desired performance outcomes.

Many state DOTs successfully have used performance measurement for years to provide improved system performance, enhanced public credibility, and in several states increased state funding. However, increasing pressure for public accountability and transparency, combined with the need to maximize limited resources, has prompted many more agencies to adopt or expand performance-based management programs.

A primary purpose of the forum is to identify and address high-priority issues and concerns surrounding performance management and its relationship to legislative program and policy development, particularly as applicable to Federal-aid programs. It provides an opportunity for more in-depth peer-to-peer discussion by CEOs and the development of actions that will support an effective nationwide performance management program in preparation for the next transportation funding reauthorization.[1] The forum will also help guide the future direction and activities of AASHTO's recently formed Standing Committee on Performance Management.

1.2 OUTLINE AND ROLE OF THIS WHITE PAPER

This white paper serves as a catalyst for discussion at the DOT CEO Leadership Forum. In particular, it addresses three key areas:

1. The business process referred to as "Performance Management," focusing on six basic components: goals and objectives, performance measures, targets, resource allocation, measuring and reporting results, and data quality (Section 2.0);

2. The current state of the practice among state DOTs, with examples of performance-based decision-making (Section 2.0); and

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[1] In October 2008, AASHTO adopted an Authorization Policy calling for a state-driven performance management process to achieve national transportation goals.

3. The issues that need to be addressed in adopting a performance-based Federal-aid Program, focusing on six performance categories: preservation, freight/economic development, safety, congestion, system operations, and environment (Section 3.0).

Section 4.0 provides summary conclusions and future plans and directions.

To address performance management for state DOTs and identify issues (as well as successes), several key questions are considered:

- What are some of the most critical performance measures for state DOTs and state DOT CEOs, and how are they used to change performance?

- What have been the challenges and success factors for state DOTs implementing performance management?

- What resources and information do state DOTs need to start or improve performance management?

Several recent NCHRP projects have developed guiding principles for establishing performance measures and documented case-study examples of performance management systems implemented by DOTs and other transportation agencies. AASHTO's Performance-Based Highway Program Task Force documented the current state of the practice of performance management. Further, a survey of performance management practices was distributed to state DOT CEOs; there were 23 respondents. This white paper builds on all of this material and implementation experience with a number of DOTs.

2.0 Performance-Based Management in Practice

2.1 OVERVIEW

Performance management is a policy-directed, data-driven, performance-based business practice that links organization goals and objectives to resources and results. The outcomes of performance-based management include more efficient distribution of limited resources and a focus on accountability of decision-making.

Over the last 15 years, there has been a dramatic increase among state departments of transportation (DOTs) in the use of performance management principles to plan, prioritize, track, and improve the effectiveness of nearly all DOT functions to achieve the agency's fundamental goals. Performance information helps to guide decisions about priorities and resource allocation, not just for capital project delivery but also for internal agency management and operations. Performance management (and overall use of performance measures) has been applied for many purposes in state DOTs:

- Providing a foundation for policy formulation and systemwide planning;

- Issuing "report cards";

- Tracking progress toward publicized policy goals and agency priorities;

- Supporting investment decision-making in resource allocation, performance-driven investment decisions, formalized performance-based budgeting, and strengthened internal program management;

- Demonstrating accountability and responsiveness to stakeholders, ensuring "wise use of tax dollars";

- Assessing the status of a program, evaluating its cost- and performance-effectiveness;

- Meeting or responding to Federal and state legislative mandates and reporting requirements;

- Guiding improved delivery of services, focusing on desirable outcomes and alternative methods of delivering these results;

- Engaging an agency within a comprehensive, statewide performance initiative aimed at broad-based improvement in government delivery of services and accountability; and

- Improving communication within the agency itself as well as with transportation system users, political leaders, other stakeholders, and the public at large.

At one end of the spectrum are agencies that have limited data mining and reporting capabilities or practices beyond those needed to meet Federal requirements. At the other end are a handful of agencies with well-developed performance management programs that help drive every aspect of the organization including budgeting and project selection processes. In between are the rest of the state agencies with some level of predictive capability. These agencies have a commitment to using system and agency performance data to improve effectiveness and efficiency but with only some elements of a comprehensive performance management system in place. Progress and improvements in the performance management process are cyclical and occur incrementally over time, requiring sustained leadership over a number of years to achieve full implementation.

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- Transparency of performance results and their implications for transportation customers and stakeholders, as well as the owning/operating agency; and

- Several agencies link organizational performance and transportation system performance. This concept has existed for some time in the private sector, but now is being considered by public sector DOTs.

A "performance management framework" has been developed to illustrate the basic performance management principles that can be integrated into all of the critical functions and operations of a transportation agency, from program development to delivery to agency operations (Figure 2.1).

Figure 2.1   Performance Management Framework

This framework is based on six principles:

1. **Setting Goals and Objectives –** An organization's policy goals and objectives provide the foundation for performance-based management decisions and define agency priorities;

2. **Selecting Performance Measures –** Performance measures establish a set of metrics to help organizations monitor progress toward satisfying a goal or objective;

3. **Setting Performance Targets –** Establishing quantifiable targets for each performance measure allows agencies to gauge specific, numerical progress over time relative to a desired goal;

4. **Allocating Resources –** An organization builds upon the preceding steps by allocating resources such as time and money, through processes such as budgeting, to achieve specific targets;

5. **Measuring and Reporting Results –** Monitoring through data collection and reporting progress to decision-makers and other stakeholders allows organizations to identify key factors influencing performance and necessary actions to improve results; and

6. **Ensuring Data Quality –** Effective decision-making through each element of the performance measurement framework requires a solid foundation of accurate, timely, and appropriate data.

Performance management best-practices and cases below are organized according to these elements of the framework.

2.2 GOALS AND OBJECTIVES

Overview of Best Practices

An organization's policy goals and objectives define agency priorities and pro-vide the foundation for performance-based management decisions. Agencies commonly define strategic goals and objectives in long-range plans, strategic plans, program development reports, or other documents. To develop goals and objectives for state transportation plans, Federal law and planning regulations require input from a wide range of agencies and stakeholders, including elected officials, business leaders, transportation interest groups, the media, and the general public. This process ensures that a state's goals and objectives reflect statewide issues, concerns, and priorities. The cyclical performance management process allows for periodic assessment and adjustment of policy goals and objectives as state priorities change.

The goal-setting process is important for an agency to focus the development of performance management within a core set of activities. Rather than starting out with a large number of strategic initiatives that require unwieldy numbers of performance measures and that may distract the decision-making process, most successful performance management programs start small. After learning from experience and building support over time, the program can be expanded to encompass a broader range of performance-based decisions.

While the specific focus of an agency's goals and objectives will vary from state to state, there are several common emphasis areas among state DOTs:

- Safety;
- Transportation system preservation;
- Operational efficiency/productivity;
- Management capacity/organizational effectiveness;
- Environmental stewardship;
- Employee development;
- Transportation system enhancement;
- Relationships with partners and suppliers;
- Customer service and satisfaction;
- Congestion mitigation;

- Economic development; and

- Financial viability.[2]

AASHTO'S recently adopted Authorization Policy suggests six key national goal areas:

1. Preserve and renew the system and maintain urban and rural accessibility and connectivity;

2. Enhance economic competitiveness, interstate commerce and national defense through an enhanced freight system;

3. Improve transport safety;

4. Reduce congestion and improve urban and rural accessibility and connectivity using multimodal solutions;

5. Support system reliability, national security and natural disaster response through enhanced system operation and management; and

6. Enhance the environment and community quality of life.

Selected Cases

The Washington legislature defines goals for the State's transportation program as *preservation*, *safety*, *mobility*, *environment*, and *stewardship*. The statute mandates that these goals be "the basis for establishing detailed and measurable objectives and related performance measures." It calls upon the Office of Financial Management (OFM) to establish objectives (as well as performance measures) for WSDOT and other state agencies with transportation-related responsibilities.[3]

In Minnesota long-term goals outlined in Mn/DOT's *Strategic Plan* lead to policies and performance measures that are defined in the *Statewide Transportation Plan* (STP), with resulting identification of system deficiencies and proposed improvements in supporting local, tribal, interregional, and modal plans (Figure 2.2).[4] Implementation details are contained in 10-Year *Capital and Service Improvements Programs* and the *Statewide Transportation Improvement Program* (STIP). More detailed, short-term performance measures that are based on the STP measures are reported in agency division or office business plans (which have a horizon of 2 years) and work plans (span of less than 1 year).

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[2] NCHRP Synthesis 326.

[3] NCHRP 8-70 Interim Report 1 (unpublished document).

[4] *Minnesota Statewide Transportation Plan: Moving People and Freight from 2003 to 2023*. Minnesota Department of Transportation, St. Paul, Minnesota, August 2003. www.oim.dot.state.mn.us/StatePlan/index.html. Accessed July 11, 2008.

Figure 2.2   Minnesota Long-Term Investment and Decision-Making Process

MPO = Metropolitan Planning Organization
RDC = Regional Development Commission
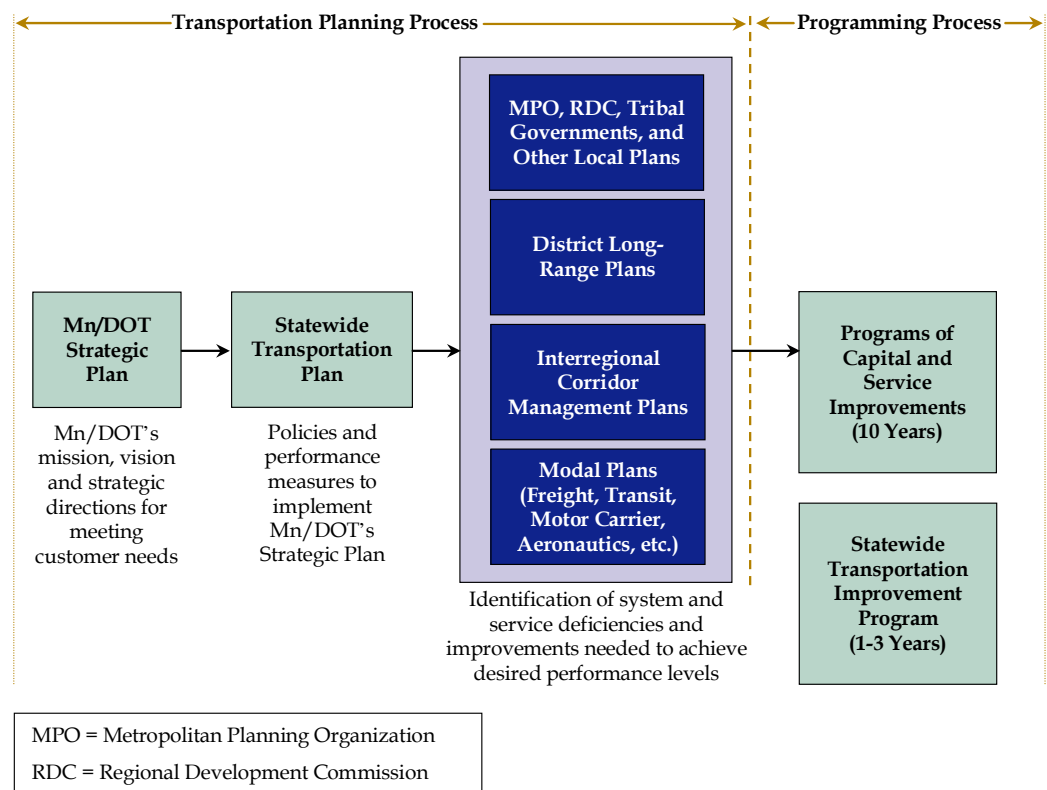
Source: Minnesota Statewide Transportation Plan, August 2003.

Mn/DOT's strategic goals as outlined in its 2003 Strategic Plan,[5] currently being revised in 2009, are to: 1) safeguard what exists in the transportation system; 2) make the system operate better; and 3) make Mn/DOT work better. For each of these strategic directions the STP has specified policies, each with an associated set of performance measures. For example, the goal to Safeguard What Exists entails the following long-range policies:

- Preserve essential elements of the existing transportation system;

- Support land use decisions that preserve mobility and enhance the safety of transportation systems; and

- Effectively manage the operation of existing transportation systems to provide maximum service to customers.

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[5] *Strategic Plan 2003: Helping Minnesotans Travel Safer, Smarter and More Efficiently.* Minnesota Department of Transportation, St. Paul, Minnesota, 2003. www.dot.state.mn.us/ information/statplan00/index.html. Accessed July 11, 2008.

The long-range goals outlined in the Florida Department of Transportation's (FDOT) Florida Transportation Plan (FTP) provide the policy direction and desired outcomes for Florida's transportation system over the next 20 years (Figure 2.3).

Figure 2.3   Florida DOT's Performance Measures Framework
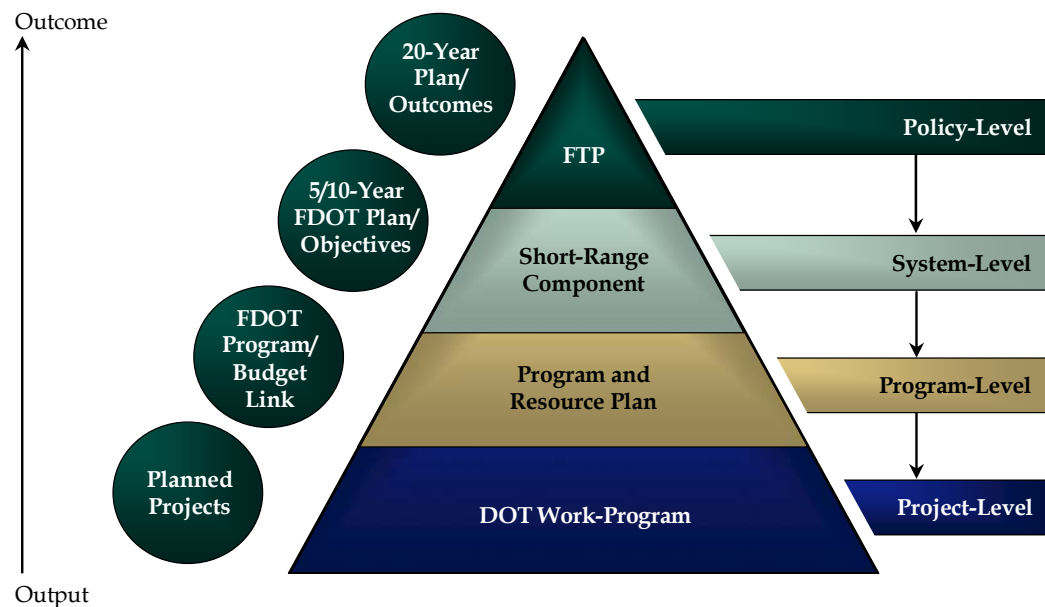
Source: Florida DOT.

The five broad goals in the FTP include:

1. A safer and more secure transportation system;

2. Enriched quality of life and responsible environmental stewardship;

3. Adequate and cost-efficient maintenance and preservation of transportation assets;

4. A stronger economy through enhanced mobility for people and freight; and

5. Sustainable transportation investments for Florida's future.

Each of the goals in the FTP is supported by a total of 29 more specific long-range objectives. While the long-range FTP does not propose performance measures or targets, such quantitative information is provided in the Short-Range Component. The Short-Range Component is based on the 5 goals of the FTP but substitutes 13 short-term objectives – spanning up to 10 years – for the long-range objectives of the FTP. For example, the goal of a safer, more secure transportation system is subdivided into performance-based objectives for reductions in the highway vehicle fatality rate, bicycle fatality and serious injury rate,

pedestrian fatality and serious injury rate, and motorcyclist fatality and serious injury rate.[6]

A business plan for the Maryland DOT's State Highway Administration (SHA) defines goals related to six key performance areas: 1) highway safety, 2) mobility, 3) system preservation and maintenance, 4) environmental steward-ship, 5) organization effectiveness, and 6) customer communication, service, and satisfaction.

The Texas DOT criteria for project selection and budgeting address five goals: 1) reduce congestion; 2) enhance safety; 3) expand economic opportunity; 4) improve air quality; and 5) increase the value of transportation assets. The Department accomplishes these goals through four basic strategies: 1) TxDOT will use all available financial tools to build transportation projects; 2) TxDOT will empower local and regional leaders to solve local and regional transporta-tion problems; 3) TxDOT will increase competitive pressure to drive down the cost of transportation projects; and 4) TxDOT will demand consumer-driven decisions that respond to traditional market forces.[7]

The California Department of Transportation (Caltrans) is in the early stages of implementing a performance management program. They define five goals (safety, mobility, delivery, stewardship, and service) and 26 objectives in their recently updated five-year strategic plan. Caltrans provided the opportunity for every employee to participate in the strategic plan's development to ensure buy-in, commitment, and ownership of the plan at all staff levels. The California Transportation Plan (CTP) defines goals, policies, and strategies to guide deci-sions toward an integrated, multimodal, sustainable transportation system. System performance measures relate to mobility, accessibility, preservation, eco-nomic vitality, safety and security, equity, and environmental quality. Regional Transportation Plan (RTP) Guidelines assist metropolitan planning organizations (MPOs) in developing RTPs consistent with Federal requirements and the CTP.

2.3 PERFORMANCE MEASURES

Overview of Best Practices

Performance measures help to translate broad policy goals and objectives into actionable programs, policies, projects, and services. Upper-level management at many DOTs use performance measures to track progress towards the goals out-lined in the strategic planning process. Failure to properly align performance

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[6] Short-Range Component of the Florida Transportation Plan. Slide presentation. Florida Department of Transportation, Tallahassee, Florida, January 2008.

[7] *TxDOT has a Plan: Strategic Plan for 2007-2011.* Texas Department of Transportation, Austin, Texas, July 2006.

measures with goals and objectives can result in wasteful spending on tracking measures having little to do with organizational or transportation system priorities. Selected performance measures should reflect an agency's strategic goals and objectives while complementing the agency's other unique characteristics, such as organizational and legislative structures, project development processes, fiscal constraints, and stakeholder concerns.

Recent efforts have investigated the benefits of using comparative performance measures to compare DOT performance data on issues of strategic importance. The benefits of a comparative approach include:

- More communication among DOTs;

- Greater awareness of best practices, lessons learned, and innovations;

- Improved business operations; and

- Increased responsiveness to customers' needs.

While a comparative performance program would involve voluntary peer comparisons and rigorous methodologies, several hurdles remain to achieve greater acceptance of comparative performance measures among state DOTs. Data limitations and varying approaches to tracking performance make agency-to-agency comparisons difficult.

Five steps are recommended to help transportation agencies select performance measures from among the numerous measures available:[8]

1. **Inventory Existing Measures –** Identify performance measures already in use within the agency. Understand how each existing measure is defined, how it is being used, and whether data or other issues limit its value.

2. **Assess Gaps –** Based on the agency's stated policy goals, identify gaps in existing performance measures.

3. **Define Selection Criteria –** Establish detailed performance measure criteria to help refine the list of potential candidate measures. Criteria may include implementation feasibility (data availability and costs), policy sensitivity (relationship to agency goals and objectives), usefulness for decision support, and applicability to broad audiences (both internal and external to the organization).

4. **Identify Candidate Measures/Adjustments to Existing Measures –** Develop a list of candidate measures and relate each measure to one or more strategic goals. Tying performance measures to strategic goals and objectives is what makes them meaningful.

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[8] NCHRP Report 551, *Performance Measures and Targets for Asset Management*.

5. **Assess and Select Measures for Further Design and Implementation –** Apply the criteria developed in Step 3 to the candidate measures identified in Step 4 to determine which measures are worth pursuing.

Selected measures should encompass input, output, and outcome measures as well as leading and lagging measures to evaluate the upstream and downstream consequences of policy changes and/or specific resource allocation decisions. Performance measures should also reflect the difference in perspectives between system managers and system users. Many agencies stress the importance of keeping the measures few and simple, focusing the "vital few" on the agency's strategic goals; this is supported by private sector best-practices in performance management.

Suggested performance measures aligned with AASHTO'S recently adopted Authorization Policy six key national goal areas are shown in Table 2.1.

Selected Cases

WSDOT has selected over 100 specific performance measures that cover all key agency functions, programs, and modes. Highlighting the importance of performance management as a core management tool at WSDOT, the agency has embraced the motto, "What gets measured, gets managed."

Examples of some of WSDOT's proposed performance measures are listed in Table 2.2. These measures are reporting-type measures for communication to the legislature. Many are backed by technical measures (e.g., pavement structural condition, rutting, and roughness; bridge ratings; congestion delay times; collision statistics) that are obtained by system monitoring and inspection and are used in management or other analytic systems and quantitative prioritization procedures.

Table 2.1 Suggested Performance Measures Aligned with National Goal Areas

Goal Areas	Suggested Measures
1. Preservation	• Pavement – Average International Roughness Index (IRI) • Pavement – Percent of pavements in poor condition • Bridge – Percent classified as Structurally Deficient (SD), weighted by deck area • Bridge – Percent classified as Functionally Obsolete (FO), weighted by deck area • Bridge – Average Sufficiency Rating • Bridge – Number of scour critical bridges • Bridge – Number of posted bridges
2. Freight/Economic Development	• Average speed on Interstate and National Highway System corridors • Average time to cross borders • Number and percent of bridges allowing clearance for double-stack containers • Freight volume by mode including TEU throughput at ports
3. Safety	• Number of fatalities • Fatality rate (using VMT) • Number of serious injuries • Rate of serious injuries (using VMT)
4. Congestion (Mobility and Accessibility)	• Hours of Delay (Vehicle-hours and Person-hours) • Hours of Delay per VMT • Travel Time Index
5. System Operations Management	• Travel Time Index • Planning Time Index • Incident Clearance Time • Lane Closures (Lost Lane-Hours) Due to Work Zones and Weather Events
6. Environment	• Transportation-Related Air Quality Emissions • State DOT Use of Stormwater Best Management Practices • State DOT Operations: Energy Use, Recycled Materials, and Carbon Footprint • Annual highway transport greenhouse gas emissions

Source: NCHRP 20-24(58), *Factors Influencing the Effectiveness of Performance Measures* (unpublished document).

Table 2.2 WSDOT Proposed Performance Measures

Goals	Objectives	Proposed Performance Measures
	• Extend the useful life of existing facilities, systems, and equipment.	• **State Highway Pavement –** Percent of state highway pavement in fair or better condition.
		• **Local Roadway Pavement –** Percent of city and county roadway pavement in fair or better condition.
		• **Bridges –** Percent of state, city, and county bridges in fair or better condition.
		• **State Highway Maintenance –** Percent of targets met for state highway maintenance levels.
		• **Ferry Vessels and Terminals –** Percent of state ferry terminals in fair or better condition. (Future reports to include county terminals and state and county vessels.)
	• Reduce fatalities and serious injury collisions.	• **Traffic Fatalities –** Number and rate of traffic fatalities per 100 million vehicle miles traveled.
	• Reduce risks and ensure security.	• **Collision Reduction –** Percent reduction in injury and damage before and after safety improvements.
	• Address congestion.	• **Travel Times –** Travel times on the most-congested state highways (commuter routes around Puget Sound).
	• Maximize operational performance and capacity of existing systems.	• **Hours of Delay –** Hours of delay on the most-congested state highways.
	• Increase the reliability of travel for goods and people.	• **Trip Reliability –** Reliable travel times on the most-congested highways around Puget Sound.
	• Reduce bottlenecks and chokepoints.	• **Commute Modes –** Percentage of commute trips taken while driving alone.
		• **Incident Response Times –** Average length to clear major incidents lasting more than 90 minutes on key highway segments.
		• **Freight –** Measure is still being developed.
		• **Passenger Rail –** Percent of trips and ridership on state-supported Amtrak Cascades.
		• **Transportation-Efficient Land Use –** Measure is still being developed.
	• Protect habitat.	• **Fish Passage –** Number of culverts fixed and miles of stream habitat opened up.
	• Reduce degradation of air and water quality.	• **Stormwater Quality –** Number of WSDOT stormwater treatment facilities constructed.
		• **Air Quality –** Tons of greenhouse gases produced statewide.
	• Improve program and project delivery.	• **Capital Project Delivery –** Percent of Nickel and Transportation Partnership Act (two state transportation funding statutes and mechanisms) capital projects completed on time and within budget.

Source: Cambridge Systematics and Michael Markow, NCHRP 8-70 unpublished case study.

Each of Mn/DOT's policies has a set of performance measures to gauge progress and forecast extrapolated as well as policy-based trends in these measures. As examples, the first Mn/DOT policy listed in Section 2.2, to "preserve essential elements of the existing transportation system," has performance measures devised to ensure that:

- Pavement ride quality is acceptable to customers;

- Airport runway pavement condition maintains safety;

- Pavement maintenance extends service life and reduces long-term costs;

- Bridge structural condition meets national and state standards; and

- Remaining vehicle life of the transit fleet optimizes investments.

To ensure appropriate breadth of coverage, performance measures are organized by individual aspect of each policy and for each mode (or modal group). Several criteria have been used by Mn/DOT to select performance measures for its STP:

- They must have statewide significance, measuring either a systemwide attribute or an essential element of a modal or departmental function;

- They must meaningfully measure a key outcome of the Statewide Plan policy framework;

- Together they must represent all major functions, modes, and customer segments for which Mn/DOT delivers a transportation service;

- They should cover outcomes over which Mn/DOT has direct or indirect influence, so that Mn/DOT can manage them; and

- They should measure or influence an attribute that is important to customers and stakeholders.

As described in Section 2.2, FDOT's Short-Range Component of the performance measures framework is based on the five goals of the FTP, but substitutes short-term objectives for the long-range objectives. At the executive level, the DOT Executive Board establishes and reviews key department-wide performance measures on a monthly basis. These measures are divided into five categories: 1) transportation system safety, 2) customer and market focus, 3) production performance, 4) transportation system performance, and 5) organizational performance.

After a departmental reorganization in 1995, the Ohio Department of Transportation (ODOT) reinvigorated their focus on processes and results by formally instituting a performance measure program. ODOT identified key performance measures to monitor pavement and bridge condition, highway maintenance, design and construction functions, and other important division results. The agency also developed the Organizational Performance Index (OPI), reflecting 65 performance measures and targets, to support resource allocation decisions, process improvements, and staff performance reviews. Ohio DOT has found that to be effective, performance measures need to focus on results,

provide timely and useful feedback, and address the interests of customers and the agency. Organizational commitment to affecting these measures can help bring about substantial change and improved service.

The Missouri Department of Transportation (MoDOT) built their performance management system around a set of 18 measurable "Tangible Results" that were carefully worded to describe agencywide strategic goals in terms of desired results or outcomes. A total of 111 performance measures are linked to the Tangible Results.[9] The measures were identified by MoDOT's leadership as the most important to the State's transportation system capable of influencing results. However, staff will add, change, or remove individual measures as needed to ensure a focus on results.

2.4 TARGETS

Overview of Best Practices

Quantifiable targets for each performance measure allow agencies to gauge progress over time relative to a desired goal. However, practices of establishing performance targets vary considerably among state transportation agencies. Some agencies view target-setting as a multidimensional process, involving:

- Financial considerations (reflecting a realistic projection of available funding levels);

- Technical considerations (targets should be achievable based on current and forecasted conditions or performance and the resources available);

- Policy considerations (reflecting existing policies and priorities, customer and public involvement, and executive and legislative input); and

- Economic considerations (minimizing life-cycle costs and maximizing benefits relative to investments).

According to the survey conducted for the 2009 CEO Leadership Forum, 19 of the 23 responding states have targets for preservation, and 19 also have targets for safety (Table 2.3). However, some goal areas are not as well developed in terms of performance measurement. For example, only one responding state has targets for freight/economics; 16 have no measures at all in that area.

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[9] A complete listing of Missouri DOT Tracker performance measures is available at http://www.modot.org/about/general_info/Tracker.htm.

Table 2.3   Use of Measures and Targets by Goal Area

Goal Area	Measures Only	Measures and Targets	Neither
Preservation	3	19	1
Freight/Economics	6	1	16
Safety	4	19	0
Congestion	8	10	5
System Operations	7	9	7
Environment	5	7	11

Source: Unpublished survey conducted for 2009 CEO Leadership Forum, Center for Transportation Studies and Cambridge Systematics, Inc.

One approach to establishing performance targets involves seven steps:[10]

1. **Define Context and Time Horizons –** Clarify the application of each target and the time horizon it will cover (such as long-range, annual, quarterly, or daily reporting requirements).

2. **Select Scope of Measures for Targets –** Identify the performance measures that are suitable for target development. Not all measures lend themselves to quantitative targets, while others may not have sufficient baseline or trend information on which to establish a target.

3. **Develop Long-Term Goals –** Develop long-term goals based on benchmarks from peer agencies, customer feedback on acceptable performance levels, or economic efficiency.

4. **Consider Funding Availability –** Realistic estimates of future funding provide the basis for financially constrained performance targets.

5. **Analyze Resource Allocation Scenarios and Tradeoffs –** Using analytical tools that project future performance as a function of investment level, analyze the performance implications of different resource allocations (both within and across program categories).

6. **Consider Policy and Public Input –** Provide two-way communication between system managers and system stakeholders to convey the implications of resource allocation on desired performance levels.

7. **Establish Targets and Track Progress –** Select target values and establish procedures to track progress over time. Periodic target adjustment may be necessary to reflect changes in policy or priorities.

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[10]NCHRP Report 551.

Targets are typically set after establishing a baseline data trend and may be adjusted over time. Efforts should be made to ensure that targets are attainable. Setting targets too high can lead to over-investment and non-attainment, whereas setting targets too low can lead to under-investment and unmet customer expectations. While the private sector has consequences for meeting or not meeting targets, such actions have not been implemented at state DOTs or other transportation agencies.

Selected Cases

Table 2.4 summarizes several DOT target-setting practices. Several DOTs now set performance targets based on forecast funding levels. Others base targets on trends, tradeoff analyses, or comparing performance across organizational units.

Target-setting within the WSDOT capital programming approach must account for broad policy goals and objectives, external reporting, and internal programming needs. WSDOT therefore has several types of targets and related performance measures: internal versus external, aspirational versus specific, and formal versus informal or "understood." Moreover, "targets" are established through several processes and therefore must be coordinated across several sources, such as WSDOT's long-range planning process (LRP), its biennial Strategic Plan, the Governor's Government Management Accountability and Performance (GMAP) program, the Attainment Report submitted by OFM to the legislature, the Federal Stewardship Report, and the Washington State Quality Award (a Baldrige process).[11]

Table 2.4   Target-Setting Practices by Agency

Target-Setting Parameters	State DOT Applications
Based on anticipated funding levels through the forecast horizon	Idaho DOT, Michigan DOT, Minnesota DOT, Montana DOT, Ohio DOT, Washington DOT
By comparing performance across organizational units	Florida DOT
For different time horizons	Maryland Dot, Minnesota DOT
For different geographic areas	Texas DOT
Based on funding levels, performance analysis trends, and tradeoff analysis	Minnesota DOT, Montana DOT

Source: Cambridge Systematics and High Street Consulting, NCHRP 8-62 unpublished interim document (2008).

WSDOT has found that target-setting requires a solid history of performance data as well as managerial understanding of:

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[11]Cambridge Systematics and Michael Markow, NCHRP 8-70 unpublished case study.

- What is within the agency's control;

- Whether data accurately portray the behavior they purport to represent; and

- Whether data, measures, and targets can be practically applied within a performance-based programming and budgeting process.

Washington's Governor may issue a target as a matter of public policy, particularly aspirational targets. More specific program targets established through the Governor's Priorities of Government (POG) program are often the result of a negotiation.

In Florida, state law mandates a number of output and outcome-based performance targets, including:

- Eighty percent of pavement on the State Highway System meets department standards;

- Ninety percent of FDOT-maintained bridges meet department standards;

- One hundred percent of the State Highway System meets acceptable maintenance standards;

- Fifteen percent of discretionary capacity funding must be used for transit projects; and

- Fifty percent of discretionary capacity funding must be applied to the Strategic Intermodal System.

Meeting the state-mandated targets is the department's first priority. Although statute requires minimum performance targets, FDOT sets higher performance targets for some measures. For example, the department targets 75 percent of discretionary capacity funding for the Strategic Intermodal System, compared to 50 percent required by state law.

An entire chapter of Minnesota's 2003 Statewide Transportation Plan, currently being updated in 2009, is devoted to establishing a target-setting framework for its performance measures. Mn/DOT recognizes that the degree to which it has control over results varies by individual performance measure. For example, while Mn/DOT has direct control over the State's pavement quality, it can only influence transit service through funding.

In the Caltrans Strategic Plan described earlier, each strategic objective has a specific target to be completed by the plan's horizon year (2012). To help ensure that the agency reaches the ultimate target for each objective, Caltrans also established annual targets for each of the plan's five fiscal years. In 2007, Iowa completed its Comprehensive Highway Safety Plan establishing a goal of saving an additional 20 to 45 lives per year depending on which types of strategies can be implemented, for a total of no more than 400 roadway fatalities in 2015.

2.5   RESOURCE ALLOCATION

Overview of Best Practices

A true performance management program connects performance measurements with actions or decisions. Resource allocation is one of the most fundamental uses of performance measurement. Performance management helps agencies achieve the best level of performance possible given the resources that are available.

Performance management involves balancing results and spreading resources across a range of performance areas. Decisions on how to allocate resources within and across different assets, programs, and types of investments involves analysis of tradeoffs to understand how different allocations will affect the achievement of policy objectives and priorities. After identifying the key factors that influence performance, agencies can direct resources toward areas with the greatest improvement potential and the most importance to stakeholders. Even with comprehensive performance processes in place, however, performance management cannot make up the difference of insufficient funding. The range of options and tradeoffs considered must also reflect limitations posed by realistic funding constraints.

Selected Cases

Resource allocation is not limited to budgeting and financial investments for transportation projects. Several agencies use performance targets to evaluate staff performance and other department activities. Table 2.5 provides examples of select agency actions based on performance.

Table 2.5   Resource Allocation Examples from Select Agencies

Agency	Examples of "Action" Based on Performance
Arizona DOT	Prioritization of capacity expanding projects outside of urban areas
California DOT	Allocation of resources for State Highway Operations and Protection Program
Florida DOT	Prioritization of program funding levels
Minnesota DOT	Capital budgeting decisions at the district level Funding allocation across districts Adjust types of investment in program
Montana DOT	Capital funding allocations to districts, systems, and work types; and project programming consistency
Ohio DOT	Assessment of staff performance Allocation of funding across districts "Face-to-face" meetings to develop action plans to address performance deficiencies
Pennsylvania DOT	Identification of actions in district and bureau annual business plans to improve performance Quarterly "face-to-face" meetings between district engineers and Deputy Secretary for Highway Administration to review performance and identify actions to meet targets Similar face to face meetings between Bureaus and Deputy Secretaries
Virginia DOT	Staff accountability, performance bonuses Monthly video conference with Commissioner to review project status for major projects (based on "Dashboard")
Washington DOT	Quarterly meeting to review performance with 25-30 senior staff Project prioritization Funding allocation across districts

Source: NCHRP Report 8-36(47).

WSDOT's Preservation and Improvement programs are each divided into sub-programs and categories of projects. This breakdown enables projects within each category to be compared to their peers during prioritization, using analytic methods and data appropriate to each category. The program structure also facilitates relating projects by category to corresponding policy goals, enabling a better understanding of the relationships among program expenditures and changes in system performance to meet goals and objectives.[12]

Project prioritization and selection entail several steps to identify needs or problems, identify alternative solutions, scope the preferred solution in terms of costs and potential impacts on performance, prioritize projects within each category, and build a program that responds to the goals above while meeting funding constraints – not only the dollars available, but also the eligibility requirements

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[12]Cambridge Systematics and Michael Markow, NCHRP 8-70 unpublished case study.

of each funding source (WSDOT projects are funded by three separate state funding mechanisms, each with its own project and program eligibility rules, in addition to Federal funds and some local funding).

WSDOT is required by state law to analyze project priorities in certain ways: Preservation projects should be consistent with a minimum-life-cycle approach to maintaining these assets; improvement projects should be consistent with economic efficiency using benefit/cost analysis. Financial guidance on the availability of funding for the highway program is overlaid on the list of prioritized projects by category to build a recommended program and budget. WSDOT distributes funds to regions on the basis of performance as evaluated on a statewide basis – there are no set allocations.

Each year every Mn/DOT district, following uniform guidance, identifies investment priorities. These priorities are based on quantifiable performance measures and targets that establish a statewide basis for identifying critical transportation improvements for the entire trunk highway system. These district projects are ranked and incorporated into the STIP.

Mn/DOT has institutionalized several steps to ensure that the project selection process remains consistent with department goals and policies. The most important step includes the periodic assessment of the transportation system's performance with a regular review of the modal measures data by senior staff. This review has resulted in program adjustments in the 10-year capital investment program and in some cases the STIP. For example, in 2005, the senior staff remixed the projects in its highway construction program based upon data which indicated diminishing pavement conditions.

Mn/DOT prepares biennial budget requests for the Minnesota Legislature. This request is performance-based, showing the specific impact of funding requests on transportation system performance measure targets. For example, in its 2005 legislative budget proposal, Mn/DOT requested a shift in funds from highway construction to highway maintenance based on the agency's performance measures data. The legislature agreed that a greater investment in maintenance would yield long-term savings.

FDOT's Executive Board is responsible for making the department's resource allocations. Allocation decisions are based on the output and outcome-based performance targets mandated by state law (described in the previous section). While maintenance is funded off the top, the Executive Board is responsible for determining the priority of funding for other programs.

The Iowa DOT adjusts its maintenance program based on observed performance measure trends. For example, mowing activity was modified to focus on safety considerations (i.e., sight distance) rather than aesthetics, and funds were shifted to address the edge rut problem for safety reasons.

ODOT has geared many of its performance management efforts toward improving the allocation of resources to specific functions. Managing pavement and bridge conditions is one key example. The agency first collects pavement

and bridge condition data by district. Based on current expenditures and expected change in conditions, ODOT then predicts future pavement condition and estimates the total funding needed to meet system preservation goals. Funding is allocated between districts to best meet the needs of the system. Districts with pavement or bridges that fall below performance targets receive a larger share of funding to address the deficiencies. Over the last several years, ODOT has seen a significant improvement in pavement and bridge quality as a result of this process.

Similar to ODOT, the Virginia Department of Transportation (VDOT) uses performance results to distribute maintenance and operations budgets to its nine districts based on need. As VDOT adjusts to this new performance-based approach, a "hold harmless" provision ensures that each district will receive a minimum of what they received the previous biennium. Above this minimum amount, districts with a greater share of targeted needs will receive proportionally more funding. The primary resource allocation challenge for VDOT and many other state DOTs, however, is that needs simply outpace available resources.

2.6 PERFORMANCE MONITORING

Overview of Best Practices

Measuring and reporting performance results provides agencies with clear accountability and feedback for both impacts and effectiveness. Actual performance results may not only influence future resource allocation decisions, but also agency goals and objectives. Recognizing the key factors that influence performance provides the opportunity to make adjustments to resource allocation, project delivery, agency operations, and transportation policy for improved results.

Regular reporting frequency is more important to a successful performance management program than the methods used for reporting. Regular reporting enables agency leaders to incorporate performance measures into routine decision-making. Similarly, reporting should be as simple and consistent as possible, especially when reporting performance measures that cross agency or jurisdictional lines. A study completed by AASHTO's Standing Committee on Quality that evaluated the on-time and on-budget performance of construction contracts from 20 volunteer states found that "a consistent analysis of performance results can be a powerful learning tool, which can improve business processes and push innovation." Also, in addition to frequency, consistency, and simplicity, performance measurement reporting should be appropriately tailored for the intended audience. The presentation and depth of reporting should reflect the unique needs of technical staff, decision-makers, and the public.

Among the 23 survey respondents, 16 state DOTs have linked performance management outcomes to requests for funding. In some instances, performance measures and budget requests are included in the same document. Performance management provides the ability to articulate both unmet needs and what was

accomplished with existing tax dollars. The successful use of performance reporting and linking to funding requests is reflected in the passage of transportation financing packages in both Minnesota and Washington.

Selected Cases

Table 2.6 describes reporting approaches identified for several state DOTs.

Table 2.6   Reporting Approaches for Sample State Agencies

Agency	Reporting Frequency	Reporting Mechanism
Arizona DOT	Varies – ADOT's measures used to support Long-Range Plan development.	Part of Arizona DOT's Long-Range Plan.
Minnesota DOT	Senior executive staff meeting reports quarterly on a rotating cycle. Infrastructure measures reported annually. Some operations measures reported monthly or quarterly.	Face-to-face meetings with Minnesota DOT executive staff, with combination of Dashboards, PowerPoint slides, reports, etc., to support discussion.
Missouri DOT	Quarterly	Missouri Tracker – Print and electronic formats available. Document geared toward public/external stakeholder audience.
Montana DOT	Director's Report – Program delivery measures – Quarterly.	Director's Report.
	P3 – Project programming tool – Annually.	P3 – Performance-based capital allocations are taken as formal Transportation Commission actions.
Ohio DOT	Monthly/Quarterly.	In-house web database and report generator/ selected measures as part of annual external reports.
Oregon DOT	Annually.	Performance Report – Print and electronic formats available. Document geared toward public/external stakeholder audience.
Pennsylvania DOT	Quarterly.	Agencywide executive-level Scorecard Bureau/Division-level Dashboards for senior management.
Virginia DOT	Daily.	Web-based Dashboard updated daily.
Washington DOT	Quarterly.	Gray Notebook – Print and electronic formats available. Document geared toward public/ external stakeholder audience.

Source: NCHRP 8-36(47).

The same Washington legislative statute that mandates State goals calls upon the Office of Financial Management (OFM) to establish objectives and performance measures for WSDOT and other state agencies with transportation-related responsibilities, and to submit biennial reports on transportation objectives and performance measures to the legislature. OFM has prepared a 2007 Draft Baseline Report as the initial effort under this requirement, to allow the legislature to review and comment on performance measures. Additionally, WSDOT

publicly distributes the "Gray Notebook" performance report annually, which is oriented towards the public or external stakeholders.[13]

Mn/DOT takes part, with other Minnesota state agencies, in that State's performance reporting initiative. It displays performance results in "Department Results" summaries, as well as "needle-gauge," color-coded dashboards that indicate whether performance measures meet their target, are slightly below target, are significantly below target, or are above target.

The FDOT Executive Board monitors key performance measures on a monthly basis. In addition, FDOT's internal performance measurement database, the PBviews Performance Measurement System, allows each office and program to monitor results and data on a continuous basis. The system displays monthly, quarterly, and annual information, including raw data, trend charts and graphs, and comparisons between actual performance and target results.

The Maryland SHA monitors agencywide performance results on a quarterly basis to adjust program activities as necessary to optimize performance. In addition, the Maryland SHA demonstrates to the Maryland Legislature the need for additional highway funding where performance results indicate additional funding is needed to sustain or improve results. After substantial increases in funding are secured, performance results provide accountability by demonstrating how the money was used and to what effect.

2.7 SUPPORTING DATA SYSTEMS

Overview of Best Practices

High-quality, consistent data are critical to successful performance management and, by extension, to achieving the overall goals and objectives of the agency. Complex, system-level transportation decisions require timely, understandable, and standardized data. Conversely, data that are uncertain or inaccurate reduce the management value of the performance measures they inform.

State DOTs are more concerned about data availability, quality, and affordability than data quantity. Having too much data is not only expensive, but also potentially confusing and unwieldy. Suggestions to improve performance measurement data collection include:

- Build on information and tools already in use at different levels of the organization;

- Collect data that will be used to make decisions, not simply the data that is available;

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[13]Cambridge Systematics and Michael Markow, NCHRP 8-70 unpublished case study.

- Identify data gaps in terms of accuracy, precision, timeliness, and consistency;

- Collect information on both outputs and outcomes and identify trends when possible;

- Manage data collection by assigning schedules for collection, quality control/ quality assurance procedures, and accessibility and adjust procedures over time as necessary;

- Plan for smooth transitions as legacy systems are replaced; and

- Develop a data business plan to address issues systematically.

Many agencies decentralize the basic responsibility of collecting performance data to individual "performance measure owners." The individuals responsible for managing the data collection efforts understand how the data is used and have greater incentive to promote data accuracy. Other agencies rely on sophisticated data management systems, while others are taking steps to fully automate data collection and performance measure reporting.

Several state DOTs are approaching data business planning by deploying data management or governance frameworks. Data management is the development, execution and oversight of architectures, polices, practices, and procedures to manage information as it pertains to data collection, storage, security, analysis, quality control, and reporting. Data management impacts people, processes, and technology, and includes data governance and stewardship.

Establishing and adhering to data standards is critical, as this ensures data quality, closest to the source of the initial data capture. Subsequently, any decisions made higher up in the organization, based on these data, are more easily justified when the data can be proven to be accurate, timely and of consistent high quality.

Selected Cases

The WSDOT Office of Program Development was able to gain support for a Data Stewardship program by starting with a smaller goal of getting support from senior executives for a "Data Policy." This led to support for the Data Catalog, and through the use of the Data Catalog, they were able to implement the Data Stewardship program.[14]

WSDOT has been on an internal mission for the last six years to create "one DOT." This effort of building partnerships between business and IT will be the foundation for supporting a more robust Data Governance framework for WSDOT.

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[14]Cambridge Systematics and Michael Markow, NCHRP 8-70 unpublished case study.

WSDOT has a Data Stewardship Council, which was established in 1996, to address data issues across the Department. They also established a Data Council in 1999, with the responsibility for setting data standards, data architecture standards, data stewardship standards, data modeling standards and a data repository.

WSDOT has also defined "Business Stewards" as the Executive, Managerial, and Operational personnel, while the "Technical Stewards" include the more traditional IT roles as Strategic Information and Systems Stewards, Information Architecture Stewards and Database Stewards.

Florida DOT maintains all of its performance measures information in a software system called *PBviews*. FDOT participates in the statewide performance reporting effort, "Florida Performs," together with other state agencies working in public safety, health, education, local economy, and environment and conservation.[15]

Minnesota DOT also recently embarked on an agencywide effort to systematically align data and information to support transportation decisions in the State. Mn/DOT is cultivating the support of top management by creating a high-level Business Information Council with representation from nearly all divisions and offices. A two-pronged approach is underway involving both decision-making and governance focus. Mn/DOT plans to assess what decisions and key supporting data are most important and how gaps will be filled. They also plan to affirm data as an asset and develop a framework to support guiding principles and values, roles and responsibilities and methods for assessing priority among competing data needs.

Like Mn/DOT, Alaska, California, Oregon, Virginia, and Michigan are in various stages of development of a data business plan. The Alaska Department of Transportation and Public Facilities (ADOT&PF) is engaged in a multiyear process to develop a data business plan for the data management programs of the Department. The concept of the data business plan was to provide a "roadmap" of where existing data programs are, where the programs should be going, and how to progress. The objectives are to understand the existing data management programs, align data management programs with the Department's mission and goals, increase the data management program return on investment (ROI), and provide a data management program long-range plan to meet future needs. The data business plan is being treated as an Intelligent Transportation System (ITS) project; therefore, a systems engineering process (SEP) approach (the FHWA ITS Final Rule) is being applied. The first step of the Data Business Plan was the Concept of Operations (COO). The COO documents the physical infrastructure of existing data programs, identifies how data management programs fit into ADOT&PF's missions and responsibilities, and provide expecta-

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[15] Florida Performs. www.floridaperforms.com/ScoreCard_Glance.aspx. Accessed July 11, 2008.

tions regarding needs and vision of future data programs. An implementation plan was developed in the COO to lay out the next steps in the Data Business Plan process as follows: risk management tools to solicit user/stakeholder feedback and surveys; performance measures (metrics) for program managers; standards for data dictionaries, naming conventions, and abbreviations; future data applications and integration relationships; existing and new logical/physical data models; and changing data requirements and agency business needs/new initiatives. These are currently being worked on within Alaska DOT.

Virginia DOT recently completed a data business plan for the System Operations (SO) Directorate. The Plan includes clearly defined roles/responsibilities for data stewards, data architects, data custodians, business owners, and communities of interest. It also includes a seven-step approach to implementation: assign roles, produce initial systems operations data catalog, develop systems operations-wide data and business process models, develop SO-wide business requirements for data access, estimate data acquisition and maintenance costs, initiate annual business data review process, and establish communication protocols.

3.0 Issues and Challenges

The development of a national performance management system should be founded on successful practices already implemented by the states. Successful practices in each phase of the performance management framework are identified in this paper, and AASHTO's proposed six national goal areas and potential performance measures are largely based on identified state needs and existing practices. However, there are issues to be resolved relating to the consistent use of the measures by all states. Several high-level issues and challenges have emerged from performance management research, case studies, and the 2009 CEO Leadership Forum survey (Table 3.1). Some issues are relevant to ongoing performance management efforts within state DOTs, while some are specific to the development of a national performance management system.

Overall, a national performance management system needs to utilize national goals, performance measures, and targets that are relevant to each state. Further, each state has different abilities in terms of resources and funding to develop data management systems to support performance-based decisions, and each DOT is at a different level of development of performance-based systems.

Survey respondents suggested that many of the institutional hurdles related to implementation of performance management might be overcome by sustaining executive leadership; allowing and encouraging broad participation in selection of performance measures and targets; demonstrating the use of measures in decision-making; and conducting regular evaluation of measures and processes. It was suggested that the most effective way to overcome hurdles was to simply "learn by doing".

Table 3.2 illustrates selected issues that have been identified relative to specific, commonly used measures within AASHTO's suggested goal areas. These issues are related to:

- Linkage to goals;

- Geographic scale;

- Available data collection and analysis tools and algorithms; and

- Data gaps.

Table 3.1   High-Level Issues and Challenges

Category	Issues and Challenges
Process	• States need a significant role in establishing national goals • New Federal approach must take into account state experience • Transition plan needs to be set to account for varying level of state experience and expertise • Integration with, and influence of, external processes • The degree to which state DOTs have influence over what is being measured relative to external factors
Definition/Method	• Measures will be used for comparative purposes which underscores the need for consistent definitions, methods, data, and reporting • Outcome measures will be useful only when linked to investment decisions • Federal reporting requirements need to be well defined • Target "levels" need to be determined: level of difficulty to reach, as well as short-term versus long-term targets
Funding Allocation	• Any role performance measures will have in Federal funding should be clarified • "Disincentives" to states that have managed effectively, invested high levels of state resources, and achieved results near or above national goals should be avoided • Nature of "incentives" for states making sustained progress needs to be determined
Data	• Freight/Economics, Congestion, and Environment measures are at very high levels and not currently tied to specific investment decisions • Data quality is sometimes questionable • Data silos are prevalent • Manual data entry systems
Institutional	• Accepting the culture of accountability • Defining measures and consistently reporting them over time • Replacing subjectivity with objective data-driven decision-making • Overcoming the "worst first strategy" • Breaking the mind-set that a region or asset class "owns" a budget • Convincing elected officials
Legal	• Some funding sources set up by constitution or legislation and direct allocation • Equity Formulas—assuring funds distributed equitably among regions

Source: Unpublished survey conducted for 2009 CEO Leadership Forum, Center for Transportation Studies and Cambridge Systematics; Various other sources.

Table 3.2   Sample Issues with Specific Performance Measures

Area	Measure	Issues
Preservation	Pavement – Average International Roughness Index (IRI)	State-to-state differences in how IRI is measured and reported
	Pavement – Percent of pavements in poor condition	No national standard for accurately characterizing the structural adequacy of pavements, does not consider a full range of pavement distresses
	Bridge – Percent classified as Structurally Deficient (SD), weighted by deck area	Binary measure, ideal measure for overall bridge condition would be a numeric index that allows for specifying different levels of urgency for addressing a bridge need
	Bridge – Percent classified as Functionally Obsolete (FO), weighted by deck area	Misstates the level of need for many agencies
	Bridge – Average Sufficiency Rating	Potentially confusing for non-engineers
Freight	Average speed on Interstate and National Highway System corridors	Expect significant variation by terrain, infrastructure design and capacity, weather, incidents, work zones, and time of travel
	Average time to cross borders	Data and methods not proven, need to adjust for volume, operating conditions
	Number and percent of bridges allowing clearance for double-stack containers	Rail only, data questions, need to account for demand for intermodal movements
	Freight volume by mode including TEU throughput at ports	National data expensive to generate on a regular basis, does not apply equally to all states
Safety	Fatality rate (using VMT)	Rural versus urban
	Number of serious injuries	Inconsistent definitions of injuries
Congestion	Hours of Delay (Vehicle-hours and Person-hours)	Different methods for estimating delay
	Travel Time Index	Based on models, not real data
System Operations	Travel Time Index	Based on models, not real data
	Planning Time Index	Requires continuous or near-continuous monitoring capabilities
	Incident Clearance Time	No standard for data collection and recording
	Lane Closures (Lost Lane-Hours) Due to Work Zones and Weather Events	No standard for data collection and recording, variable conditions by state
Environment	Transportation-Related Air Quality Emissions	Estimated
	State DOT Use of Stormwater Best Management Practices	No real data
	State DOT Operations: Energy Use, Recycled Materials, and Carbon Footprint	Data not collected in many cases, no uniformity

Source: NCHRP 20-24(58), *Factors Influencing the Effectiveness of Performance Measures* (unpublished document).

4.0 Conclusions and Future Directions

The trend towards states adopting performance management has been the result of several factors, including the demand for more accountability from government programs and agencies, the pressure of scarce financial resources, and the recognition of best business practice.[16] These factors will largely shape the upcoming Authorization discussions in Congress.

WSDOT has recognized the following key lessons over its long process of developing a performance-based management system:

- **Keep perspective.** Performance measurement is one of several decision-making tools.

- **Timing is everything.** Don't delay until you have the perfect data, framework, or IT system.

- **Lead, don't follow.** Tell your story before someone else tells it for you.

- **Don't tolerate silos.** Strive for a "One DOT" mentality.

In general, survey respondents and participants at the 2009 CEO Leadership Forum agreed with these conclusions. In particular, in terms of timing, it is important to get started with available tools and measures and refine them over time. State DOTs feel that any national performance management system should focus on areas of existing expertise, especially safety and preservation; other areas, particularly environment, freight, and economic development, need more research and development. Increased sharing of best practices and training will be required for states to reach the levels of performance management likely to be required by any national performance-based system.

In the Congressional Authorization discussions, it will be important to recognize that even though performance management is recognized as a best business practice, it alone will not guarantee that a desired or acceptable level of performance will be achieved. Most importantly, total funding available for transportation will limit the performance that is possible to achieve even with a comprehensive performance process in place. As AASHTO has stated, "if sufficient funding is not available, performance management does not make up the difference." What performance management can help to achieve is the best level of performance possible given the resources that are available. However, available resources must be spread across a range of performance areas. Performance

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[16]*A Primer on Performance-Based Highway Program Management*, AASHTO, January 2008.

management involves balancing performance and resources and making tradeoffs to reflect local priorities. Achieving the best level of performance depends on several factors:

- Consistency in, and understanding of, goals, objectives, performance measures, and targets;

- High-quality data to support performance management decisions;

- The ability of managers, and the availability of analytic tools, to identify performance impacts of projects realistically and efficiently; and

- The ability to use performance information to inform as well as manage expectations among the political leadership, stakeholders, and the public.

Successful implementation will continue to result in:

- Improved system and organizational performance;

- Greater results with constrained resources and fewer investments with low performance benefits;

- Strengthened accountability with elected officials and stakeholder groups; and

- Improved communication with the full range of stakeholders.

Generally, performance management can be categorized into six key elements, all of which are necessary for a true performance-based approach:

1. Setting goals and objectives;

2. Selecting performance measures;

3. Setting performance targets;

4. Allocating resources;

5. Measuring and reporting results; and

6. Ensuring data quality.

5.0 Acknowledgments