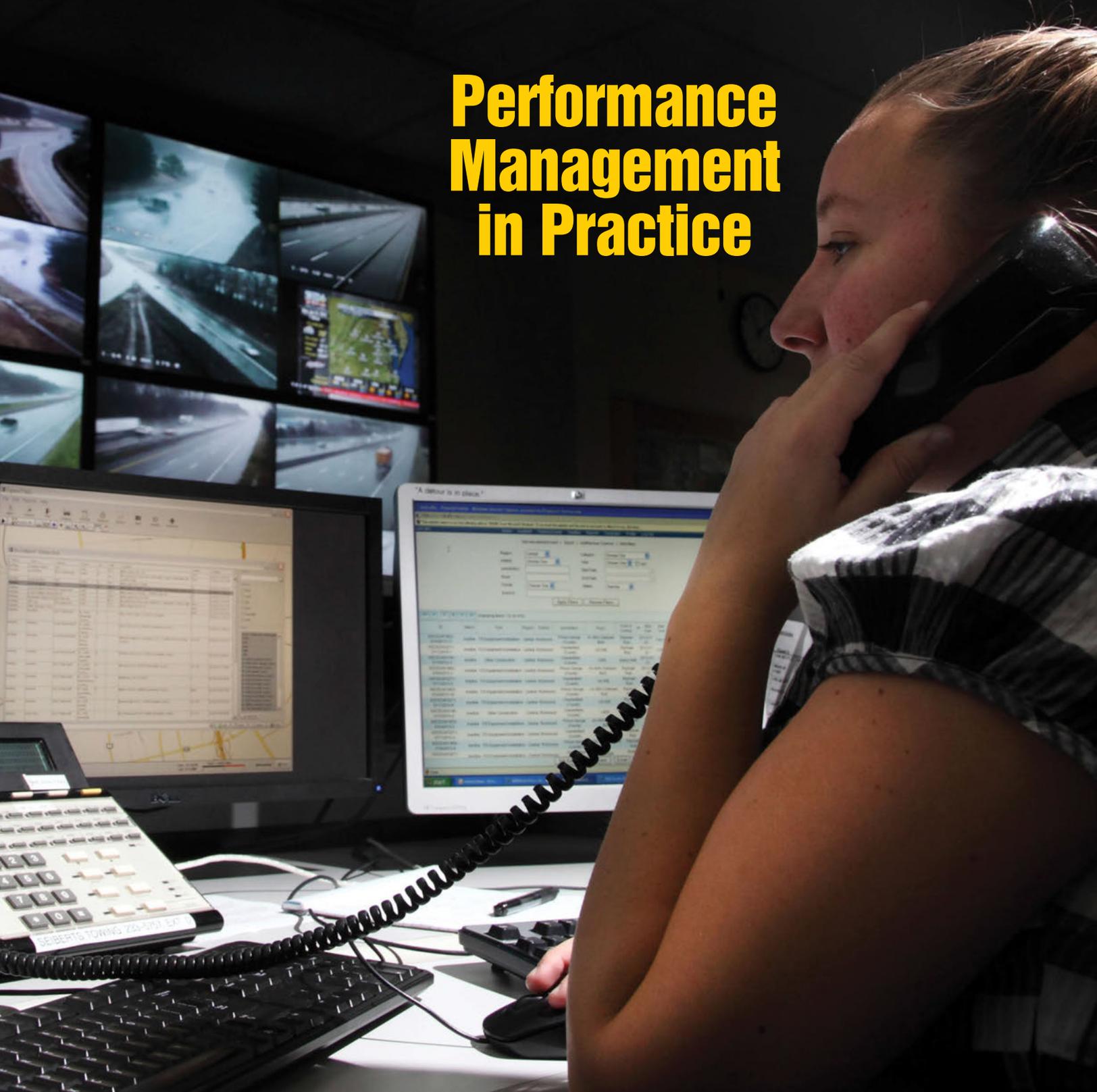


TR NEWS

Performance Management in Practice



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PERFORMANCE MANAGEMENT IN PRACTICE

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Performance Management in Practice: Working Together to Improve Results

Hyun-A Park, Mara Campbell, and Daniela Bremmer

The articles in this issue are designed to support progress in performance management by transportation agencies. Actively managing and improving performance demonstrates that the transportation community is delivering efficient and effective services to the nation's travelers and is making the best use of resources.

6 The Benefits of Performance Management: A Chief Executive Officer's Perspective

Kirk T. Steudle

When a state department of transportation (DOT) starts measuring performance and communicating the results, everyone in the state benefits, reports the author, Director of Michigan DOT, who traces out the initiatives and successes under his state's "ready and adaptable" model incorporating a "data-driven decision-making process."

9 Integrating Performance Measures into States' Long-Range Transportation Plans

Mike Hancock

Across the country, a new era of performance-based, long-range transportation planning is strengthening the accountability and transparency of states' transportation programs and is improving decision making, according to the author, a state DOT chief executive, who describes successful models from three states.

13 Telling Our Stories Powerfully, One Data Set at a Time

Mara Campbell and Julie Lorenz

The information gathered through a performance management system gains power when communicated successfully to specific audiences. The authors offer proven practical tips and examples to help DOTs communicate data to build support for decisions, ensure accountability, and tell stories of progress.

18 Organizational Support for Performance Management

Carlos Bracerias

In the past two decades, Utah DOT has pursued a simple but clear mission: to optimize resources with performance-based measures to ensure a safe, well-maintained, free-flowing transportation system. The author, the agency's executive director, presents the four goals that define the department's strategic direction, along with practical case studies.

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Mapping Out a National Framework

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The Moving Ahead for Progress in the 21st Century Act (MAP-21) is creating a new framework at the national level for evaluating surface transportation system performance.

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25 Performance Management for All: Building on the States' Robust Foundation

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Transportation agencies' experience with performance management will serve as a foundation for the MAP-21 requirements, this author affirms; the challenges ahead include balancing state and federal investment priorities; setting and coordinating targets; and addressing data issues.

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26 Partners in Performance:

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Jeffrey F. Paniati

Documenting planned investment strategies and outcomes with nationwide consistency will clarify the link between investments and results at the local and national levels, allowing decision makers to understand investments that lead to improvements in performance and to identify smarter investment strategies, the author maintains.



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COVER: The Richmond District Traffic Operations Center in Virginia. Performance management enables transportation agencies to deliver faster and more effective results to the traveling public. (Photo: Tom Saunders, Virginia DOT)

TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

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28 Transportation Performance Management: Theory and Practice, Challenges, and Strategies for Success

Gregory Slater and Frances Harrison

Performance management is easy to describe but difficult to get right, the authors observe. Implementing performance management—aligning people, processes, data, and analytical tools—can take several years and requires iteration and adaptation. Presented are key steps, common challenges, and strategies for success.

34 Transportation Asset Management and Performance Management: A Symbiotic Relationship

Ananth Prasad

Transportation asset management describes a performance-based approach for managing transportation system physical assets; performance management describes the application of the same basic principles to a broader set of objectives; the author shows how each approach has influenced and stimulated the evolution of the other.

36 Moving from Reactive to Strategic Decision Making: Ten Basic Steps Toward Performance Management

Trish Hendren

Using examples from the Washington Metropolitan Area Transit Authority, the author illustrates 10 steps to help organizations start down the performance management path—proven ways and practical insights that can help an organization shift from reactive to strategic decision making.

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COMING NEXT ISSUE

PHOTO: CHRISTINE GERENCHER



Feature articles in the September–October issue explore the challenges facing tribal transportation and report on the accomplishments of programs serving the unique transportation needs of the 566 Indian tribes throughout the United States. Articles highlight the federal trust relationship and tribal sovereignty; a bridge replacement project in the Oneida Nation using context-sensitive solutions to connect the community and strengthen tribal identity; tribal self-governance in the transportation arena; right-of-way jurisdiction through Indian Country; environmental justice and tribal transportation; transportation research successes—and more.

The Four Corners area of the Southwest United States is home to many American Indian nations, applying research results to address transportation challenges on tribal lands.



INTRODUCTION

PERFORMANCE MANAGEMENT IN PRACTICE

Working Together to Improve Results

HYUN-A PARK, MARA CAMPBELL, AND DANIELA BREMMER

Park is President, Spy Pond Partners, Arlington, Massachusetts, and Chair of the TRB Policy and Organization Group. Campbell is Customer Relations Director, Missouri Department of Transportation (DOT), Jefferson City, and Chair of the TRB Performance Measurement Committee. Bremmer is Director, Strategic Assessment and Performance Analysis, Washington State DOT, Olympia, and Chair of the TRB Management and Leadership Section.

Transportation performance management strengthens an agency's accountability for results and provides a focus for the allocation and management of resources. Performance management entails the establishment of meaningful performance measures that link to policy goals and objectives, to program and project delivery, and to maintenance and operations. In its most important application, performance management supports the use of data to inform decision making at strategic, operational, and tactical levels.

The passage of the federal transportation legislation, Moving Ahead for Progress in the 21st Century (MAP-21) has increased the prominence and importance of performance management. MAP-21 requires that recipients of federal transportation funding

apply performance measures that can track the effectiveness and the outcomes of the funds. A long history of research and implementation activities can help guide the transportation community in integrating performance management, realizing the benefits, and improving the practice (Table 1, page 4).

Range of Approaches

Although MAP-21 has sharpened the focus on performance management, many state departments of transportation (DOTs) have pursued the activity on their own for years, recognizing an effective strategy that can lead to better outcomes. A quick look at four state DOTs that have performance management practices in place indicates the range of approaches, results, and benefits:

The Osage River Bridge and Rail project in Missouri received funding from the Federal Railroad Administration's High-Speed Intercity Passenger Rail Program; cost-sharing projects at the Missouri Department of Transportation (DOT) have increased since 2009.



PHOTO: MISSOURI DOT



In 2011, work began on a Washington State DOT project to replace the SR-99 Alaskan Way Viaduct with an underground tunnel; performance measures have helped gain new funding for transportation investments in the state.

◆ **Communication and funding.** Washington State DOT has used performance measures to communicate effectively, to make the case for needed funding, and to demonstrate the results of applying available resources. For example, telling the performance story led to a strong improvement in voter confidence and supported the state legislature in approving two gas tax increases for transportation investments. Most recently, continued communication of demonstrated performance strengthened efforts to consider new revenue packages.

◆ **Organizational infrastructure and partnerships.** Missouri DOT has applied performance management to strengthen its internal organizational infrastructure and to highlight external partnerships. For example, in 2013, the department's quarterly monitoring tool, *Tracker*, recorded an agencywide increase from \$30 million to \$47.5 million between 2009 and 2013 in cost-sharing projects through partnering agreements. Figure 1 (page 5) shows the portion attributed to railroad projects.

◆ **Internal agency decision making.** North Car-

TABLE 1 Performance Management: Past, Present, and Future

Past	Present	Future
<ul style="list-style-type: none"> ◆ Many agencies and organizations started with a focus on quality ◆ Some agencies used available frameworks like the Baldrige and Balanced Scorecard^a ◆ The American Association of State Highway and Transportation Officials initiated a comparative performance measurement program to identify best practices and to understand the underlying data ◆ Dashboards were created to report agency performance; most focused on project delivery 	<ul style="list-style-type: none"> ◆ MAP-21 legislation mandates performance reporting for agencies that use federal funds ◆ National performance measures are established for a broader array of areas ◆ Agencies are required to set targets for specific performance measures ◆ Data and technology advances create opportunities to improve performance measurement ◆ Increased use of uniform measures creates opportunities and challenges 	<ul style="list-style-type: none"> ◆ Taking a national view of transportation performance ◆ Achieving more for the money at all levels of transportation delivery ◆ Agencies gain benefits from the increasing effectiveness of performance management practices ◆ The public understands the relationship between infrastructure condition, investment, mobility, and safety

olina DOT has used performance management to increase the effectiveness of internal management and decision making. The system connects employee performance evaluations agencywide to business units, executives, and agency performance, providing accountability at all levels and across all program areas.

◆ **Longevity and maturity.** Maryland DOT has tracked performance consistently in its *Annual Attainment Report* since 2002. The longevity and maturity of this practice has benefited the agency substantially, improving its ability to understand the impacts of decisions and to recognize developing trends.



PHOTO: WIKIMEDIA COMMONS

Maryland DOT's *Annual Attainment Report* found that although the cost per trip of commuter bus service increased in 2013, increased ridership and better contractual management held the cost growth below historical levels.

Lessons and Techniques

This issue of *TR News* assembles perspectives on performance management from leaders at transportation agencies throughout the country. The authors share the current thinking, lessons learned, tools and techniques, and future issues related to performance management in transportation. Specifically, the articles present insights on

- ◆ Key ingredients for a strong program—namely, executive support and leadership, a strong business infrastructure, and good data;
- ◆ Common uses and practices of performance management in long-range transportation planning, strategic management, transit agencies, coordination with asset management programs, and effective communication; and
- ◆ Other related topics, including MAP-21, with an update on rulemaking and the impact on transportation agencies, and a comparative performance measures series highlighted in *Research Pays Off*.



PHOTO: NORTH CAROLINA DOT

Moving Forward

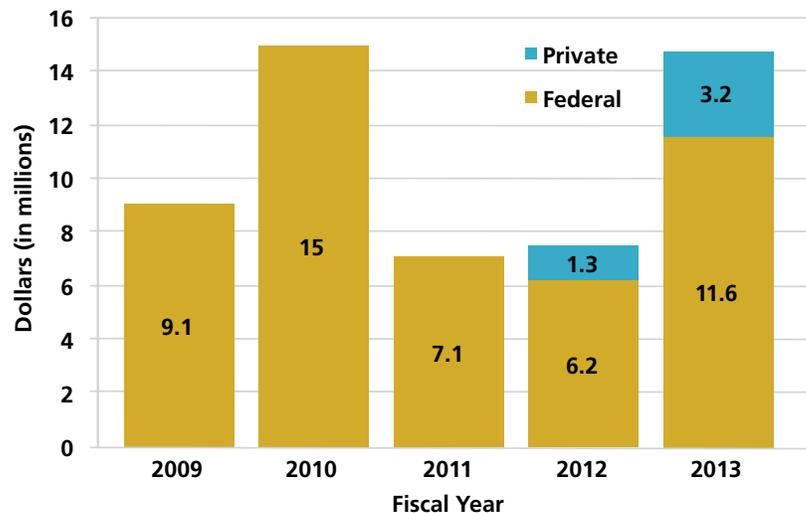
Performance management is a priority for transportation agencies because of MAP-21 and because of the need to deliver more with limited resources. How can a state DOT deliver the biggest “bang for the buck”? What trade-offs can optimize the use of available funds? What is needed to make an agency performance driven? Transportation managers are grappling with these questions.

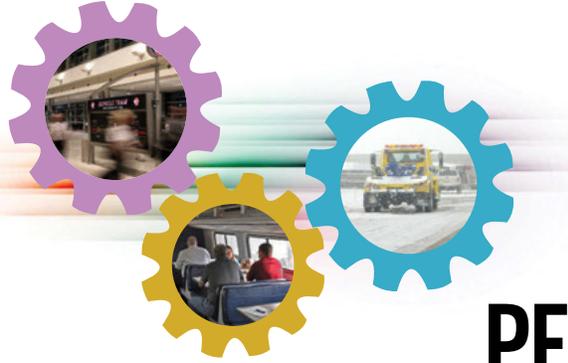
Nonetheless, an interest in performance management is not the same as a commitment to move forward. The articles in this issue are designed to support progress in performance management by all transportation agencies. Actively managing and improving performance demonstrates that the transportation community is delivering efficient and effective services to the nation's travelers and is making the best use of resources.

Performance statistics on North Carolina DOT's dashboard website emphasize accountability.

Appreciation is expressed to Christopher J. Hedges, Manager of TRB's National Cooperative Highway Research Program, for his work in developing this issue of *TR News*.

FIGURE 1 Dollars generated through cost-sharing and partnering agreements for railroad projects in Missouri.





THE BENEFITS OF PERFORMANCE MANAGEMENT

A Chief Executive Officer's Perspective

KIRK T. STEUDLE

The author is Director of the Michigan Department of Transportation, Lansing, and Chair of the Transportation Research Board Executive Committee.

In an era of scarce resources, every transportation agency must maximize the benefits from limited funds. The public is demanding greater accountability from government; every agency therefore should be able to explain its choices logically—and sometimes to defend those choices. Technology is providing more and better data, along with faster ways to analyze the data; the failure to use a data-driven decision-making process to achieve the longest-lasting results at the least expense is inexcusable.

A Rigorous Culture

Performance measurement has had a significant impact on the Michigan Department of Transportation (DOT). The department has measured performance and reported the results for many years. As one of the longest-serving state transportation agency CEOs in the country, I readily admit that performance measurement has benefited me professionally as well—for example, I was able to transition successfully from a Democratic to a Republican administration in part because the rigorous performance measurement culture at Michigan DOT was

important to the new governor.

When Governor Rick Snyder took office, performance measurement gained a new dimension, not only for Michigan DOT, but for all agencies in the state. In 2011, the governor initiated a dashboard—an array of measures—that tracks performance in key areas of interest to the public.¹ Supporting dashboards provide details for such areas as education, health, energy, public safety, finances, and of course, infrastructure.

The infrastructure dashboard tracks transportation performance for items of specific interest to the public, such as safety and bridge condition.² Underlying that dashboard is Michigan DOT's scorecard, which reports on the performance of the state's transportation system across modes, with measures that are more meaningful to engineers and planners.³

¹ www.michigan.gov/midashboard/0,4624,7-256-58012---,00.html.

² <http://michigan.gov/midashboard/0,4624,7-256-59297---,00.html>.

³ www.michigan.gov/documents/mdot/MDOT_Scorecard_11-14-11_01-19-12_374118_7.pdf.



PHOTO: AARON WEBB



The agency's focus on data prompted a statewide effort to reduce traffic delay on major corridors, particularly after winter storms or traffic accidents.

Published online, the Michigan DOT performance scorecard informs the public and encourages feedback.

Customers and Partners

A smart CEO knows that keeping the public informed is vital, even if the news is not always good. Performance measurement has had great effects on Michigan DOT's customers. Since 2006, Michigan DOT has published a comprehensive survey of customer satisfaction.⁴ The results have consistently been positive, and the 2013 survey found that 73 percent of customers believe that Michigan DOT is doing a good job—an approval rating any politician would envy.

These results were achieved despite Michigan's decade-long economic struggle, the national economic recession, and a well-publicized lack of funding for new transportation projects. The Michigan DOT web page has posted a shorter version of the survey, which the agency's leadership promotes to the public to gain ongoing feedback about the agency's actions.⁵

Performance measurement has improved the working relationship between Michigan DOT and its partners as well. For nearly a decade, the department has been part of Michigan's Transportation Asset Management Council,⁶ which works with local transportation agencies across jurisdictions to measure pavement conditions on roads eligible for federal aid. The council's web page provides a dashboard for each of the more than 600 local road agencies in Michigan.⁷ The dashboards show road and bridge conditions and safety trends, as well as traffic by county.

⁴ www.michigan.gov/mdot/1,1607,7-151-9621_14807_14809---,00.html.

⁵ <https://www.research.net/s/ZKC9H99>.

⁶ www.mcgi.state.mi.us/MITRP/Council/Default_Council.aspx.

⁷ www.mcgi.state.mi.us/MITRP/Data/PaserDashboard.aspx.

MiScorecard Performance Summary								
Business Unit:		Transportation		Green	>90% of target			
Executive/Director Name:		Kirk Steudle		Yellow	>= 75% - 90% of target			
Reporting Period:		Apr 2014		Red	<75% of target			
				Date Approved:	5/22/2014			
				Revised By	blaxtonv on 05/22/2014 12:44			
Metric ID	Metric	Status	Progress	Target	Current	Previous	Frequency	Metric Definition
A Economic Growth								
1	Commercial vehicle traffic miles	Green	👍	Maint/Increase	5.81B 2012	5.74B	CY Annually	Maintain or increase the number of commercial traffic miles in billions traveled on Michigan roads.
2	Rail freight traffic in millions of tons	Red	👎	Maint/Increase	58.6M 2011	60.4M	CY Annually	Maintain or increase total freight in and out of Michigan.
3	Passenger air service	Green	👍	Maint/Increase	37.1M 2013	36.8M	CY Annually	Maintain or increase number of air passengers in and out of Michigan.
4	U.S. trucking trade traffic through MI borders	Red	👎	Maint/Increase	43.1% 2013	45.3%	CY Annually	Maintain or increase the percent of trucking trade traffic through Michigan's border crossings.
5	Jobs created as part of the 5-year program	Red	👎	Maint/Increase	13,225 2013	13,870	CY Annually	Maintain or increase the number of direct and indirect jobs sustained by highway investment.
6	Create an Accelerated Rail Investment Plan for the Chicago Detroit/Pontiac Corridor	Green	👍	Nov, 2014	48% complete 2012/2013	N/A	CY Annually	Development of a multi-state Tier One EIS and Service Development Plan for implementation of accelerated passenger rail and increased round trip frequencies within the Chicago to Detroit/Pontiac rail corridor. These documents will provide sufficient information to support future decision making to

The Amtrak *Bluewater* line runs from Port Huron to Kalamazoo, Michigan. Performance management has helped Michigan DOT build effective partnerships with transportation providers.



PHOTO: MICHIGAN MUNICIPAL LEAGUE

The council holds two annual conferences to help local officials understand asset management and its benefits. As a result of Michigan DOT's work on the council, relationships with local transportation providers, which generally had been difficult 20 years ago, have turned into sustainable partnerships in the past decade.

Communicating Results

Michigan DOT's performance measurement tools also have been instrumental in communicating the need for increases in transportation funding to state legislators. Michigan has a full-time legislature with some of the strictest term-limit laws in the country; this combination creates an almost constant need to provide reliable information and education.

At the start of the recent legislative session, I met with each new legislator to discuss Michigan's transportation funding woes. In the past year, my staff and I made presentations at legislative town hall meetings across the state. Michigan DOT developed a web page to explain the need for additional funding in plain language and with displays of the data developed through the focus on performance measurement.⁸

In addition, staff put together a less rigorous, laptop version of the model used for projecting road condition. The laptop model allows me to adjust the dollar amount for additional investment according to a legislator's ideas and then to generate a projected condition curve at that level of investment. The tool has been effective in helping legislators understand the magnitude of the state's transportation funding needs.

⁸ www.michigan.gov/mdot/0,4616,7-151-68212_64050_64091---,00.html

As a result of this concerted communication, the legislators no longer question whether the state's roads and bridges need additional investment—they have seen the data and are convinced that more investment is required to preserve the infrastructure. The discussion now is about how much more to invest, and how to do it in a way palatable to the public and elected officials.

While the work continues toward a revenue solution, the data have convinced the legislature and Governor Snyder's office to agree to invest up to \$350 million of state general funds in transportation projects in 2014. This level of general fund investment in roads and bridges is unprecedented in Michigan.

Departmentwide Effort

The success of Michigan DOT's data-driven project selection process prompted the agency to turn the bright light of performance measurement onto other areas, such as operations. As part of a departmentwide effort to improve customer satisfaction rating, Michigan DOT's seven regions undertook a year-long effort to reduce traffic delay on high-priority travel corridors, particularly after accidents or winter storms.

Michigan DOT region engineers and their key staff met weekly to report progress and to identify the next steps that could reduce travel delay. The engineers calculate that the efforts will have saved Michigan drivers millions in user-delay costs across all regions for 2013.

When a state DOT starts measuring performance and communicating the results, everyone in the state benefits. The model is ready and adaptable—why should any state DOT delay?



INTEGRATING PERFORMANCE MEASURES INTO STATES' LONG-RANGE TRANSPORTATION PLANS

MIKE HANCOCK

The author is Secretary of the Kentucky Transportation Cabinet, Frankfort; President of the American Association of State Highway and Transportation Officials; and a member of the TRB Executive Committee.

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires that state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) engage in performance-based planning and programming (PBPP). This approach integrates performance management concepts into federally required transportation planning and programming processes.¹ As with performance management, PBPP generally starts with a vision and goals for the transportation system, selects performance measures, and uses data and analysis tools to inform the development of investment priorities, which are carried forward into shorter-term investment plans and programs.

¹ See the article by Prasad (page 34), which describes a performance management framework.

Performance measures and the integration of the measures into a state's long-range transportation plan (LRTP) are key to PBPP. MAP-21 requires state DOTs to integrate the national-level measures into long-range plans and into short-term transportation improvement programs.² In both cases, state DOTs must describe the performance measures and targets for assessing transportation performance and then document the progress in achieving the performance targets.

Enhanced Connection

Although performance management principles are not new to state DOTs or to many MPOs, the

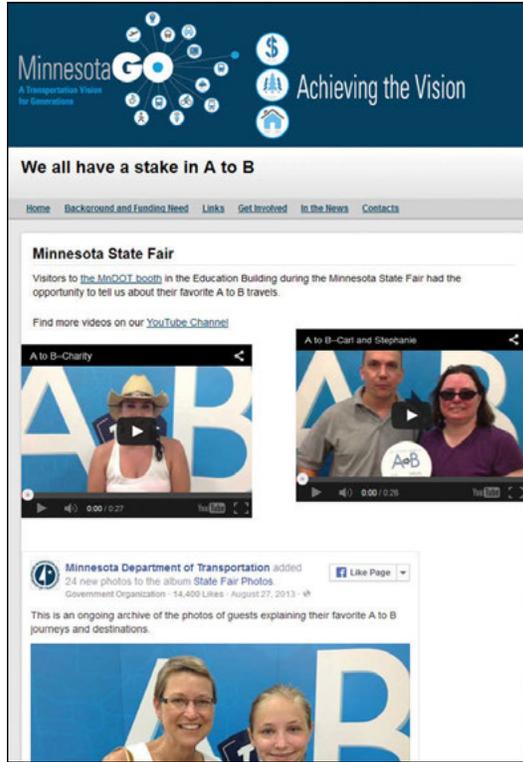
² See the article by Wright (page 25) for a perspective on MAP-21 from the American Association of State Highway and Transportation Officials.

Preservation of the state's infrastructure assets is a key element of the 2035 Maryland Transportation Plan. The Maryland Transportation Authority used dehumidification techniques to preserve suspension cables on the Chesapeake Bay Bridges.



Photo: William F. Yurasko, Flickr

Public participation was key to Minnesota GO, the state's collaborative transportation plan; recruitment strategies included a booth at the 2013 Minnesota State Fair.



enhanced connection that is required between the performance measures and the long-range plans is new. The methods for incorporating performance measures into the long-range planning process, how-

ever, are far from exact. Few states have fully developed the data, tools, or procedures to allow the integration of performance measures into planning and decision making across modes or outside of such core areas as highway preservation.

L RTPs can vary significantly in content and in the depth of the analysis that undergirds the content. Some state DOTs create simple policy plans that lay out a vision for the future, but others go beyond the requirements of the federal law and account for land use, housing, the environment, and other nontransportation issues that have an impact on their communities.

This variability in the content of LRTPs leads to differences in how performance measures are used and in how the measures are integrated into the LRTP. Three related endeavors, however, should be highlighted:

- ◆ The analysis of the trade-offs,
- ◆ The shaping of the conversation about funding and investment, and
- ◆ Communication with stakeholders.

Analysis of Trade-Offs

Minnesota DOT uses performance measures and predictive models to assess and communicate the trade-offs associated with investment decisions. For example, Minnesota DOT's recently completed

Minnesota's 20-Year State Highway Investment Plan

Scenario planning for the Minnesota State Highway Investment Plan (MnSHIP)^a identified three approaches for dividing the available funds among the investment categories:

- ◆ Approach A would maintain the infrastructure on the entire system—roads, bridges, and roadside structures.

- ◆ Approach B would allocate available funds in accordance with the Minnesota Department of Transportation's (DOT's) most recently approved statewide investment direction.

- ◆ Approach C would focus on meeting the infrastructure and mobility needs on the Interstates only but also would increase investments in local priorities and in non-



Scenarios for investing funds under the Minnesota State Highway Plan included channeling resources to local investments and nonmotorized transportation.

motorized transportation options.

Each scenario offered detailed information on costs, performance measures, and the overall impacts of the investment approach. Minnesota DOT presented the approaches to stakeholders for feedback; an online interactive scenario tool also was made available, so that those who could not attend a Stakeholder Engagement Meeting could review the information online. Minnesota DOT will issue annual performance reports to track progress

on these measures.

^a www.dot.state.mn.us/planning/mnship/.



Maryland's *Annual Attainment Report* outlines progress toward priorities in the Maryland Transportation Plan, such as service quality and system reliability.

20-year Minnesota State Highway Investment Plan (MnSHIP), which is part of the Minnesota GO Family of Plans and an extension of the department's LRTP, used scenario-based planning techniques to demonstrate a range of possible performance outcomes associated with three fiscally constrained investment approaches (see sidebar, page 10).

Taking into consideration the approach selections and additional feedback, MnSHIP planners identified and implemented a set of performance trade-offs in line with public priorities and expectations for the transportation system.³

Shaping the Conversation

Maryland DOT provides a model for shaping the conversation about transportation funding and investment. In 2002, the agency established an *Annual Attainment Report on Transportation System Performance* that provides a transparent evaluation of the state transportation system's performance (see sidebar, page 12). The report reviews performance measures and trends for all modes of transportation within the state and indicates the progress toward achieving the goals and objectives in the Maryland Transportation Plan (MTP), the 20-year vision for transportation in the state.

Updated every five years, the MTP relies on input from the extensive public engagement of Maryland's citizens, agencies, and interested organizations. The engagements lead to revisions of the long-range vision for the transportation system, including goals and objectives, and of the measures for tracking progress toward meeting the goals and objectives.

³ For more information, www.dot.state.mn.us/minnesotago.

Communicating with Stakeholders

In 2013, the Kentucky Transportation Cabinet (KTC) conducted the *Your Turn* survey, which provided input into the development of the 2014 Long-Range Statewide Transportation Plan. The survey gave KTC the opportunity to engage the users of the transportation system in setting a vision and defining the goals that will guide the development and maintenance of Kentucky's transportation system through 2035.

The analysis of the survey results enabled KTC to assess the expectations of customers, the resources of the agency, and the measurable outcomes of the agency's performance in generating a well-maintained, multimodal transportation system. With this guidance, KTC will be able to deliver safe and reliable service to its customers and improve their quality of life over the next 20 years.

Kentucky's *Your Turn* survey engaged the public in the development of the 2014 Long-Range Statewide Transportation Plan.

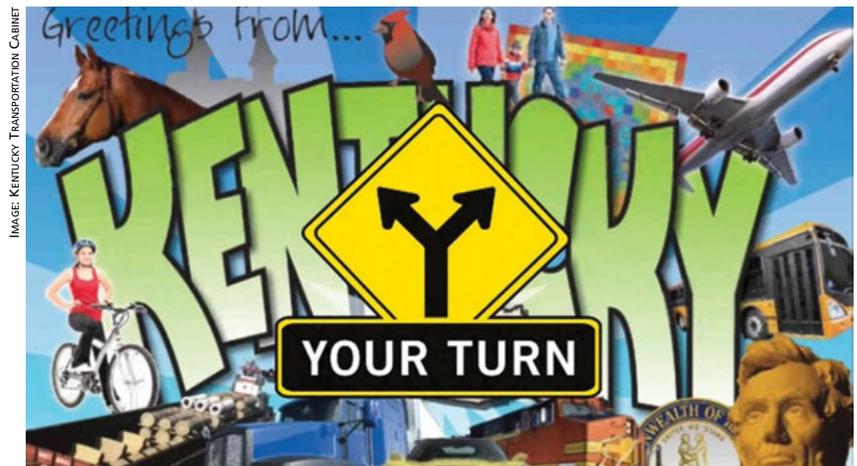


IMAGE: KENTUCKY TRANSPORTATION CABINET



TELLING OUR STORIES POWERFULLY, ONE DATA SET AT A TIME

MARA CAMPBELL AND JULIE LORENZ

Highway fatalities decreased and highway condition increased in quality after the Missouri Department of Transportation (DOT) introduced *Tracker*; communicating performance management successes can help engender public support for projects.

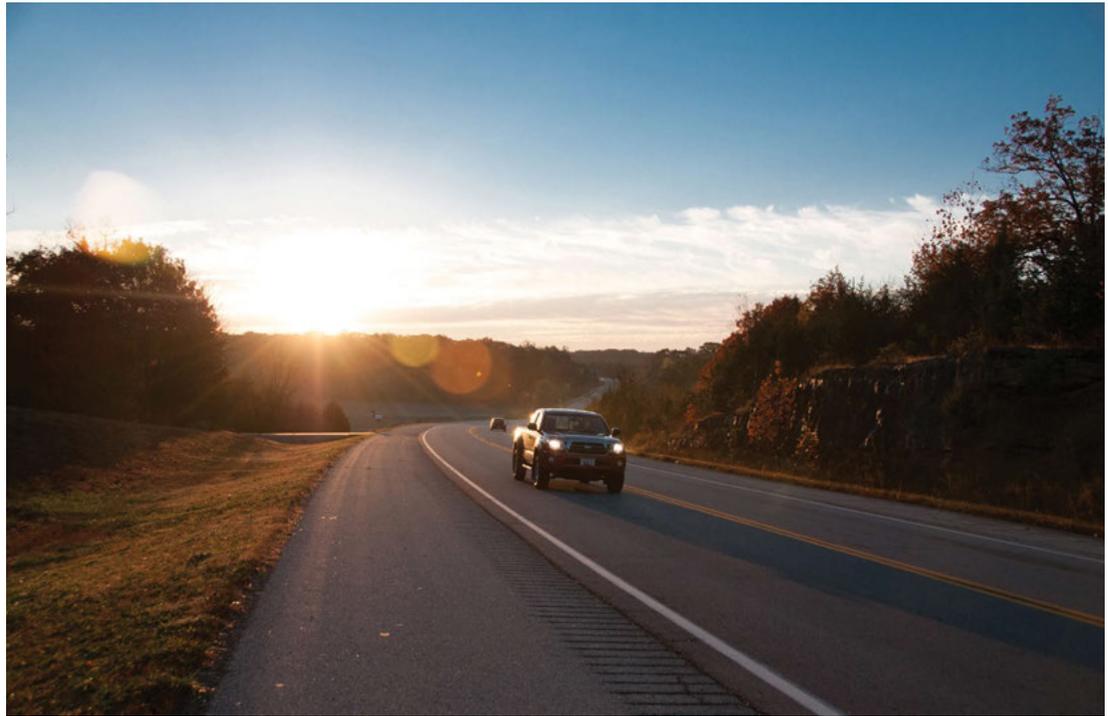


PHOTO: MISSOURI DOT

Campbell is Customer Relations Director, Missouri DOT, Jefferson City, and Chair of the TRB Performance Measurement Committee. Lorenz is Senior Strategic Consultant, Burns and McDonnell, Kansas City, Missouri.

The information gathered through a performance management system has considerable value on its own. The data gain power, however, when communicated successfully to a specific audience. The stakes for the delivery of this information are higher than ever. Internal decision makers want comprehensive, relevant metrics to drive strategies and decisions. The public, spoiled by *USA Today*-style infographics and quick, succinct Twitter messages, has high expectations for how data should be delivered.

Transportation agencies are finding that clear, relevant communication engenders a sense of responsibility, transparency, and respect among internal and external audiences. Communicating performance management information can help departments build support for decisions, ensure accountability, and tell stories of progress.

Metrics Supporting Strategy

Department managers and decision makers rely on instinct and experience. In a world driven by data, performance management adds another tool to the arsenal. The book and movie *Moneyball* demonstrated that the right metrics could make a contender out of one of the lowest-budget teams in professional baseball. Similarly, with the proper analysis and a strong presentation, performance management data can help decision makers maximize their budgets and their resources.

This information provides a broad and important context for specific decisions. “A decision maker is bombarded every day about how and where to spend money and how to prioritize time and activities,” notes Sam Van Hecke of Cambridge Systematics, Inc., a management and planning consultancy. “Data, properly delivered, can help develop long-range strategic

To build an effective outreach program, transportation agencies can survey how system users prefer to receive data.



PHOTO: CANADIAN PACIFIC, FLICKR

plans and demonstrate how the department has moved the needle in regard to clearly defined goals.”

Ensuring Accountability

“What can’t be measured can’t be managed” is a performance management cliché. But when what is measured is also communicated, an organization grows stronger. When a department’s goals—and the progress toward those goals—are shared among all staff, employees work harder to elevate the team. This beneficial cycle creates an effective program, with the department meeting its defined objectives, as well as an effective organization, with high-performing, professionally satisfied staff.

On-time passenger rail performance emerged as a concern of North Carolina residents, according to the state DOT performance metrics office.

“Most transportation agencies operate under challenging circumstances, whether it’s a funding crisis, a leadership change, or legislative partisanship. This can lead to credibility issues,” observes Daniela Bremmer, Director of Strategic Assessment at Washington State Department of Transportation (DOT). “Embracing performance management is one of the biggest ways to combat that.”

Aligning staff under performance management goals can create a sense of urgency and accountability within the department. Sometimes a culture shift is necessary to ensure that performance management accountability becomes second nature—part of everyday tasks, weekly reviews, and performance evaluations.

Bremmer has seen this kind of culture shift unite an agency. “It’s a ‘one DOT’ mentality. If one person succeeds, everyone succeeds,” she reports. “When a team sets goals and works hard to communicate the goals internally and externally, it creates a shared sense of responsibility.” The enhanced teamwork can increase efficiency and innovative thinking.

Customer-Centric Approach

A clear, compelling, and relevant story can move an audience to accept—and even embrace—new ideas or unfamiliar concepts. Studies at Ohio State University have shown that storytelling is more effective than pure data in swaying beliefs. Both internal and external audiences can be deeply sensitive about the performance, efficiency, and budget of transportation departments. But telling a story that puts the



PHOTO: NORTH CAROLINA DOT

audience at the center can help increase their understanding of—and satisfaction with—the department's efforts.

The first step in finding the best way to talk to an audience is to listen to the audience. Conducting focus groups with internal leaders, citizens, and legislative bodies can provide insight into the information they find relevant. A deeper understanding of how they prefer to receive information can lead to a stronger relationship with each stakeholder group. Building the public trust is vital in efforts that do not have a well-defined performance benefit. The credibility from earning an audience's trust extends to projects with benefits that are more subtle.

North Carolina DOT frequently asks constituents what is most important to them. Even if the topic that emerges is only tangentially related to the agency's work, as long as North Carolina DOT has some influence on the topic, the agency will report on it.

"We heard from our audience that they care about on-time passenger rail performance," reports Ehren

Meister, the agency's director of performance metrics. "Even though that's not our direct responsibility, we feel we have a role as conduit for that information." Meister and his colleagues have found that a customer-centric approach increases the public's interest in and respect for the organization's activities.

The accompanying sidebars offer practical tips about storytelling and data visualization to reach audiences (see below and page 16). Following are descriptions of efforts by various transportation departments across the country that have led the way.

Performance Journalism

The *Gray Notebook* is in its second decade as Washington State DOT's primary report on transportation system performance.¹ The report has become a foundational document for the agency and is regarded as an industry standard.

¹ www.wsdot.wa.gov/Accountability/.



Washington State DOT's quarterly performance report, the *Gray Notebook*, has highlighted improvements in the state transportation system since 2001.

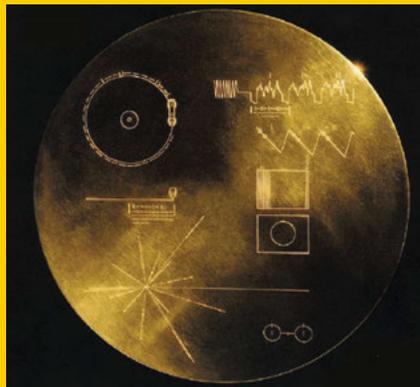
Telling a Story with Information

The people at the animation studio Pixar know about storytelling. Pixar director Andrew Stanton's greatest story commandment is simple: "Make them care." Following are tips to help turn performance management data from mere numbers and words into a compelling story.

1. Make it relevant. Think about what is important to the audience and show them how the information will have an impact on their daily lives. Often what is most vital or interesting to the audience differs from what may be most important to the state department of transportation (DOT).

2. Keep it short. The average attention span has decreased by 33 percent since 2000. A reader of a state DOT's performance information should be able to grasp the core message in 15 seconds and the full story within three minutes. For some audiences, this time may include some basic education.

3. Focus. According to a report prepared for the Federal Highway Administration by Cambridge Systematics, Inc., and Burns & McDonnell, the general public has moderate-to-low interest in transportation issues. To keep an audience's attention, simplify the message and present only the most relevant information. This applies also in communicating with an internal stakeholder, who needs to prioritize a daily inundation of information.



Visual information can be essential to understanding—as on the etched gold aluminum covers of the "Sounds of Earth" records aboard the Voyager probes, the farthest human-made objects from Earth. The etchings offer a pictorial key to playing the record.

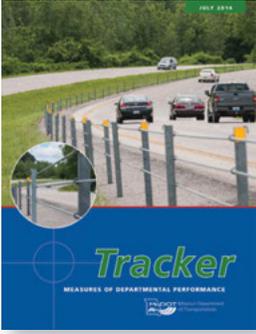
PHOTO: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

4. Take care with numbers. The general audience cares deeply about costs, but numbers indicating budgets or quantities often have little meaning to someone outside the industry. Feeling completely comfortable with the data is important—verification is key. The public's appetite for infographics continues to grow, even for financial and budget information. Infographics have an impressive reach—the space probe *Voyager 1* left the solar system in 2012 equipped with an infographic meant for any intelligent life it may encounter.

5. Have a conversation. Avoid bureaucratic lingo and complicated terminology. Speaking in the customers' language shows that you are listening to them. The American Association of State Highway and Transportation Officials has assembled

guidance on "green light" words to use; these include choices, responsibility, economy, and efficient traffic. On the "red light" list are such words as maintenance, fixing, and public spending.

8. Test it. Read the message aloud. Does it make sense? If the audience is internal, review the product with a colleague. If the audience is external, run the message by a friend or acquaintance from a different industry. If the person does not immediately grasp the message, make improvements and test the message again.



Missouri DOT's quarterly *Tracker* updates performance metrics in each of seven results areas.

Bremmer coined the term “performance journalism” for the practice of communicating performance metrics. She believes that tracking the right information and knowing how to communicate it puts state DOTs in the driver’s seat: “If you have the metrics, you have the ability to shape the narrative instead of having to feel defensive if the media get ahead of the story.”

When Washington State DOT implemented proactive performance management communication, the media coverage shifted in three to six months. “We started reporting a strong message openly and shared our goals and successes—this made a big difference,” Bremmer recalls. The agency never misses an opportunity to report, to fill an agenda spot, or to make a presentation, knowing that bringing the report to life creates an impact.

Dynamic Dashboards

North Carolina DOT introduced performance accountability in the early 2000s and implemented comprehensive scorecards and easy-to-read dashboards in 2007.² Both elements allow website visitors to see how the agency measures up against performance targets.

The public-facing dashboard employs a simple but effective graphic—a fuel gauge—that is familiar and understandable to general audiences. North Carolina DOT also maintains a more complex, internal

² <https://apps.dot.state.nc.us/dot/dashboard/>.

management dashboard—a first for a state agency—which is updated in real time to provide performance data and results by organizational hierarchy.

“Our dashboards are dynamic tools that show internally and externally how the organization is performing,” Meister explains. “For our staff, the tools improve strategic decision-making ability and overall accountability. For our citizens or customers, the dashboards provide information about issues that are relevant to them in an accessible, straightforward way.”

Tracking Progress

Published since 2005, Missouri DOT’s *Tracker* provides performance information to decision makers, partners, and citizens. Missouri DOT organized *Tracker* around seven tangible results, each assigned to a specific leader, to increase accountability.³ Every quarterly edition of *Tracker* updates the metrics, allowing Missouri DOT to gauge progress constantly and to provide relevant information to the general public.

Department leaders credit the comprehensive and transparent presentation of performance information as a contributor to the organization’s customer satisfaction rating of 85 percent. Since the advent of *Tracker*, the number of fatalities on Missouri highways has dropped by 34 percent, and the percentage of major highways in good condition has increased by 122 percent.

³ www.modot.org/about/Tracker.htm.

Painting a Picture with Data

Some information cannot be explained without visual assistance. The use of visual information has increased by 9,900 percent on the Internet since 2007 and by 142 percent in newspapers between 1985 and 1994. The following tips can help ensure that infographics make the most of the available space:

1. Let the data drive. Instead of thinking up a graphic idea and stuffing the data into it, start with the information. Dig in and listen to the story the numbers are telling. Most of the time, a graphic should convey one big idea well instead of an agglomeration of data.

2. Identify the emotion. According to Gareth Cook, the Pulitzer Prize-winning author of *The Best American Infographics*, the keys to successful data visualization are intellectual power, aesthetic sophistication, and emotional impact. Numbers can tell a story. Connecting emotionally with the audience extends their attention span and increases their retention of the message.

3. Think about the format. Will the graphic be printed in a paper report or will it be an electronic PDF file? What is the potential for interactivity? Will the graphic be viewed on a smart

phone? The answers to these questions will define the screen size for the design. Graphics meant to be viewed on a computer or tablet can take up more vertical space than most other formats.

4. Keep it simple. To enhance readability, limit the design to two type fonts. Develop multiple hierarchy levels of type sizes and weights that allow the reader to grasp the message at first glance but that also encourage a deeper look at more information. Create some white space. Tell a story—infographic headlines, subheads, and copy should be clear and compelling.

5. Use color when possible. Researchers from Xerox have found that readers are 80 percent more willing to read an infographic presented in color. Color can increase a reader’s attention span and recall by 82 percent. Infographic trends are fleeting, but bar charts are always effective, as are the colors red, blue, and grey.

6. Be accurate. A well-made infographic can guide a reader in a specific direction. But infographics also have the power to misinform. Maintain credibility. Do not omit necessary data to serve the story. Ensure that the data are recent and accurate, and cite the sources.



Camera crews capture footage of the pontoon repair site, part of Washington State DOT's SR-520 bridge replacement project; the agency has worked to keep open communication and to build credibility with the media, cultivating "performance journalism."

Informing Taxpayers

People are always interested in how their investment dollars are being spent. Colorado DOT answers that question directly with a website devoted to the topic—Your CDOT Dollar.⁴ The site delivers information about safety, mobility, road quality, bridges, and tunnels, offering a report card and trending information for each area.⁵

"This is what taxpayers want to know," Scott Richrath, Chief Financial Officer in the Division of Accounting and Finance, explains. "They want to feel that their investment is being used wisely." To that end, the site features an innovative calculator that allows visitors to estimate the taxes and fees they pay to Colorado DOT and see how those dollars are used.

The website and other efforts have earned kudos from the governor, who has commended Colorado DOT as the state's leading agency for performance management: "We're managing a larger cash budget than ever, so our responsibility to communicate our goals and progress is larger too. It's our job to gather reams of data and then transform them to help us make informed and meaningful decisions."

Just Do it

There is no perfect formula for communicating performance management information. The effort is

always evolving—and should be—as departments innovate and improve processes. Bremmer advises agencies simply to get started: "Start small if you need to. Don't wait for everything to be perfect, because it never will be." She adds, "Don't get paralyzed by data analysis. You will soon figure it out."

A good approach is to spend as much time in figuring out the best way to communicate the data as in gathering the data. If the audience does not read the information or does not understand it, the effort is wasted.

"The audience—whether it's your boss or your neighbor—wants localized, relevant information," Van Hecke observes. "It's important to provide a customer-centric experience that guides your audience through the information in the way you want them to see it."

Budgets and costs for Colorado DOT projects, such as rockfall mitigation in Georgetown Hill in 2011, are detailed on the Your CDOT Dollar website.



⁴ <http://dtdapps.coloradodot.info/Otis/YCD>.

⁵ The American Society of Civil Engineers publishes a comprehensive report card on the condition of America's infrastructure (www.infrastructurereportcard.org/), but the approach has not yet gained traction in the transportation industry, even though the general public understands the message instantly.



ORGANIZATIONAL SUPPORT FOR PERFORMANCE MANAGEMENT

CARLOS BRACERAS

The author is Executive Director, Utah Department of Transportation, Salt Lake City; Chair, Project Panel on the U.S. Domestic Scan Program, National Cooperative Highway Research Program; and Chair, Technical Coordinating Committee for Reliability Research, second Strategic Highway Research Program.

Successful performance management serves as an objective, stabilizing force as state departments of transportation (DOTs) balance public needs and budgetary limitations to achieve optimal results with taxpayer dollars. State DOTs face a challenge, common to many organizations, of trying to provide greater results with budgets that are not growing in proportion to increased needs.

To prioritize projects and spending, many factors must be balanced—for example, input from elected officials, who provide guidance on behalf of the public; organizational challenges; and limited funding. Without technical data and the principles of performance management, the decision-making process easily can skew toward one of these factors, potentially undermining the goal—to make better decisions about how to spend the public’s money in providing the best possible results for every dollar spent.

Informing and Improving

Performance management practices help state DOTs not only to achieve the goal of spending public funds effectively but to communicate the reasons for investment decisions and to demonstrate actual or projected outcomes to the public and elected officials. In Utah, elected officials appreciate Utah DOT’s help in informing and improving decisions. In addition to helping the public and elected officials understand the outcomes achieved with the funding available, performance management offers the critical benefit of trust that the money is being spent in the best possible way.

In the long term, performance management creates an environment in which adequate funding is more likely; achieving adequate, not excessive, funding is the ideal scenario. For a state agency, having enough money to do everything on the agenda can lead to bad decisions and consequently to a decline



Photo: Utah DOT

New signal performance metrics allowed Utah DOT to improve the signal operations along Foothill Drive in Salt Lake City.

in public confidence. State DOTs need to face the difficult decisions of how best to use limited funds to achieve the best results; performance management offers the best approach.

Performance management ensures an environment in which leaders can align an organization effectively and direct all levels of the department in understanding and carrying out the daily activities important to customers. An organization that does not adequately communicate its strategic goals to employees on the front lines has failed to complete its mission. A strong performance management environment allows employees at every level to make choices, take actions, and measure results in accordance with defined strategic goals.

Building the Foundation

Utah DOT historically had prepared for moving into performance management, especially in the areas that have become strategic goals. Building a successful performance management program requires cultural and structural foundations within the organization.

Utah DOT's culture of performance management began many years ago and was exemplified in a 1977 study, *Good Roads Cost Less*, by the agency's then-director of research. The study expressed the philosophy that the transportation system is better served through the regular application of cost-effective preservation treatments than by periodically implementing costly reconstruction. The *Good Roads Cost Less* doctrine has echoed for decades throughout the department and remains a guiding principle for every employee, including the technicians responsible for daily activities on roadways.

In the late 1990s, Utah DOT had an opportunity to formalize and develop performance management practices in reconstructing Interstate 15 (I-15) for the 2002 Winter Olympics. Legislative bonding of more than \$1.5 billion allowed the department to reconstruct 17 miles of I-15 in Salt Lake Valley in four years.

A key provision in the legislation granting the funds for construction was that Utah DOT develop an asset management program. Instead of approaching this as a check-the-box requirement, Utah DOT dedicated resources to build performance management practices into an integral part of operations and decision making.

The first asset management plan, written in 2003, included a so-called gap analysis and an implementation plan. Utah DOT recognized the need to develop a vision, strategic direction, asset inventory, optimization strategies, individual performance goals, and performance tracking. These elements are

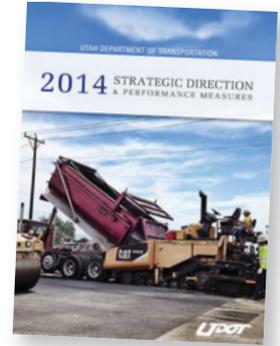
interdependent, but Utah DOT initially did not have all of them in place; the eventual efforts to implement all, however, have produced an environment of innovation and have developed a culture dedicated to public transparency and accountability.

Practical Integration

Utah DOT's performance management is critical for intelligent decision making about investments and for managing the state's transportation system. By providing a unified vision and direction for the agency, performance management has been integrated into decision making, funding, and project selection, as well as into performance plans throughout the organization.

In the past two decades, the department has pursued a simple but clear mission: to optimize resources with performance-based measures to ensure a safe, well-maintained, free-flowing transportation system. This mission has developed four goals that define the strategic direction and are updated and detailed each year in *Strategic Direction and Performance Measures*. The document articulates to elected officials, the public, and frontline staff the department's vision, mission, and performance for each of the strategic goals:

◆ **Preserve infrastructure.** Utah DOT manages an extensive highway system of roads, bridges, signs, culverts, guardrail, and other facilities collectively valued at approximately \$31 billion. The department has a long-term strategy to preserve and maintain the transportation infrastructure with a combination of measured asset performance, routine maintenance,



Utah DOT's yearly progress on its safety, infrastructure preservation, mobility, and economic goals is outlined in *Strategic Direction and Performance Measures*.

Safety innovations, such as this diverging diamond interchange in St. George, are part of an effort to reach zero fatalities on Utah roads.

PHOTO: UTAH DOT





PHOTO: UTAH DOT

Measures to make snow removal more efficient and to increase mobility and safety include weather forecasting technology and the evaluation of road conditions within an hour of a storm event.

and regularly scheduled projects. Utah DOT is able to use limited funding to maximize the long-term health of roads, bridges, and other assets.

◆ **Optimize mobility.** Utah's population has grown by 75 percent in the past 25 years. In that same time, vehicle miles traveled have nearly doubled. The growth has increased demands for capacity, and the increased system use has strained scarce resources for preserving and extending the service life of roads and bridges. The department prioritizes capacity projects based on a combination of objective criteria: congestion, safety, vehicle use, and economic development.

◆ **Zero fatalities.** The department has a goal of zero fatalities on Utah roads. Performance management is an integral reason for a net decrease in fatalities of 41 percent from 2000 to 2013. In pursuing this goal, Utah DOT focuses efforts on four areas: engineering, education, enforcement, and emergency services. The department has implemented specific programs with defined performance measures in each of these areas.

◆ **Strengthen the economy.** Utah DOT recognizes that the transportation system enables economic growth and empowers prosperity. The goals of preservation, mobility, and safety contribute to a strong and prosperous economy.

Strategic Direction

At first glance, a vision or strategic direction may seem unrelated to performance management, but Utah DOT has found the success of both inextricably linked. Performance measures are necessary in defining objectives—understanding where an organization is helps in determining where it should go. Similarly, a clear strategic direction enables an orga-

nization to choose which data to capture; performance management becomes integral to success and is not a superficial or obligatory process.

Performance management is integrated vertically across Utah DOT, from executive-level leaders to frontline designers, construction engineers, and maintenance staff. The coordinated effort by the entire department ensures successful performance management.

Each group has a key role in creating a sustainable culture. The highest level of leadership articulates the vision and a strategic direction. Management sets goals and performance targets that align with the vision and strategic direction; management implements programs and projects to achieve the agreed-to performance measures. Frontline staff develop personal performance plans with specific goals to support established performance measures.

In addition to laying a cultural foundation through strong leadership and a clear vision, a functional performance management program requires a structure that integrates performance management into decision making. This may be accomplished in several ways, each with its own benefits and challenges. Utah DOT favors the flexibility of a steering committee, which reviews performance and prioritizes actions, instead of written policies and procedures that provide an if-then set of rules for determining the proper course of action. Whatever the structure, leadership must champion the value of performance management and must allow the structure to function.

Steering Committee

At Utah DOT, the Asset Management Steering Committee sets the direction for the department's asset management programs, including review and approval of individual safety, capacity, and preservation program funding. The committee collaborates in bimonthly meetings and provides structural support across the agency divisions, reducing the risk of siloed or duplicative efforts and ensuring that spending and actions are in line with the strategic direction.

Utah DOT's deputy director chairs the committee. Voting members report directly to the deputy and include all four region directors, the engineer for operations, and the directors of programming and planning. The department's division managers serve as nonvoting members.

The steering committee uses data collected through the performance management program to prioritize and deliver projects. Each spring, the committee reviews the program and the agency's direction, as well as specific division performance goals

and targets. Each fall, the committee finalizes performance management objectives and makes recommendations for funding. The committee reviews the program performance measures, the targets, the expected future trends, and the recommendations with the state's Transportation Commission, which is responsible for approving the funding.

multilane concrete Interstates to rural two-lane asphalt roads. Approximately \$250 million is required annually to preserve this \$25 billion asset. Utah DOT's pavement management philosophy, as noted earlier, is that good roads cost less—in other words, timely, cost-effective treatments minimize cost while achieving the greatest long-term benefit.

Practical Case Studies

Pavement Management

The department manages and preserves approximately 16,000 lane miles across the state, from urban

Pavement Optimization

The department manages a total of 243 state highways. These highways are divided into 2,446 individual sections of varying length. Each section has its

Building a Sustainable Culture of Performance Management

Two years ago, the Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law. Performance management, a data-driven decision-making process, is a major thrust of the legislation. Successful implementation by state departments of transportation (DOTs) is good business practice and will benefit customers and the public.

The lasting legacy of MAP-21 for Utah DOT and other transportation organizations will be the establishment of a holistic approach to managing assets, from vision and strategic direction to the establishment of a robust inventory, to developing performance goals and targets, and to allocating funds to optimize projects. This will establish a culture of sustainability.

Performance management has provided Utah DOT with the ability to articulate its vision by transforming data and information into knowledge. The department

has created a data-driven, transparent approach that optimizes limited funds to create not only a sustainable asset management program but also a sustainability culture within the agency. The graphic above illustrates Utah DOT's view of how performance management can help build a sustainable culture founded on a clear vision.

Following are definitions of each element in the figure, with examples from Utah DOT's strategic goal to preserve infrastructure:

◆ **Vision:** a philosophy that determines the culture and a clear goal for the future of an organization. For example, the "good roads cost less" approach creates a sustainable program and a culture that maintains pavements as an asset for future generations.

◆ **Strategic direction:** a course of action to achieve the vision. To accomplish the task, "set performance targets for spe-

cific classes of roads," the department uses a data-driven process to manage the preservation of the highway system; the specified targets help identify the lowest-cost treatment with the greatest benefit.

◆ **Data:** facts and statistics collected for records and analysis. The guideline, "Deploy the most current technologies," aims to generate data that provide a complete representation of the highway system.

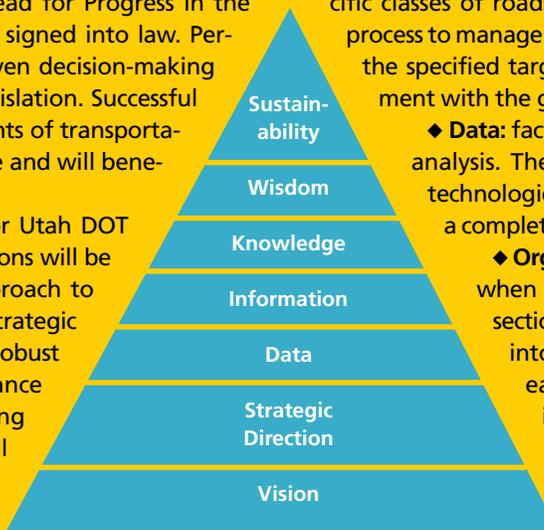
◆ **Organizing information:** data gain meaning when organized in context. "A plan for every section of every road" divides 243 state routes into 2,446 individual sections, documents each section's individual history from original construction to preservation, and forecasts future treatments.

◆ **Knowledge:** information given greater meaning by testing outcomes and measuring results. Through "selection of the right project at the right time," the department chooses sections for preserva-

tion treatment to minimize total costs and to maximize the performance of the entire statewide system.

◆ **Wisdom:** knowledge proven through performance management. Utah DOT foresaw that funding would not be sufficient to practice the "good roads cost less" philosophy on low-volume roads. Acknowledging that "funding constraints limit pavement management to high-volume roads," the department has implemented a tiered system to preserve high-volume Interstate and National Highway System roads.

◆ **Sustainability:** a sustainable culture emerges when wisdom is documented and becomes integral to decision making. The effort to "create an enduring culture" of pavement management at the agency has spanned two generations and has brought continuous improvements, not only in pavement management performance but in the creation of a cultural approach to pavement management for following generations.



Utah DOT's view of how performance management can help build toward a sustainable culture founded on a clear vision.

Utah DOT approaches pavement preservation with a focus on the most beneficial and cost-effective treatment, instead of pursuing a “worst-first” strategy.



own history—date of construction, traffic volumes, facility type, results from the biannual distress surveys, and next scheduled preservation treatment.

With pavement optimization, the department selects the treatment that provides the greatest benefit at the lowest cost, instead of following a “worst-first” strategy. Utah DOT recommends a program of specific projects to fit the available budget.

Pavement Condition Forecasting

Utah DOT uses distress surveys and modeling techniques to forecast pavement conditions. Forecasting takes into account the type of facility—Interstate, National Highway System, urban, or rural; the materials—concrete or asphalt; the region; and the available budget.

Maintenance Management

An annual expenditure of \$250 million would be needed to maintain the overall condition of the entire state highway system, providing the greatest benefit at the lowest cost. Funding has been limited, however, to \$210 million per year in each of the past six years.

Utah DOT has created a tiered system for classifying highways: Interstates; Level 1, with average annual daily traffic (AADT) more than 1,000 and truck volume more than 200; and Level 2, with AADT less than 1,000. Funding is sufficient to maintain Interstate and Level 1 roads but not the Level 2 roads.

Tiered Preservation

The tiered preservation strategy addresses the risk of trying to maintain all roads equally with limited funding, which would cause all highways to drop to

a lower pavement standard. Discussion with stakeholders illuminated the need to preserve the highways used by the greatest number and emphasized the tremendous initial and ongoing investments in the Interstate and National Highway Systems.

Maintenance crews at individual maintenance stations were directed to maintain Level 2 roads at the highest level possible. In the past six years, the department has continued the tiered approach. Every year, Utah DOT has collected automated pavement distress conditions for all roads; the data revealed that the conditions of Interstate, National Highway System, and Level 1 roads not only were maintained but had steadily improved in comparison with initial targets. The department concluded that a greater amount of pavement could be maintained with the same level of funding as in previous years.

In 2013, after careful review, Utah DOT lowered the threshold for Level 2 roads from 2,000 vehicles a day to 1,000 vehicles a day. As a result, approximately 785 miles of roads were reclassified as Level 1 and are benefiting from active preservation.

Zero Fatalities

Utah DOT has set an ambitious goal for safety: zero fatalities on state roads. The number of fatalities has trended downward in the past 10 years, despite the increases in population and vehicle miles traveled. In 2012, Utah recorded its lowest number of fatalities since 1959.

Utah DOT’s four focus areas—education, enforcement, emergency services, and engineering—require the collection, processing, and analysis of data from many sources. Safety programs are developed and

specific projects implemented. Safety performance goals and targets drive critical decisions across the agency. The zero fatalities goal is communicated within the department and during monthly Transportation Commission meetings, educational campaigns, and through the media.

Engineering Solutions

Providing the best engineering solutions within the available budget will lead to dramatic reductions in highway crash fatalities. The department uses performance measures to allocate funds to specific projects within four safety programs—highway safety improvement, spot safety improvement, traffic signals, and railroad safety—to reduce fatalities and serious injuries.

Reduction in Fatalities on US-6

Nearly 10 years ago, *Reader's Digest* named US-6 one of most dangerous highways in the nation. Large sections of the highway traverse mountainous terrain and winding canyons as the road crosses the state diagonally, linking southeast and northwest. This high-speed facility serves as an important transportation lifeline for industry, trucking, and tourism, and connects with I-70 and I-15.

In the past 10 years, the department has implemented many safety measures to reduce the number and severity of crashes dramatically, with fatalities declining from approximately 15 to 3 per year, and serious injuries from 25 to 4 per year. Improvements have included the widening of shoulders; the addition of climbing lanes for trucks; dynamic speed signage; and the installation of guardrail, centerline and shoulder rumble strips, and passing lane signage.

Cable Barrier

Since 1999, the number of serious and fatal crashes caused by vehicles crossing the median on Utah roads



PHOTO: UTAH DOT

has decreased by more than 180 incidents per year—that is, by more than 95 percent. The installation of safety features, such as cable barrier, has helped to reduce crossover crashes to fewer than 10 per year.

Optimal Outcomes

As public employees, state DOT staff are responsible for assuring that the public's investment in the transportation system produces optimal outcomes. The outcomes must be achieved by collaborating with elected officials, the public, and the agencies responsible for delivering results to determine and define strategic goals.

But having goals does not assure success. The contributions of every employee, contractor, consultant, and supplier must align with the goals. Performance management measures determine whether the efforts are moving in the right direction.

The transformation of Utah DOT owes much to the positive influences of past leaders Tom Warne and John Njord, who championed and established a culture in which employees had a clear understanding of strategic goals and had the freedom to innovate in pursuing those goals. Utah DOT employees practice and embrace performance management in delivering successful programs and maximum value for every dollar invested.

Utah DOT's leadership has laid a foundation for performance management to thrive by investing in people; by partnering with the Federal Highway Administration, which developed many of the tools now in use; and by supporting the research community, which has helped determine the agency's direction. Utah DOT's commitment to performance management and asset management has made a difference, and the public has benefited.

Since it began in 1994, Utah DOT's Incident Management Program has increased first-responder safety and has reduced congestion and secondary crashes.



PHOTO: UTAH DOT

Cable barriers and other roadway safety features have reduced crossover crashes by more than 95 percent per year.

Evaluating Transportation System Performance

Mapping Out a National Framework

The 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21) is transforming the federal highway program. MAP-21 is creating a performance-based multimodal program that focuses on national goals for the transportation system, with increased accountability and transparency. The MAP-21 performance requirements will improve decision making through informed project planning, so that the public funds invested in transportation are used as effectively as possible.

A comprehensive MAP-21 implementation effort will bring together state departments of transportation (DOTs), metropolitan planning organizations (MPOs), public transportation agencies (PTAs), and the federal government. Although many state DOTs, MPOs, and PTAs now use performance management principles in project planning and programming, MAP-21 creates a new framework at the national level for evaluating surface transportation system performance across the country.

MAP-21 established national goals for the Federal-Aid Highway Program in seven areas:

- ◆ Safety,
- ◆ Infrastructure condition,
- ◆ Congestion reduction,
- ◆ System reliability,
- ◆ Freight movement and economic vitality,
- ◆ Environmental sustainability, and
- ◆ Reduced project delivery delays.

U.S. DOT has begun a course of 10 interrelated rulemakings in several phases. The rulemakings will establish measures to assess performance in several areas of national importance. Other initiatives under the MAP-21 performance-based program include developing performance targets and plans and reporting on outcomes.

—Jeffrey E. Paniati

Executive Director, Federal Highway Administration



PHOTO: DON WILSON, PORT OF SEATTLE

The 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21) focuses on performance goals for the entire transportation system, from highways to aviation.

Performance Management for All

Building on the States' Robust Foundation

FREDERICK G. (BUD) WRIGHT

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and transit agencies to track, measure, and report on transportation performance using a consistent, national framework. Although this is a first-time federal requirement, state DOTs already have implemented performance management procedures. As Florida's Secretary of Transportation Ananth Prasad notes in his article in this issue (page 34), all states have implemented some form of transportation asset management, which is a subset of performance management. Moreover, many state DOTs have implemented comprehensive and robust performance management systems to balance investment decisions against limited resources.

Tapping into States' Experience

Colorado, North Carolina, Utah, Minnesota, and Maryland are among the states that have created programs to apply the principles of transportation asset management instead of maintaining physical assets on a worst-first approach. Other states, such as Missouri, Washington, and Virginia, have well-known performance management programs that go beyond infrastructure assets to embrace multimodal planning, programming, operations, and service delivery. Missouri's *Tracker* is a tool for assessing the state DOT's delivery of services and products to customers.¹ Washington State's *Gray Notebook* has reported quarterly on the DOT's performance since 2001.² Virginia DOT has helped pioneer the transportation dashboard concept for reporting performance.³

MAP-21 requires state DOTs and MPOs to report on a limited number of national-level performance measures. U.S. DOT can use the results to tell a story about the status of the nation's transportation infrastructure and to assess the impacts of federal investments. The Federal Highway Administration (FHWA) refers to these as a "thin layer" of measures on top of the much more robust measures that most state DOTs already use to plan, program, and operate their transportation networks and services.

Answering Challenges

The experience that transportation agencies have with performance management will serve as a foundation for the MAP-21 requirement,

¹ www.modot.org/about/Tracker.htm.

² www.wsdot.wa.gov/accountability/.

³ <http://dashboard.virginiadot.org/>.



A changeable message sign on I-95 in Virginia shows travel times to an upcoming exit. Virginia and other states have robust performance management plans that address a variety of system needs.

PHOTO: TREVOR WEAVER, VIRGINIA DOT

but new challenges are inevitable. For example, target setting is not a well-established practice in the transportation industry. Although working collaboratively with planning and transit partners will be important, every state and municipality faces unique constraints and opportunities that affect their transportation systems. Funding levels and sources vary, as do environmental conditions, trends in population growth, and legislative and gubernatorial mandates and priorities. State DOTs and MPOs will have to address their unique situations and establish appropriate targets.

As transportation agency leaders face the challenges of implementing MAP-21, they will be able to tap the experiences of peers and colleagues, as well as a substantial body of research, for support and advice. For example, in the past decade, through the National Cooperative Highway Research Program, state DOTs have proposed, supported, and engaged in applied research to advance performance measurement that addresses complex management challenges and that enhances organizational and program effectiveness. This research has produced a series of reports comparing performance measures and presenting information on successful data- and system-management techniques for performance measurement (see the

article by Bremmer and Campbell, page 42). More recently, the state DOTs, along with their MPO and transit partners, have worked with FHWA and the Federal Transit Administration to discuss, promote, and test performance measures and performance-based planning and programming (see the article by Hancock, page 9).

Partnership Journey

AASHTO and the state DOTs support the national-level framework established under MAP-21 for performance measurement. This is the beginning of a longer, partnership journey into performance management. The recognized challenges ahead include balancing state and federal investment priorities; setting and coordinating targets; and addressing data issues. AASHTO and its Standing Committee on Performance Management will continue to engage with U.S. DOT to address these challenges and will work together on implementing the performance management requirements of MAP-21, sharing and applying the lessons learned and the general good practice of performance management by state DOTs.

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Partners in Performance

Working Together to Transform the Nation's Transportation System

JEFFREY F. PANIATI

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Transportation system performance is moving to the next level. Building on the successful transportation performance management efforts of state and local agencies, the Moving Ahead for Progress in the 21st Century Act (MAP-21) has created a performance-based program to strengthen the transportation system nationwide. The transportation system has expanded and thrived through the dedicated collaborative work of the Federal Highway Administration (FHWA) and its state and local partners. Achieving the performance advances in MAP-21 will require a renewed emphasis on partnership.

The new performance elements in the federal surface transportation program center on a few high-level measures. These measures focus on key outcomes in the MAP-21 goal areas. Through this so-called “thin layer” of measures, the U.S. Department of Transportation (DOT) can tell more effectively the national story of transportation system performance and the impact of investments in that system. At the same time, state and local DOTs and metropolitan planning organizations (MPOs) will build off of their current performance management practices, setting targets and reporting outcomes in a consistent manner.

A project to modernize US-26 in Oregon. Under MAP-21, transportation agencies will demonstrate how funds are spent to keep pavements and bridges in a state of good repair and other key safety and economic achievements.

Optimizing Investments

The national performance story includes the ability to optimize investments of public funds. In a constrained funding environment, transportation agencies and planning organizations must maximize returns on investments and must make tough decisions about the best mix of projects to increase system performance. Performance management allows agencies to demonstrate how their projects are benefiting the public and to identify opportunities for more effective decision making.

Agencies will demonstrate how their investments are directed to achieve the following:

- ◆ Safer roadways with a significant reduction in traffic fatalities and serious injuries;
- ◆ Pavements and bridges maintained in a state of good repair;
- ◆ Reductions in traffic congestion, saving time and money for drivers and businesses; and
- ◆ An economic boost through the swifter movement of freight goods.

Transportation agencies, local governments, and planning organizations can increase coordination in decision making. For example, they can share responsibility for establishing performance targets and for making investment decisions.

Understanding What Works

Implementing the MAP-21 performance elements will increase understanding of what works. Documenting planned investment strategies and outcomes will clarify the link between investments and results at the local and national levels, allowing decision makers to understand investments that lead to improvements in performance and to identify smarter investment strategies. This understanding of what works will enable FHWA to promote best practices and to build the tools to address gaps so that local partners can continue to advance performance management.

U.S. DOT also can report more effectively on the impact of the \$40 billion annual federal investment



PHOTO: OREGON DOT

in the nation's highways. County agencies, state DOTs, and FHWA share the goal of a safe, well-performing transportation system that provides the best value for the resources invested. Every day, transportation agencies are advancing performance through their planning and management strategies and day-to-day operational decisions. The thin layer of national performance measures will not change day-to-day decisions but will enable a nationwide consistency in data collection and processing and in the methods of reporting outcomes.

As with all changes, the performance-based program will present challenges. Close collaboration among federal, state, local, and private industry partners is key to meeting these challenges effectively and taking transportation performance to the next level.

Federal Role

FHWA will provide national leadership, defining the performance measures and establishing the process for implementing the performance-based program. FHWA also will share resources and information to help state and local transportation agencies learn from the performance management practices evolving throughout the country. FHWA can help in advancing performance management by increasing the quality and accessibility of the data critical to informed decision making; increasing understanding of how to set performance targets that allow for the many uncertainties that can affect results; and evaluating investment trade-offs across a range of performance areas, to understand the results of investment strategies and the performance benefits. FHWA can facilitate collaboration among agencies and jurisdictions, enabling stakeholders to share information and to coordinate plans.

FHWA is prepared to administer and support a performance-based Federal-Aid Highway Program. Efforts are under way to link key data systems for a more comprehensive analysis of how transportation investments lead to performance gains. FHWA is designing training to help agencies implement the new national performance measures. Through electronic dialogues, town hall meetings, webinars, and workshops, the agency has heard from stakeholders and has gained insights into the successful practices already in place and into the work that needs to be done.

Through FHWA's Every Day Counts initiative and the deployment of products developed under the second Strategic Highway Research Program, the agency is continuing to advance new and proven technologies that can help states achieve success in implementation. From accelerated construction

Photo: FHWA



Federal Highway Administrator Victor M. Mendez (now Deputy Secretary of Transportation) meets with personnel working on the Downtown Crossing project in Louisville, Kentucky. The agency will serve as a resource to state and local transportation agencies in performance management.

technologies to advanced traffic signal control solutions to strategies for preventing drivers from running off the road, these innovations will improve the planning, design, construction, and operation of the nation's roadways.

In helping all states to achieve success, FHWA's primary role is stewardship. By assisting with training and knowledge transfer and by sharing smart practices to achieve the best value for investments, FHWA, state and local DOTs, and MPOs can learn together as partners in improving system performance. The advances already achieved at the state and local levels provide a strong foundation for performance management. From rural county roads to busy state routes to the coast-to-coast Interstates, a federal and state partnership is writing an essential story of the U.S. transportation system's future.

To learn more about MAP-21 implementation, visit www.fhwa.dot.gov/map21. For more information about FHWA's transportation performance management resources, including tools, innovative approaches, and updates on the performance management rulemaking process, visit www.fhwa.dot.gov/tpm.

States can draw on new technologies and innovations like accelerated bridge construction to achieve performance management goals. Research from the second Strategic Highway Research Program developed methods and tools to apply the approach on typical bridge projects in all 50 states by local consultants and contractors.

Photo: FHWA





TRANSPORTATION PERFORMANCE MANAGEMENT

Theory and Practice, Challenges, and Strategies for Success

GREGORY SLATER AND FRANCES HARRISON

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Performance management uses data to help an agency focus on critical issues and challenges and to evaluate solutions to those challenges. To achieve an agency's vision, staff must identify how to gather the appropriate information that communicates about system performance and about the agency's actions to improve performance.

Although all transportation agencies collect significant amounts of data, an agency may be data rich but information poor. Strategically selected performance measures and a clear framework for measuring performance can help an agency focus on the data that are critical to monitor goals and objectives, evaluate programs and projects, and support decision making.

Applying the Theory

Performance management is a well-established practice in many transportation agencies, ensuring that transportation decisions are based on a set of goals, objectives, and performance measures fueled by credible information. This provides a framework of accountability for the expenditure of tax dollars.

Applied effectively, performance management can be a powerful tool for building public confidence that the available funds are well spent.

Following are the key steps in performance management:

◆ Set up a measurement framework.

Identify a set of performance measures that reflect the agency's established goals and objectives. Typically, agencies select a mix of leading and lagging measures to track progress and to receive early warnings of developing problems. A hierarchy may be established with a few high-level, outcome-based measures at the top, supported by detailed, output-oriented measures.

◆ Understand the baseline.

Once measures are established, trend lines can be projected to provide a context for monitoring and to assemble a baseline for assessing progress. To build a performance baseline, agencies must develop data sources and procedures for integrating and reporting data that support performance management.



PHOTO: ROBERT COUSE-BAKER, FLICKR

◆ **Set targets.**

Performance targets drive improvements. The process of target setting can involve an analysis of performance and investment trade-offs or can reflect aspirational goals—as in the highway safety program Toward Zero Deaths. Establishing realistic targets requires solid baseline trend data, as well as analytical capabilities that support the modeling of future performance. Targets occasionally may warrant adjustment for changes in base conditions that are beyond the control of the agency—for example, a long-term increase in fuel costs or increases or decreases in revenue.

◆ **Evaluate strategies for improvement.**

The selected performance measures are used in planning, scoping, and programming to evaluate alternative strategies. At the program level, strategies may consist of different allocations of resources across categories. For example, an allocation for preventive maintenance of pavement can be evaluated in terms of the impacts on pavement condition compared against those from an alternative strategy that allocates more funds for mobility improvements. At the project level, candidate projects for a highway safety improvement program may be evaluated and ranked based on their potential for reducing crashes.

Strategy evaluation involves understanding the site-specific or network-level conditions related to the performance measures and requires capabilities to forecast conditions for different scenarios. In addition to contrasting the “do nothing” scenario with scenarios implementing the candidate actions, scenario analysis must consider potential changes to exogenous factors—such as growth in population or in vehicle miles traveled—that may affect the results.

◆ **Make data-driven decisions.**

The selection process considers the alternative strategies and their projected performance impacts. The degree to which decisions are “data driven” as opposed to “data informed” depends on the context and on the complexity of the situation.

◆ **Monitor results.**

Monitoring the performance results allows agencies to track progress against the baseline and toward the established targets. Monitoring can help in understanding factors contributing to the results and can inform corrections to the strategies and adjustments to the targets. Evaluations can reveal what does not work or what works only minimally. Agencies can use this information to focus limited resources on strategies that have the greatest impact on the desired outcomes.



IMAGE: OREGON STATE UNIVERSITY

Implementation Challenges

Performance management is easy to describe but difficult to get right. Implementing performance management—aligning people, processes, data, and analytical tools—can take several years. Iteration and adaptation are necessary; agencies learn and improve as they go. Following are common implementation challenges.

◆ **Getting the right data and getting the data right.**

Performance measures are only useful if based on credible, consistent, and timely data—but acquiring good data is costly. How much is enough? The trade-offs between the level of detail and cost and between timeliness and quality are difficult. Agencies must address the question: what decisions need to be made with these data? Data requirements should match the intended uses, so that agencies can determine if “the juice is worth the squeeze.”

◆ **Repurposing data.**

When agencies want to use the same data for high-level performance monitoring and for project-level, site-specific decision making, the accuracy requirements for the project-level needs may trump the more forgiving requirements for the high-level measures. But this choice can affect the cost and the timeliness of the data collection. For example, asset inventory for general asset management does not require the same level of spatial accuracy as for project design.

Some agencies focus on planning-level data to provide broad coverage and to keep the budgets for data collection manageable. With the emergence of new data collection technologies such as mobile lidar,

Mobile lidar can capture a large amount of data about road surfaces. New collection technologies provide more accurate information for transportation agencies.

Video traffic count data is stored on a memory card. Storage and organization of large amounts of data is a concern for transportation agencies.



PHOTO: LADOT, FICKER

however, some agencies are moving toward the collection of more accurate data that can be used for both planning and design. Many agencies use cost-effective sampling approaches for tracking maintenance quality and allocating maintenance resources based on level-of-service targets, but these data often are disconnected from the maintenance work orders that track accomplishments and resources consumed.

◆ **Right-sizing performance measures.**

Developing a performance measurement framework involves trade-offs between simplicity and coverage. Some agencies have pursued a comprehensive approach involving hundreds of measures. Although this provides a wealth of information that can be used at multiple levels of the organization to track progress, the data gathering and analysis are burdensome and costly.

Agencies that underestimate the requirements for collecting and managing large volumes of data for performance management may end up with poor quality information and may damage the credibility of the program. In contrast, a minimalist approach with only a few measures may be more sustainable but may not provide the kind of insights the agency requires to develop effective improvement strategies.

Candidate measures can be assessed for their helpfulness in the decision processes. This screening exercise can weed out measures that may be easy to collect and report but that do not provide value.

◆ **Making credible forecasts.**

Performance management involves a series of “what if” questions: What will performance look like in 10 years? What will the system look like with greater investment in pavement preservation? How many lives

can be saved if rumble strips are added in this corridor?

Although a variety of forecasting models is available, the results depend on assumptions that can influence the certainty of the outcome. Skillful approaches to scenario development can present forecasts in a context that allows for understanding possible futures.

◆ **Getting to data-driven decisions.**

Defining how performance data will be used to allocate resources and to prioritize or select projects is critical in implementing an effective performance management program. These decisions cannot be based solely on performance data, however, because many nonquantifiable factors are at play, and practicalities such as equity must be considered. Nevertheless, agencies must define how to use the performance data in decision making and must do the hard work of shifting the status quo.

When transitioning to a more data-driven process, agencies must be wary of introducing biases into data collection or otherwise “gaming the system.” Establishing a culture in which data are treated as an asset—and the credibility of the data is paramount—ensures the quality of the information for decision making.

◆ **Communicating effectively.**

Many agencies struggle with transforming data into information and presenting the result in a manner that enables meaningful conclusions. Data presentation must help to tell not only how the system is performing but why. Why are things improving? Why are they getting worse? Because of programs or external factors? This kind of analysis and contextual presentation is frequently the weak link between data

and decisions. Staff time and effort are required, as well as journalistic skills, for fact finding and reporting effectively about performance.

◆ **Balancing continuity and adaptation.**

Ideally, agencies should establish and stick to a set of performance measures, allowing the development of a trend line and a set of analytical tools for modeling the impacts of strategies. Performance management programs are strengthened when agencies maintain continuity in measures and measurement practices.

Nevertheless, changes to performance measures may be necessary as new concerns and priorities emerge. For example, the increased emphasis on understanding travel time reliability, in addition to delay, has required new approaches to data collection and analysis. Similarly, many agencies are shifting from a focus on vehicle throughput to person throughput; this requires gathering and combining data for transit and highways.

Moreover, technologies and data sources are emerging that may provide new opportunities for measurement. Taking advantage of these new sources may mean discontinuing old measures and beginning new trend lines. Change comes with a

cost; in addition to the loss of continuity, systems may need to be retooled, and the users of the performance information may need to be educated about the new measure.

Strategies for Success

Despite these challenges, many state DOTs have made great strides in building robust, successful performance management programs. Key strategies for success are covered below.

◆ **Aligning the organization around a data-driven approach.**

Performance-based planning and performance management involve a culture shift. The shift begins with collaboration across the organization to develop and communicate the vision of the performance management program and to work through the goals for measuring success and the strategies to meet the goals. This is the starting point, and often several years are required for managers and staff to gain sufficient confidence in the data and analysis results to begin relying on them to guide decisions.

As agencies determine which strategies are yield-

Performance Management for Improving Mobility in Maryland

The Maryland State Highway Administration (SHA) has used the findings from its *Mobility Report* to improve system reliability and to guide program decisions at all levels of the organization. The report has provided a model that can be applied to the other data-driven areas of the transportation program.

The Maryland SHA business plan focuses on mobility and the economy, and reliability is woven into the organizational vision. The agency has developed various objectives, performance measures, and strategies to achieve the mobility goals for the safe, efficient, and reliable movement of people and goods. The *Mobility Report* summarizes the congestion and reliability trends in Maryland and the state's efforts for congestion management, improved reliability, and multimodalism.

Under the performance-based planning program, Maryland harnesses archived vehicle probe speed data, traffic count data, and many other sources to understand and analyze mobility on the highway infrastructure. With these diverse sources of data, Maryland SHA can monitor travel time variability and identify sources of congestion and factors contributing to unreliability.

Various congestion and reliability metrics help in identifying problem spots. Data sets and applications, including archived incident data, support understanding of recurring and nonrecurring congestion, allowing the identification of appropriate



PHOTO: EVERETT BARNES PHOTOGRAPHY/FILIER

A commuter bus park-and-ride facility in Waldorf, Maryland. The state's Mobility Report tracks progress toward goals in relieving congestion, improving reliability, and encouraging multimodalism.

mitigation strategies, from intelligent transportation systems and emergency vehicle deployment to short-term geometric improvements to mid- or long-term enhancements. In recent years, Maryland SHA has explored incorporating reliability not only for alleviating congestion but for reducing travel time variability on the system.

Characteristics and Principles for State Agencies' Data

The Data Subcommittee of the American Association of State Highway and Transportation Officials' Standing Committee on Planning has identified the characteristics of high-quality data for decision making and has developed related principles for understanding and using data:

1. **Valuable—data are an asset.** Data are a core business asset that has value and is managed accordingly.

2. **Available—data are open, accessible, transparent, and shared.** Access to data is critical to performing duties and functions; data must be open and usable for diverse applications and open to all.

3. **Reliable—data quality and extent are fit for a variety of applications.** Data quality is acceptable and meets the needs for which it is intended.

4. **Authorized—data are secure and comply with regulations.** Data are trustworthy and are safeguarded from unauthorized access.

5. **Clear—a common vocabulary is used, and data are defined.** Data dictionaries are developed and metadata established to maximize the consistency and transparency of the data across systems.

6. **Efficient—data are not duplicated.** Data are collected once and used many times for many purposes.

7. **Accountable—decisions maximize the benefit of data.** Timely, relevant, high-quality data are essential to maximize the utility of data for decision making.

These core principles are intended to ensure that state transportation agencies give data a level of attention commensurate with the importance of the project decisions.

ing the highest payoff, they can focus resources appropriately. The results help to win the hearts and minds of key staff in the organization and to achieve the buy-in needed for a sustainable performance management program. In a performance management approach, data programs become integral to how the organization does business.

◆ Telling the story.

A key aspect of performance management—and of performance-based planning and programming—is the ability to present a compelling story of the transportation system, its condition, its past, and its direction. The plot of the story is that transportation agencies are charged with responding to a variety of needs, but not all of these needs can be met. A data-driven approach can help maximize results and achieve a balance across the program in addressing congestion, safety, and transportation asset management. By sharing the information used in striking this balance, agencies can gain public confidence, which adds to the success.

◆ Getting serious about data.

The importance of quality data to the success of a performance management program cannot be overstated. Agencies must begin to treat their data as a strategic asset and to develop robust approaches to data management and access. The Data Subcommittee of the AASHTO Standing Committee on Planning has drafted a set of core data principles to assist states and to move toward national consistency in the data

used in performance management and performance-based planning programs (see sidebar, above).

◆ Mastering the art of forecasting.

Given the uncertainties in the evolving transportation system, scenario planning is an essential tool in the performance management toolbox. Effective scenario planning is an art, requiring agencies to weave together diverse data sets to develop a picture of alternative futures. Possible ranges in external factors—such as population, economic growth, and land use—must be framed and built into the predictions.

A second type of scenario planning can explore the performance implications of different funding levels or allocations across program areas. This often involves applying the tools that facilitate trade-off analysis for asset management. The results can be used to understand the risks associated with declining revenues.

◆ Leveraging geographic information systems (GIS) technology to break down data silos.

Most agencies have developed individual data programs in areas such as pavement condition, traffic, crashes, and roadway inventory. Agencies implementing performance management find it necessary to bring these data sets together into a unified framework. When data are integrated, their value for performance management is magnified. Today's GIS technology provides a powerful integration tool, an analysis framework for decision support, and an easily understood interface for a variety of customers.



A data-driven program can help redirect a focus to person throughput, serving users of many different modes.

The use of GIS can streamline workflows, break down siloed programs, and provide an agencywide communication tool. GIS can help agencies make connections between asset condition, system operational performance, work accomplished, and work planned. Program units can use GIS to assess what the other units are doing or planning and to coordinate and share resources.

GIS provides the ability to look spatially at an entire transportation corridor or region, understand the travel demand, assess the safety challenges, and view a full picture of corridor assets with condition and lifecycle data. This global view allows the development of a comprehensive, strategic approach across programs to achieve multiple performance goals.

Scenarios for System Performance

The Maryland State Highway Administration, in collaboration with the University of Maryland, recently completed the Maryland Scenarios Project, which examined the impacts of various combinations of land use and transportation improvements using the Maryland Statewide Transportation Model (MSTM). The results were incorporated into advice for state transportation policy makers.

The modeling applied the land use and transportation improvements identified in the state's

Constrained Long-Range Plan (CLRP). The scenario analysis addressed the question "What if the state were to grow differently?" Applying the MSTM, planners evaluated distinct land use scenarios in conjunction with two transportation scenarios; the CLRP helped in discussing the policy implications and in forging future directions. The scenarios provide a context for understanding the future baseline for system performance in the areas of mobility, safety, and infrastructure.

Change in Vehicle Miles Traveled (%)

Land Use	Transportation Strategy		
	CLRP	Improved Transit	Express Toll Lanes
Baseline (CLRP)	—	-1.1	0.2
Transit-friendly development	-1.2	-2.3	-2.7
Build out	11.2	10.1	11.5



TRANSPORTATION ASSET MANAGEMENT AND PERFORMANCE MANAGEMENT

A Symbiotic Relationship

ANANTH PRASAD

The author is Secretary, Florida Department of Transportation, Tallahassee, and Chair, TRB Committee on Long-Term Bridge Performance.

Transportation asset management (TAM) is a widely accepted framework for pursuing and achieving sustainable infrastructure. A high-performing TAM program incorporates detailed asset inventories, operations and maintenance tasks, and long-range financial planning to incorporate sustainability into infrastructure systems.

The American Association of State Highway and Transportation Officials' (AASHTO's) Subcommittee on Asset Management has defined TAM as a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets throughout their service life. TAM focuses on allocating and using resources for business and engineering practices, to improve decision making with quality information and well-defined objectives.

Under the typical performance management framework, an organization establishes strategic goals, objectives, and performance measures; monitors progress in achieving the goals and objectives; and makes decisions based on performance data to ensure that the goals and objectives are achieved.



PHOTO: OREGON DOT

A sign is installed on I-84 in Oregon. An effective asset management program goes beyond pavements and bridges to safety elements, environmental stewardship, and more.

Applying Performance Principles

Performance management can apply to all of the business aspects of a transportation agency and can play a significant role in a TAM program. TAM makes



PHOTO: TOM SAUNDERS, VIRGINIA DOT

Transportation asset management can renew and enhance transportation assets, from traffic operations centers to traffic signals.



Workers prepare to pour a new bridge deck in Snohomish County, Washington. Maintaining bridge assets is crucial in times of tightened resources. Transportation asset management can influence resource allocation in a performance management framework.

clear the relationship between physical infrastructure and the delivery of transportation goals and objectives. TAM aims to achieve the most cost-effective, long-term levels of service for the physical infrastructure.

At a minimum, TAM applies performance principles to the maintenance and preservation of physical assets. At its fullest, TAM applies performance principles to renew and enhance physical assets at the lowest reasonable life-cycle cost, to provide the level of service necessary to meet mobility, safety, environmental, and economic objectives.

Much of the initial work in defining the core principles of performance management came out of efforts by AASHTO and the Federal Highway Administration to promote a strategic approach to TAM. The analytic tools, data, and experience in applying performance management principles are more advanced in TAM than in many other areas of transportation.

Asset management can influence decisions about resource allocation that affect more than the physical condition of facilities. TAM principles and tools can influence strategic resource allocation within a comprehensive performance management framework, not just for the physical assets but also for policy goals and objectives. The performance areas will vary from agency to agency.

Influencing Decisions

Performance management principles apply to strategic resource allocation; asset management applies these principles at a minimum and highlights the potential for influencing other decisions. This description of asset management and performance management is not meant to imply that one is more

important than the other; both are essential for a well-managed transportation agency.

Achieving transportation system performance goals requires effective management of the related physical assets. All states have asset management programs focusing on pavements and bridges, for example. A comprehensive asset management strategy, however, would include all the physical assets that support the range of performance goals, such as safety, system operations, traveler information, environmental stewardship, and agency operations. The related assets include signage, lighting, guardrail and median barriers, rest areas, traffic signals, traffic operations centers and other buildings, equipment, and facilities.

The basic principles of TAM and performance management should be aligned to support each other. TAM describes a performance-based approach for managing transportation system physical assets. Performance management describes the application of the same basic principles to a broader set of objectives related to system operations, reliability, safety, congestion relief, freight mobility, and environment, as well as to project and program delivery.



New Mexico Department of Transportation purchased new equipment for snow removal through a multivendor award from the state. A performance-based approach can foster more efficient management of physical assets.



MOVING FROM REACTIVE TO STRATEGIC DECISION MAKING

Ten Basic Steps Toward Performance Management

TRISH HENDREN

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Washington Metropolitan Area Transit Authority (WMATA) is deploying performance management to improve decision making; rush hour at downtown Farragut North station.



PHOTO: LARRY LEVINE, WMATA

The Washington Metropolitan Area Transportation Authority (WMATA) established the Office of Performance in 2009 to introduce a performance-based management approach at the agency, increase the agency's accountability and transparency, and respond to the national focus on performance measures. The office serves as an internal consulting team to develop tools across the agency that turn data into information, address performance challenges, and communicate results effectively. The Office of Performance has developed external communications, including the Vital Signs Report and a scorecard to track progress toward WMATA's strategic goals.

The benefits of using performance data to guide decision making, the key characteristics of goals and measures, and the necessary components of effective performance management have been well documented. Not readily available, however, is a description of the recommended steps that will push an organization further toward the implementation of performance management.

Examples from the Washington Metropolitan Area Transit Authority (WMATA) can illustrate 10 steps to help organizations start down the performance management path or—for agencies with more experience—can serve as reminders or new tactics. The 10 steps do not represent a linear path, a checklist for success, or approaches applicable only to transit agencies, but are proven ways that can help any organization shift from reactive to strategic decision making.

1. Inventory performance data.

When WMATA created an Office of Performance in 2009, one of the first activities was to inventory the data reports generated throughout the agency, assess the source and the reliability, determine the characteristics of the measure—was it an outcome or output?—and establish the audience for the report and the report's extent of use. The findings were surprising—first, the myriad reports included and often duplicated more than 90 measures; second, only a handful were applied in decision making.

The results indicated how quickly a transportation agency could move from “data poor” to “data rich and information poor.” An inventory and assessment of reported data can serve as a starting point for building performance products and can identify internal champions who use the reports to make decisions.

2. Develop an elevator pitch.

Although practitioners know the value of applying data, the benefits of performance management need to be promoted. Cultural resistance typically is grounded in the fear that data will be used for blame. The WMATA Office of Performance has observed that this cultural resistance follows the Kübler-Ross five stages of grief: denial, anger, bargaining, depression, and acceptance (1).

This grief cycle can occur in the face of widespread change, such as a directive to use data for decision making. For example, the interest in adjusting the calculation of rail on-time performance initially met responses of denial, such as “We understand our service delivery is good, so there is no need for different information,” followed by anger: “We don’t have time to change an algorithm, we have a service to deliver,” followed by bargaining: “Let’s just adjust how midday service is tracked,” followed by depression: “Those results are so low,” and finally by acceptance: “Using these data, we can identify actions to improve our service.”

One way to confront this likely cultural resistance is to develop an elevator pitch. Early on, the Office of Performance was invited to attend a 7 a.m. meeting of the bus maintenance superintendents. When the bus director asked on the spot for an explanation of the Office of Performance and what it does, the office representatives drew a blank but left determined that the situation would not happen again. The team developed a succinct elevator pitch:

The Office of Performance’s mission is to expand the use of performance information to guide decision making, promote WMATA’s benefit in the region, and unify employees around common goals.

This brief pitch, “inform, promote, unify,” has served well in starting conversations about performance management and clarifying that the office was



PHOTO: LARRY LEVINE, WMATA

not acting as performance police. WMATA General Manager and CEO Richard Sarles reports, “We have overcome barriers here by not using performance measures to punish, to find fault, to blame. This has not traditionally been the way performance measures have been used in operating agencies” (2).

3. Promote performance management.

Without leadership support, the effort to move toward performance management cannot succeed (3–6). As a concept, performance management is an easy sell—who would not want information to improve decision making, communication, and results? The challenge, however, is turning tacit executive support of performance management into active support by the executive management team.

At WMATA, the general manager holds monthly one-on-one meetings with each member of the executive team to discuss performance measure results and the actions leading to the results. The Office of Performance also encouraged the general manager to support the development of business plans across the agency through direct requests, participating in business plan workshops, and in companywide communications. The result was an increase in the number of departmental business plans from 2 in 2010 to 35 in 2013.

The bylaws of the WMATA Board of Directors include a directive for performance monitoring. Board of Directors Chair Tom Down has stated, “Focusing on performance data helps everyone be accountable for specific performance—it is a powerful management tool and a tool for telling our story to the public.” The Board’s regular requests and inquiries for performance information have established consistent pressure for WMATA to focus on results.

Nonetheless, the executive leadership should not be the only promoters of performance management.

A WMATA business plan meeting, including Jack Requa, Assistant General Manager of Bus Services, and Hercules Ballard, Managing Director, Office of Rail Transportation, addresses performance results.



PHOTO: LARRY LEVINE, WMATA

Michael Haizlip works on a Metrobus engine. Performance management facilitates efficiency in bus maintenance.



PHOTO: LARRY LEVINE, WMATA

Performance information led to a marked improvement in Metro escalator maintenance services and availability.

Leadership positions can experience a high degree of turnover; therefore focusing on institutional change at the staff level is critical. During the performance data inventory, organizations and agencies can identify departments, offices, and subunits that have embraced components of performance management. Focus on these early adopters by helping them strengthen the connection between their work and organizational goals and provide avenues to champion their accomplishments.

For example, at the first agencywide business planning meeting, the head of the escalator maintenance department described how performance information had helped employees make a dramatic turnaround in escalator availability. Nothing speaks louder than a peer-to-peer conversation. Nurture the emerging glimmers of performance management, and organizationwide change will follow.

4. Create a product.

Releasing a tangible product regularly can help in establishing performance management. The inventory of performance data may identify elements that could be combined, enhanced, or rebranded. WMATA developed the monthly *Vital Signs Report* (VSR) for the Board of Directors and management, along with a scorecard for the public that tracks long-term trends systemwide through 10 key performance indicators.

The VSR rebranded several Board of Directors reports and created a clear link to the agency's strategic goals and department business plans. Unlike many public performance reports, the VSR answers two questions: Why did performance change? What actions should be taken? A consistent, one-stop report, the VSR has helped close the gap between data riches and information poverty.

A stand-alone product like the VSR offers an opportunity to demonstrate that performance management does not mean performance policing. The product can clarify what performance management means and can articulate the benefits: informed decisions; evaluation of policies, programs, and projects; improved accountability; and better results. The performance product also can serve as the proof for the elevator pitch. WMATA's Sarles has noted, "We are still overcoming some old fears of performance measures, but we always focus on partnerships, breaking down silos, showing how you can use information to make a better decision" (2).

In creating a performance product, do not allow the perfect to be "the enemy of the good"—do not delay for the perfect measure or the perfect data—just get started (5). The VSR has demonstrated that publishing increases scrutiny of the data, which can cause some short-term trouble but in the longer term can increase data reliability.

Do not hold up a performance product because of missing data. Releasing a report with a "not available" notation may inspire a solution (7). Keep the intended audience in mind in developing the product. For example, WMATA's online scorecard was built to provide a quick view of agency performance for customers; in comparison, the content-rich VSR aims to provide the Board and management with an understanding of results and future actions. Finally, revamp the look of key performance products to ensure freshness and to keep the intended audiences interested.

5. Establish a common performance language.

Measures, goals, indices, metrics, standards, objectives, outcomes, outputs, targets, factors, criteria—are these terms interchangeable? To enhance internal and external communication and ensure that people are talking about the same subject, create a standard set of performance terms and definitions. Table 1 (page 39) shows the information from the WMATA performance terminology cheat sheet developed to establish a common language. Although performance management should not police performance, it can police the performance language.

Like other elements of performance management, common terminology takes a while to take hold. After four years, WMATA staffers now are correcting themselves when they say "goal" instead of "target."

6. Embrace the power of "why."

Performance products, tools, and discussions must include information about why the results are what they are. Focusing on the why clearly communicates



PHOTO: LARRY LEVINE, WMATA

The author facilitates the annual business plan kickoff meeting with senior managers from across WMATA.

that performance management intends to understand the results and identify improvements, not to punish. Too much focus on measures can be a pitfall (8). Scorecards and dashboards can become a distraction by emphasizing a 0.001 percent change instead of zeroing in on actions to improve results, on assessments of those actions, and on adjustments that may be necessary.

In addition to fostering a positive culture change, focusing on the why enables an agency to tell its story to external audiences. WMATA's VSR has provided opportunities to wrap performance data in a blanket of information. For example, instead of focusing on a 6 percent numerical change, the 2013 annual VSR explained that bus fleet reliability improved as a result of the midlife overhaul of clean diesel buses, the replacement of 100 older buses, and a partnership with manufacturers to resolve persistent battery problems.

Since release of the first VSR in June 2010, media coverage of WMATA's performance results has included direct quotes from the report. In addition, Board members have commented on how the VSR has created a platform for well-informed discussion.

7. Connect relentlessly to goals and objectives.

In addition to explaining the results, performance products need to remind users about the overarching reason for doing all of this—the goals. Agency goals should become the steady drumbeat in the background that inspires action—the goals should be ingrained in the subconscious of workers so that they live the performance management culture.

As noted in a recent conference paper, "Performance management is an organizational improve-

PHOTO: LARRY LEVINE, WMATA



ment process that hinges on aligning employee interest with the organization's objectives" (2). This is the "unify" in the Office of Performance's mission statement. Even agency goals set many years ago still can be intermingled into a variety of employee communications. WMATA's goal language appears in budget presentations, signature lines for e-mails, Board committee agendas, submission forms for Board items, and employee performance plans.

The department business plans that establish a direct connection between individual day-to-day work and agency goals have been a main product of the WMATA performance management effort. A one-

Members of the media tour WMATA's Bladensburg bus maintenance facility. Rehabilitation of the facility is part of a plan to improve performance results.

TABLE 1 WMATA Performance Terminology Cheat Sheet Data

<i>Term</i>	<i>Definition</i>	<i>Example from Department of Bus Maintenance</i>
Mission	Establishes the overarching purpose of the organization	WMATA provides safe, equitable, reliable, and cost-effective public transit
Goals	Provide direction for the organization to attain its mission	Meet or exceed customer expectations by delivering quality service
Performance measures	Track progress toward strategic goals	Bus on-time performance
Targets	Set end point or directions for measures	81 percent
Actions	Steps taken to move toward achieving strategic goals	Complete 100 midlife overhauls of the Orion VII compressed natural gas fleet and begin rehabilitation of new flyer diesel fleet
Business plans	Capture all of the above at a departmental level to document who at WMATA does what and by when	



PHOTO: LARRY LEVINE, WMATA

Replacement of older buses with the new 7000-series vehicles helped to improve the reliability of WMATA's bus fleet.

Shifting Metro crews' schedules helped increase on-time rail service—a result of data that showed the effect of track work on on-time performance.

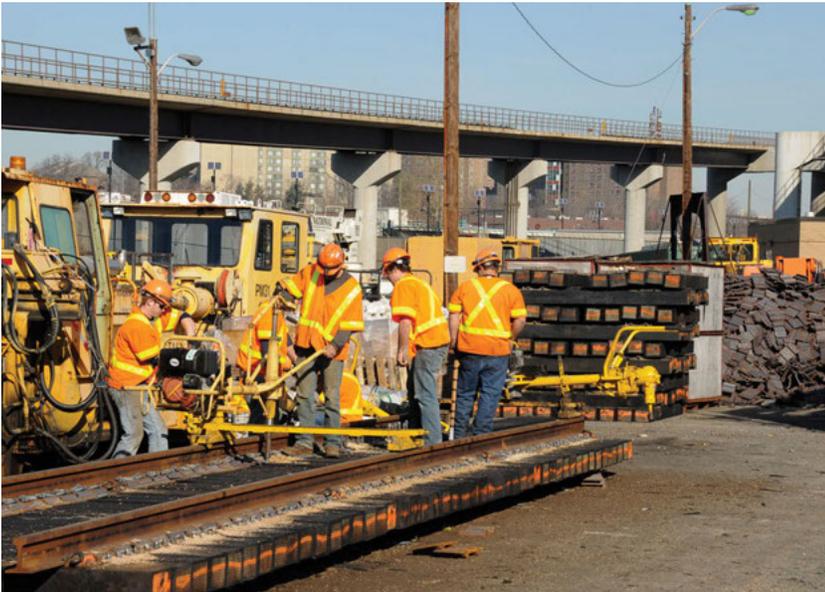


PHOTO: LARRY LEVINE, WMATA

page handout succinctly explains why staff should document the actions essential to making progress toward WMATA's goals, develop specific measures to track progress, set targets to define success, list specific staff responsible for each action, and highlight partnerships with other departments essential for success.

But why do all of this? The elevator pitch for business plans advances six main benefits: to improve performance; to show what the department does; to argue for support and resources; to move from a reactive to a strategic approach; to foster unity around goals; and to focus staff and resources. The primary benefit, however, is getting employees to understand that their individual actions directly contribute to the agency's success. For most, thinking about agency success above finite work assignments will represent a cultural change that will take

time; clearly explaining why individual employees should embrace this new performance management approach, therefore, is critical.

8. Define your touchdown.

Every year, WMATA executives conduct a work session facilitated by the Office of Performance to determine targets for the agency's key performance indicators. The Board of Directors uses these targets to evaluate the general manager annually; WMATA therefore strives for targets that push improvement but are realistic to attain.

The executives discuss historical data trends, planned activities, resource constraints, externalities that may influence results—such as major construction projects on bus routes—and performance results from peer agencies. The general manager takes the draft targets to the Board to finalize a mutually agreed-on set. Setting targets in a collaborative manner has focused the executive leadership team on specific performance areas, has increased buy-in to the measures, has revealed data problems, and has highlighted areas that need more resources.

WMATA has avoided targets that are unattainable, such as “100 percent on-time performance,” because these quickly can become meaningless. “Don't overreach,” Sarles advises. “If people feel the climb up the hill is so rigorous, they won't have the energy to start the climb” (2).

Moving the goal posts to make a touchdown more attainable is fine, but doing this midgame may damage credibility. WMATA's target-setting approach follows the five steps outlined in Table 2 (page 41):

- ◆ Identify the audience (e.g., Board of Directors),
- ◆ Select a purpose for the targets (e.g., to manage expectations),
- ◆ Evaluate inputs (e.g., performance trends),
- ◆ Determine the type of target (e.g., numbers that resonate with the intended audience), and
- ◆ Define the timeline (e.g., annual).

9. Assign staff to this effort.

An agency must be willing to dedicate resources to the performance management effort. A stand-alone resource like WMATA's Office of Performance is a rarity. The dedication of resources, however, could mean adjusting staff responsibilities. The person or people responsible for guiding performance management should be identifiable, like the owners of each action in the department business plans—agency employees should know the contact person for questions about performance management.

The elevator pitch, the internal marketing efforts, and the development of performance products

TABLE 2 Target-Setting Steps

1. Audience	External Internal
2. Purpose	Stretch Easy to attain Manage expectations
3. Inputs	Data trends Actions Resources Externalities Peers
4. Type of target	Percent change Number Return to base year Directional
5. Time frame	Weekly, monthly, etc.

should demonstrate the value in dedicating staff to implement performance management. Although a stand-alone office is not a requirement, implementing this organizational structure at WMATA sends a clear message to the organization, the Board of Directors, and the customers about the value of performance management.

10. Celebrate accomplishments along the way.

The transition to performance management takes time; therefore recognize the ongoing efforts and achievements by groups or individuals applying the principles of performance management. WMATA's Office of Performance maintains a so-called "jolly book," recording highlights. For example, the bus superintendents installed screens to display on-time performance results at each garage, showing operators how their actions have improved service. Other accomplishments include the use of data to articulate



PHOTO: LARRY LEVINE, WMATA

Performance management connects employees at all levels to an agency's mission.

the effects of track work on rail on-time performance; the use of preventive maintenance trends to argue successfully for additional escalator maintenance staff; and a railcar location tool allowing operations to position cars better for service.

Publicly highlight improved performance results. A sign posted across the system noted that WMATA's escalators had achieved the highest availability in almost five years. As one bus director commented, "Aren't improved results the whole point?" Celebrating these accomplishments along the way will make the slow evolution toward performance management seem faster.

Take the First Step

The ten steps outlined in this article are intended to make the performance management implementation path less steep and less forbidding. The overarching message is that every agency can and should do this. The transition will not occur overnight—therefore get started as soon as possible.

WMATA's experience shows that performance management can permeate an organization and can demonstrate at all levels—from the front-line workers to the CEO—that individual actions will help an agency reach the goals. Remember the elevator pitch: inform, promote, and unify.

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PHOTO: LARRY LEVINE, WMATA

Publicizing agency successes can bolster the implementation of performance management.

Sharing Knowledge, Improving Decisions, and Establishing Accountability

Comparative Performance Measurement Demonstrates Benefits

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The successful implementation of performance management during the past decade has improved accountability in the transportation industry and has identified effective practices. Establishing consistent, comparative performance measures for key areas of national interest—while retaining flexibility for agencies to customize the measures—has accelerated the implementation of performance management across the states.

Problem

Comparing the performance of the transportation system and of state agencies at a national level is a daunting challenge. Some of the underlying issues include the following:

- ◆ The national data infrastructure is inadequate for providing direct and accurate comparisons among states;
- ◆ Data measured by every state cannot be com-

pared directly for a variety of reasons, such as inconsistencies in definitions or in sample sizes or the use of collection techniques that introduce biases;

- ◆ Measures are interpreted differently in varying contexts—for example, congestion indicates economic activity for some, but deficiencies in the infrastructure for others;

- ◆ Substantial narrative information is needed to tell the national, as well as an individual state agency's, performance story properly; and

- ◆ Agencies have concerns about invalid conclusions drawn from comparisons.

Despite these complications, several members of what became the American Association of State Highway and Transportation Officials' (AASHTO's) Standing Committee on Performance Management recognized the need for states to work together to provide “apples to apples” comparisons on performance indicators relevant to transportation.



PHOTO: STEVEN VANCE FLICKR

As a performance measure, traffic congestion is hard to classify—it can be considered a sign of economic activity or of poor infrastructure.

TABLE 1 Comparative Performance Measure Summary

NCHRP Project ^a	Study Contribution	Published
Project Delivery, 20-24(37)A	Compared performance and established effective practices by state DOTs for delivering transportation construction projects on time and on budget.	2007
Pavement Condition, 20-24(37)B	Compared performance and established effective practices by state DOTs for pavement smoothness, a feature highly valued by all travelers and shippers.	2008
Bridge Conditions, 20-24(37)E	Compared performance and established effective practices by state DOTs for addressing bridge conditions.	2010
Traffic Safety, 20-24(37)C	Compared performance and established effective practices by state DOTs for traffic safety, specifically in reducing highway fatality rates.	2009
Traffic Operations: Incident Response, 20-24(37)D	Compared performance and established effective practices by state DOTs for traffic incident management, specifically in reducing roadway and incident clearance time.	2011

^a All of the NCHRP comparative performance measure reports are available at: <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=543>.

Comparative Research Initiative

The first pilot project began in 2006 by testing the value of comparative performance measurement among seven volunteer states. The pilot yielded insightful findings and led to the first of a series of AASHTO-sponsored projects, funded through the National Cooperative Highway Research Program (NCHRP), exploring comparative performance measurement in several subject areas (Table 1, above).

For each measurement area, the research compiled detailed performance data from state DOTs, calculated performance measures for each agency, developed peer groups for comparative analysis, identified the top tier of agencies for the selected measures, scrubbed and normalized the data, and conducted interviews to determine the practices related to high performance.

These efforts covered an array of subject areas and demonstrated the viability of national-level performance measures. Each project can be regarded as trailblazing, because each provided insights and effective practices in a particular subject area. The collective success has led to the identification of new opportunities and support for exploring additional performance topics for a national, comparative analysis.

Results

Information from one of the comparative performance measurement research efforts—on pavement smoothness—is detailed in the sidebar on page 44. The full series of efforts demonstrated that state DOTs working together can develop acceptable measures and compare performance in areas critical to the mission of every state DOT.

The participating state DOTs reported that the projects helped in addressing many of the functions and processes that drive internal performance measurement programs, such as identifying benchmarks, responding to stakeholder demands for more accountability, exploring solutions for emerging business challenges, making continuous improvements, and increasing the focus on customer expectations.

In addition, this applied research demonstrated the following:

1. Rigorous methodologies for comparative measurement are achievable;
2. Comparative data can be collected; and
3. Identifying effective, ready-to-adopt practices can overcome resistance by agencies suspicious that national comparative performance measurements may devolve into winner-and-loser rankings.

Alaska Department of Transportation and Public Facilities (DOT&PF) implemented safety measures such as signage.



PHOTO: ALASKA DOT&PF



PHOTO: ALASKA DOT&PF

Rumble strips and other engineering improvements on Alaska's roads were examined in NCHRP comparative performance measurement project.

Benefits

By identifying and developing a common terminology, thresholds, and standards for national performance measures, agencies were able to review not only their own performance but to glean ideas that could be adopted or expanded from high-performing agencies.

The knowledge gained from this series of comparative performance measurement research projects has been invaluable and has proved a critical, foundational step as state DOTs and metropolitan planning organizations prepare to implement the performance measurement requirements of the Moving Ahead for Progress in the 21st Century Act. The comparative performance measurement projects have validated the vision and possibility of a performance-based transportation program that focuses on key areas of national interest and enables effective

practices tailored to individual states' needs.

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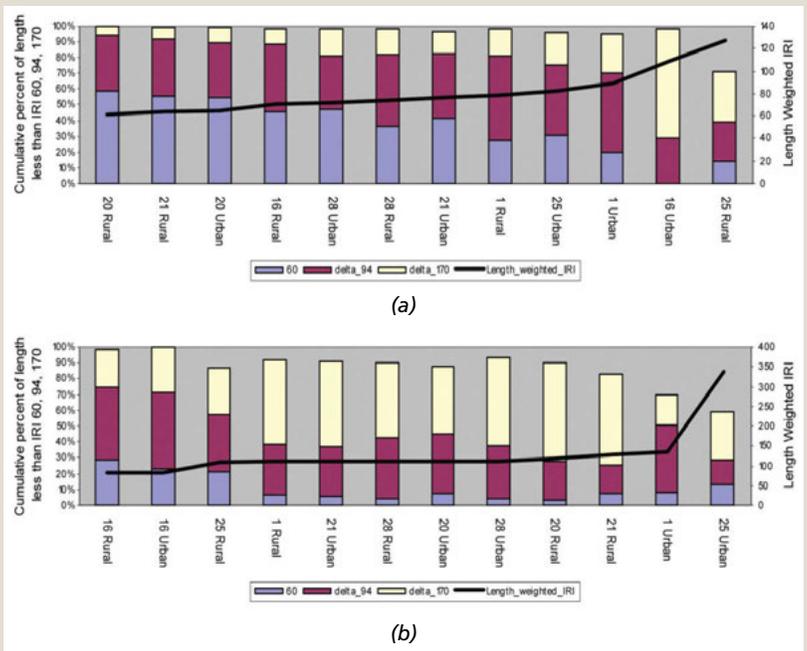
Suggestions for Research Pays Off topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2956; gjayaprakash@nas.edu).

Pavement Smoothness Eases the Way

National Cooperative Highway Research Program (NCHRP) Project 20-24(37)B, Measuring Performance Among State Departments of Transportation: Sharing Good Practices Based on the International Roughness Index, produced the second report on comparative performance measures. The project identified states that have achieved exemplary performance, analyzed the practices that have contributed to success, and documented the practices for other states.^a

Pavement smoothness is an important performance measure for all states—travelers and shippers value the feature highly, and several studies have found that smooth pavement reduces vehicle operating costs. The Federal Highway Administration's Highway Performance Monitoring System requires all states to collect and report International Roughness Index (IRI) data for roads in the National Highway System. The importance of this measure to states and the availability of relatively consistent data across agencies made pavement smoothness a good candidate for comparative performance measurement. After agreeing to the data requirements and definitions, 32 states collected data for rigid and flexible pavements, climate conditions, and other relevant categories; the categories identified peer states and enabled more accurate comparisons.

The accompanying figures show the comparative results for flexible and rigid pavements in the peer group of states with a dry-freeze climate. Each bar represents the rural and urban Interstate pavements in a particular state, identified by a ran-



International Roughness Index performance comparisons in dry-freeze climate: (a) flexible pavement; (b) rigid pavement. [Source: NCHRP Project 20-24 (37)B, Measuring Performance Among State DOTs: Sharing Good Practices Based on the International Roughness Index.]

dom number, not by name, to protect against misuse of the results to generate rankings. The left y-axis indicates the percentage of highway miles that fell below the IRI cutoff values of 60, 94, and 170 in./mi. The space above the bar indicates pavement sections with an IRI above 170 in./mi. The right y-axis shows the average IRI, length-weighted by centerline mile, traced by the graph line superimposed on the bars.

^a All of the NCHRP comparative performance measure reports are available at <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=543>.

CALENDAR

TRB Meetings

August

- 18–22 NURail and Summerail Conference*
Altoona, Pennsylvania
- 25–27 15th Biennial Harbor Safety Committee and Area Maritime Security Committee Conference
Philadelphia, Pennsylvania
- 25–28 4th International Symposium on Naturalistic Driving Research
Blacksburg, Virginia
- 26–29 Transportation-Related Environmental Analysis Summer Conference
Nashville, Tennessee

September

- 15–17 Transportation and Federal Land Partnership Enhancing Access, Mobility, Sustainability, and Connections to the American Great Outdoors
Washington, D.C.
- 15–18 Pavement Evaluation 2014*
Blacksburg, Virginia
- 21–24 6th Biennial Northeast Transportation and Wildlife Conference*
Burlington, Vermont
- 25–27 2nd International Conference on Access Management*
Shanghai, China

- 29– Oct. 1 European Transport Conference*
Frankfurt, Germany

October

- 14–16 International Symposium on Pavement Life Cycle Assessment
Davis, California
- 26–29 21st National Conference on Rural Public and Intercity Bus Transportation: Setting Our Course for the Future*
Monterey, California
- 29–31 Shaping the New Future of Paratransit: An International Conference on Demand-Responsive Transit
Monterey, California

November

- 3–7 3rd International Conference on Connected Vehicles and Expo*
Vienna, Austria

December

- 4–5 National Accelerated Bridge Construction Conference*
Miami, Florida
- 10–11 8th University Transportation Center Spotlight Conference on the Role of Transportation in Economic Competitiveness
Washington, D.C.

2015

January



11–15 TRB 94th Annual Meeting
Washington, D.C.

For information, visit
www.trb.org/AnnualMeeting2015/AnnualMeeting2015.aspx.

March

- 23–26 2015 Joint Rail Conference*
San Jose, California

May

- 17–19 Ninth National Aviation System Planning Symposium
Charleston, South Carolina
- 18–22 9th International Conference on Managing Pavement Assets*
Alexandria, Virginia
- 24–26 Fifth International Symposium on Nanotechnology in Construction*
Chicago, Illinois
- 31– June 2 5th International Conference on Transportation Systems Performance Measurement and Data
Denver, Colorado

For additional information on TRB meetings, including calls for abstracts, meeting registration, and hotel reservations, visit www.TRB.org/calendar, call 202-334-2934, fax 202-334-2003, or e-mail TRBMeetings@nas.edu.

*TRB is cosponsor of the meeting.

Harry Allen Capers, Jr. Arora and Associates, P.C.

In his 32 years scoping, designing, constructing, operating, inspecting, and maintaining bridges for the New Jersey Department of Transportation (DOT), Harry A. Capers, Jr., has been able to work on many major bridge replacement and rehabilitation projects. “My career occurred during some exciting years, starting with the push to complete the Interstate system up to addressing the needs of the Interstate projects that were built in the 1950s,” he comments.

Capers’ career tracked the DOT’s rapidly changing focus, from operating the state’s highway system to considering the impact of transportation infrastructure on land development, economic growth, resource and energy use, and the environment. “Further complicating the issue were rapid changes in the introduction of new technologies, materials, and tools for the construction indus-



“Engaging research assets allowed me to make data-driven technical decisions to address problems that existing standards and practices did not clearly cover.”

try to do things bigger, faster, and more economically,” he recalls. “I was faced with the challenge of providing safe and serviceable structures while balancing multiple trade-offs—cost, service, risk, and the pressure to include sustainability.”

After graduating in 1974 from the Polytechnic Institute of New York (now the New York University Polytechnic School of Engineering), Capers was commissioned as a second lieutenant in the New Jersey National Guard, which he served until his retirement in the rank of major in 1996. He started at New Jersey DOT as an engineer trainee in the Highway Design office, soon thereafter transferring to the Bridge Design office and progressing to principal engineer. Later, as supervising highway engineer in the Division of Bridge Design, he developed project scopes for structural work based on design studies and field investigations; reviewed consultant designs, bids, and fees; and oversaw projects.

In 1991, Capers was promoted to manager of the Bureau of Structural Project Management, responsible for planning and organizing all structural work in the agency’s construction contracts. He entered senior executive service in 1996, assuming major policy responsibilities for structural and bridge design projects. He led a major reorganization of personnel and duties within the bridge area of New Jersey DOT, resulting in the new

Office of Structural Engineering, directed a complete rewrite of the agency’s *Bridges and Structures Design Manual*, streamlined bridge inspection standards, and managed a major revision of the prequalification criteria for approval of consultant firms. In assuming this position, he also became the New Jersey state representative to the American Association of State Highway and Transportation Officials (AASHTO) Bridge Subcommittee. In 2003, he worked with the Federal Highway Administration as a load and resistance factor design (LRFD) resource and facilitator for implementation of LRFD in 12 states.

Capers was assigned to the New Jersey DOT Office of Transportation Security in 2004 to coordinate infrastructure vulnerability assessments; develop, evaluate, and recommend new standards and procedures for critical highway infrastructure projects; and implement best-practice and other security programs. In 2006, Capers retired from state service and brought his bridge expertise to Arora and Associates to serve as vice president and corporate bridge engineer. As principal investigator on the National Cooperative Highway Research Program (NCHRP) U.S. Domestic Scan Program, Capers facilitates information exchange among transportation agencies throughout the country and currently is responsible for 29 individual scans on a variety of transportation projects.

Throughout his career, Capers has harnessed research to help guide decision making. “I needed a more rigorous scientific understanding of the behavior of the bridges, materials, and codes I was dealing with to make data-driven decisions that would address these new challenges and still ensure safe, serviceable, and durable structures,” he observes. He turned to colleagues who administered formal research programs. “Engaging research assets allowed me to make data-driven technical decisions to address problems that existing standards and practices did not clearly cover,” he notes.

Capers contributed to bridges and structures research over many years of service to TRB committees. In 2000, Capers joined the General Structures Committee, serving as chair and also as a member of the Structures Section from 2004 to 2010. He is a member of the Bridge Preservation Committee and has served on the Long-Term Bridge Performance Committee, the planning committees for two international bridge engineering conferences, and the Bridge Management Committee. He has chaired many NCHRP panels since the late 1990s and currently leads the NCHRP Project Panel on Large-Scale Abutment Scour Protection.

“If I have been confronted by an issue, it is highly likely that others in similar positions have been, too,” Capers muses. “Researchers are among the best assets available in this regard. Such sharing of knowledge is extremely important—we can’t afford to keep learning the same lessons over and over.”

Douglas W. Harwood

MRIGlobal

As program director at MRIGlobal's Transportation Research Center, Douglas W. Harwood focuses on two technical areas: documenting the safety and traffic operational effectiveness of highway geometric design features and developing and applying analysis tools for the safety management of highway infrastructure.

In his research, Harwood has quantified the traffic operational and safety effects of roadway and traffic control features including left- and right-turn lanes, sight distance, and median widths at intersections; passing and no-passing zones on two-lane highways; passing and climbing lanes; pedestrian crossings; and pavement surface friction. Through the National Cooperative Highway Research Program (NCHRP), he has assisted with the technical updating and editing of the 2001 and 2011 editions



"With analysis tools, every project can be planned and designed to improve safety."

of the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets*. Commonly known as the Green Book, this volume helps ensure that highway geometric design criteria are based on research results. Harwood also developed the traffic operational analysis procedure for two-lane highways presented in the TRB *Highway Capacity Manual*.

Harwood has led or contributed to the development of many tools for safety management of highway infrastructure, including AASHTO's *Highway Safety Manual* (HSM) and its Safety Analyst software tools, the Federal Highway Administration's Interactive Highway Safety Design Model (IHSDM), and U.S. Road Assessment Program (usRAP) tools.

Harwood received a bachelor's degree in civil engineering from Clarkson University in Potsdam, New York, and a master's degree, also in civil engineering, from Purdue University in West Lafayette, Indiana. In 1973, he joined MRIGlobal—a not-for-profit research institute in Kansas City, Missouri, formerly Midwest Research Institute—as assistant engineer. He became program director at MRIGlobal Transportation Research Center in 2003.

Harwood presented a paper at the 1999 TRB Annual Meeting that triggered interest in assembling the HSM and that played a key role in the development of the first edition, published in

2010. Harwood led the engineering of Safety Analyst, wrote the original conceptual plan for IHSDM, and served as principal investigator of the usRAP program. He also has applied these tools to safety and traffic operational analyses in the project development process for state departments of transportation (DOTs).

"It is especially rewarding to see highway design criteria and the safety management process based increasingly on research results instead of engineering judgment," Harwood comments, adding that Safety Analyst and usRAP tools can help highway agencies identify appropriate safety improvement locations and select appropriate countermeasures; with HSM and IHSDM procedures, agencies can quantify the anticipated safety effects of highway infrastructure projects and can compare the safety performance of design alternatives. "This enables safety to receive the full consideration it deserves in project decision making, along with other key factors that were already addressed quantitatively—traffic operations, environmental impacts, energy consumption, right-of-way and community impacts, and construction cost," he notes.

The new safety management tools allow for practical benefit–cost analyses for proposed projects and efficient evaluation of the effectiveness of completed projects. "In today's limited-funding environment, we need to maximize the reduction in fatalities and serious injuries with every available dollar in our highway improvement budgets," Harwood notes. "This need not be limited to projects funded by safety programs—with analysis tools, every project can be planned and designed to improve safety."

Harwood joined the TRB Operational Effects of Geometrics Committee in 1980, serving as chair from 1999 to 2005. He was named emeritus member in 2006. He chaired the steering committee for the Fourth International Symposium on Highway Geometric Design in 2010, a collaboration of the Operational Effects of Geometrics and Geometric Design committees, and is leading the steering committee for the Fifth International Symposium on Highway Geometric Design in 2015. Harwood also was a member of the Joint Subcommittee on Development of the *Highway Safety Manual*, the Task Force on Development of the *Highway Safety Manual*, and, since its formation in 2011, the Highway Safety Performance Committee. He is chair of the Highway Safety Management Subcommittee. He served on the Highway Capacity and Quality of Service Committee from 1990 to 1999 and chaired its Two-Lane Roads Subcommittee.

Harwood is a member of the Committee for Review of the U.S. DOT Truck Size and Weight Study. He also served on the second Strategic Highway Research Program Technical Coordinating Committee for Safety Research and is a member of the International Road Assessment Program's Global Technical Committee. He is a three-time recipient of TRB's D. Grant Mickle Award for technical papers related to operations and maintenance of transportation facilities.

International Conference Highlights Women's Issues in Transportation

KATHERINE F. TURNBULL

The author is Executive Associate Director, Texas A&M Transportation Institute, and past Chair, TRB Technical Activities Council.

The discussion of women's issues in transportation has come a long way since the first conference on the subject in 1978. The Transportation Research Board (TRB) Women's Issues in Transportation Committee has been at the forefront, identifying and advancing needed research, facilitating ongoing communication and coordination on key topics, and partnering with other organizations to move research results into practice and to share experiences.

The 5th International Conference on Women's Issues in Transportation, April 14-16, 2014, in Paris La Défense, France, continued a long-standing tradition of excellence, scholarship, and interaction. The conference was sponsored by the French Institute of Science and Technology for Transport, Development, and Networks (IFSTTAR) and organized by France's Transport Research Arena (TRA) and TRB. Women's Issues in Transportation Committee member Ariane Dupont, IFSTTAR, chaired the conference planning committee.

Focusing on the theme of "Bridging the Gap," the conference featured keynote presentations, breakout sessions, poster sessions, and master classes, offering interactions with leading women researchers and policy makers. Nearly 220 participants from 36 countries attended the conference.

Participants—men and women—discussed a range of topics, including women's issues related to safety, mobility, technologies, bicycling, public policy, and employment in the transportation sectors. Technical tours of the Musée de l'Air et de l'Espace (the Air and Space Museum) and bicycling trips through Paris allowed participants to experience local transportation up close.

The conference dinner, hosted by the Fédération Internationale de l'Automobile (FIA), was held at FIA headquarters. A second-floor balcony of the building provided an ideal vantage point for view-



PHOTO: MARCIA ANDERSON-BOMAR

Recipients of special achievement awards from Fédération Internationale de l'Automobile were (left to right) Sandra Rosenbloom, Susan Herbel, and Maryvonne Plessis-Fraissard.

ing the traffic flow in Place de la Concorde—a mesmerizing view of automobiles, buses, trucks, motorcycles, mopeds, bicycles, and pedestrians navigating the area—and missing each other.

Moderated by Mary Crass, International Transport Forum, a panel of speakers provided a range of perspectives on transportation. Michele Mouton highlighted her experience as a rally driver who competed at the World Rally Championships and in other international events. Marie-Claude Heys described her participation in the Whitebread Round the World Race and other international sailing events, and Roselyne Bachelot-Norquin summarized her career as a French politician and television commentator.

The dinner also featured the first FIA special achievements awards for promoting women and women's issues in transportation. FIA President Jean Todt presented awards to Susan B Herbel, Cambridge Systematics, Inc.; past TRB Executive Committee Chair Sandra Rosenbloom, Professor, University of Texas at Austin and Senior Fellow, Urban Institute; and Maryvonne Plessis-Fraissard, formerly with the World Bank and now an independent consultant. All three recipients are longtime and continuing TRB volunteers.

The conference helped bridge gaps in research, policy, and practice on a range of topics and in experiences in different countries. Plans for the 6th International Conference on Women's Issues in Transportation already are under way; date and location are to be announced.

Conference participants took part in a bicycle tour of Paris.



PHOTO: MARCIA ANDERSON-BOMAR

Opening Corridors to the Future for Rising Researchers

TRB's Young Members Council Cultivates Leadership and Involvement

JOUNG LEE, ALISON CONWAY, AND LUCY PRIDDY

Lee is Associate Director for Finance and Business Development, American Association of State Highway and Transportation Officials. Conway is Assistant Professor, City College of New York, and 2014 Chair of the Young Members Council. Priddy is Research Civil Engineer, U.S. Army Corps of Engineers. Lee and Priddy are past Chairs of the Young Members Council.

Alison Conway, current Young Members Council president, guides a roundtable discussion for young members of TRB standing committees at the 2012 TRB Annual Meeting.

As newspaper headlines warn of the brain drain in the American workforce resulting from a wave of retiring baby boomers, the transportation industry suffers from an image problem and is perceived as a relatively poor career choice compared with other options. A 2004 University of Denver study found that only 2.6 percent of students expressed interest in transportation from a list of 14 career sectors.

To attract and retain the best young talent for the transportation research sector, TRB established the Young Members Council (YMC) in 2011. Although many efforts had helped educate and involve new and young members—such as the well-attended welcome session at the beginning of every TRB Annual Meeting and Young Member slots on TRB standing committees—no institutionalized efforts strategically developed and targeted resources to those interested in transportation industry careers. With support from the TRB Executive Committee and Technical Activities Council, as well as grassroots enthusiasm and leadership from younger TRB veterans, the YMC took root in the Design and Construction and the Planning and Environment Groups and eventually became involved in all of the discipline-based groups within the organization.

Crucial Mission

The mission of the YMC—to encourage and expand participation by young professionals in all aspects of the TRB community—may seem fairly straightforward, but is crucial to the future success of TRB and to the industry as a whole. Composed of 16 members serving three-year terms, the YMC strives to serve young professionals advancing the national transportation research agenda.

The young members represent a variety of technical areas and lead 10 discipline-specific YMC subcommittees, which include the following:

- ◆ Aviation,
- ◆ Design and Construction,
- ◆ Freight Systems and Marine,
- ◆ Legal Resources,
- ◆ Operations and Preservation,
- ◆ Planning and Environment,
- ◆ Policy and Organization,
- ◆ Public Transportation,
- ◆ Rail, and
- ◆ Safety and Systems Users.

Now in its third year, the YMC continues to progress toward the goal of providing opportunities for involvement, resources, networking, and representation for young professionals and students at all levels of TRB. At the 2014 Annual Meeting, the YMC sponsored or cosponsored 25 events with its subcommittees. Four workshops introduced young members and other interested attendees to the fundamentals of aviation, marine transportation, safety, and transportation operations, and in a fifth workshop, panelists including young and seasoned professionals working in different areas of transportation research shared their experiences and provided career advice.

The council also sponsored or cosponsored a variety of panel and poster sessions that included cross-cutting expert panels and opportunities for young members to present their own work. In two “Emerging Professionals” podium sessions and one “Work-in-Progress” poster session, young researchers presented ongoing work and received constructive feedback from expert audiences. For the second year, young



PHOTO: RABON PHOTOGRAPHY



PHOTO: RISSON PHOTOGRAPHY

Lee (center) confers with 2013 TRB Executive Committee members (left to right) John Halikowski, Paula Hammond, Mike Hancock, Sandra Rosenbloom, and Joan McDonald about guidance for YMC initiatives.

Opening Corridors to the Future (continued from page 49)

professionals also competed in a transportation start-up challenge, “The Six-Minute Pitch,” and presented inventive technology ideas to a panel of mock investors.

Networking and Mentoring

In addition to developing Annual Meeting sessions, the YMC has worked to promote networking opportunities for young members and to increase their involvement in TRB committees. At the 2014 Annual Meeting, the YMC participated in the New and Young Attendees Welcome Session, providing information about resources such as guides, websites, and social media. The Young Professionals reception, cohosted by YMC and Young Professionals in Transportation, an international professional association and close YMC partner, had a record turnout. In addition to promoting informal networking, the council is working to establish formal mentoring opportunities.

In 2014, the YMC Freight Systems and Marine Subcommittee piloted a mentoring program, working with four TRB standing committees—Freight Planning and Logistics, International Trade and Transportation, Ports and Channels, and Urban Freight—to match interested young members with veteran mentors.

To recognize the contributions and achievements by young members to TRB and the transportation profession, the YMC developed the TRB Outstanding Young Member Award in 2012. The first award was presented at the 2013 Annual Meeting to Stephanie Camay, Parsons Brinckerhoff; the second was pre-

sented to Stephane Hess, University of Leeds, United Kingdom, in 2014. With the support of Stantec, the YMC will continue to issue annual calls for nominations for this award to ensure the recognition of rising leaders in the transportation industry.

Future Strides

Looking to the future, the YMC hopes to expand on its successes to promote even more involvement by young members in TRB and to tackle the challenges unique to its associates. Through innovative sessions, recognition and networking opportunities, and expansion of its formal mentoring program, the YMC aims for increased involvement at the 2015 TRB Annual Meeting.

The council and its subcommittees will extend activities beyond the meeting, through webinars, social media, and other communication methods, to engage new audiences, such as young professionals and students who may be unable to attend the meeting. The YMC subcommittees will collaborate with TRB committee leaders and members to strengthen and expand discipline-specific outreach.

Aware that the transportation research community needs to recruit and involve its new and young members, TRB leadership has directed the YMC to seek out ideas from students and young professionals and to represent their interests. By providing less-intimidating opportunities for input and engagement from new participants—and many of their peers—the YMC will continue to be a key liaison to TRB leadership and the broader research community.

For more information about YMC or to access YMC resources for new and young members, please visit the YMC’s website at www.trb.org/abouttrb/ymc.aspx.



PHOTO: RISSON PHOTOGRAPHY

Conway and Priddy at the start of the TRB Executive Committee policy session, January 2014.

Registration for 2015 Annual Meeting Opens in September

MARK R. NORMAN

The author is Director, Technical Activities, TRB.

For the first time in almost 60 years, the TRB Annual Meeting will be moving to a new venue. TRB's 94th Annual Meeting will be held at the Walter E. Washington Convention Center in Washington, D.C., January 11–15, 2015. This is the fourth in a series of articles on the move.

Prepare for Registration and Housing

Registration for the TRB 94th Annual Meeting opens in September 2014. TRB has contracted with approximately 20 hotels to provide guest rooms at the prevailing government per diem rate—currently \$184 per night. These rooms will be made available only to those who register for the meeting and can be reserved as part of the online meeting registration process.

All prospective attendees are encouraged to visit the TRB Annual Meeting website at www.TRB.org to become familiar with the hotel options and to prioritize choices before beginning the registration process.

The Walter E. Washington Convention Center is located between 7th and 9th Streets and N Street and Mt. Vernon Place, NW, in downtown Washington, D.C., across from the Carnegie Library at Mount Vernon Square, and approximately 1 mile north of the National Mall. The new Marriott Marquis Hotel is directly across 9th Street from the Convention Center, and the two buildings are connected by a short underground walkway.

Sessions, exhibits, posters, and most large events will take place in the spacious Convention Center. Most committee meetings will be held in the Marriott Marquis.

In considering hotel options, attendees should be mindful that the Marriott Marquis can accommodate only about 20 percent of those who will need hotel rooms for the Annual Meeting. Alternatives range from large chain hotels to boutique hotels to hotels that offer primarily suites. Locations include the immediate vicinity of the Convention Center and trendy Washington, D.C., neighborhoods such as Dupont Circle.

The hotels in the TRB room block are easily accessible to the Convention Center. Visit the TRB Annual Meeting website for more information about each hotel and about transportation options. No shuttle buses operate between hotels and the Annual Meeting sites.



PHOTO: TIMOTHY CAMARDA

Most committee meetings at the 2015 TRB Annual Meeting will take place at the Marriott Marquis.

What Does the Fee Include?

All TRB Annual Meeting registrants will receive the following benefits:

- ◆ Eligibility to reserve hotel guest rooms at the government per diem rate;
- ◆ Admission to more than 800 workshops and sessions, with more than 4,000 presentations featuring the latest research and developments in transportation;
- ◆ Access to more than 350 meetings organized by TRB standing committees and task forces to provide networking opportunities;
- ◆ Three days of exhibits showcasing the latest in transportation-related products and services;
- ◆ Access to the Annual Meeting Interactive Program and Mobile App, available in early November, to enable advance planning of itineraries and schedules management during the meeting;
- ◆ Complimentary wi-fi access in public areas, meeting rooms, sessions, the exhibit hall of the Convention Center, and in the Marriott Marquis; and
- ◆ Complimentary use of TRB Annual Meeting Online, which provides access to the papers and presentations delivered at the meeting.

The spotlight theme for the 94th TRB Annual Meeting is “Corridors to the Future: Transportation and Technology.”

To learn more about the meeting and to register, visit the TRB Annual Meeting webpage at www.TRB.org.



TECHNICAL TRAINING—Brian J. Turner, Transportation Learning Center, outlines a recently completed Transit Cooperative Research Program (TCRP) project to establish a system of qualification for rail vehicle technicians, integrating national training standards, progressive classroom curricula and introductory courseware, on-the-job learning modules, mentoring, and more. The TCRP Oversight and Project Selection Committee met June 27 and 28 at the Keck Center to review program progress and funding.

Mitigation of Weldment Cracking of Highway Steel Structures

Structural supports for signs, luminaires, traffic signals, and other highway steel structures generally are galvanized to prevent corrosion and to ensure a long service life. The galvanizing process induces cracking in some weldments, however, and these flaws can reduce the service life and lead to unsafe conditions.

The University of Kansas has received a \$499,975, 30-month contract [National Cooperative Highway Research Program (NCHRP) Project 10-94, FY 2014] to propose improved design, materials, and construction specifications of galvanized steel highway structures to mitigate weldment cracking caused by galvanizing.

For more information, contact Amir N. Hanna, TRB, at 202-334-1432 or ahanna@nas.edu.

Pavement Performance Measures Considering Preservation Treatments

Pavement preservation maintains and improves the functional condition of a highway system, slows deterioration, and can lead to improved pavement performance, longer service life, and reduced life-cycle costs. Current measures for quantifying pavement performance do not account for potential enhanced performance, longer life, and cost savings that result from preservation treatments; for example, the International Roughness Index (IRI) widely used by highway agencies for measuring pavement smoothness does not effectively measure the impact of preservation treatments.

AMEC Environmental & Infrastructure, Inc., has received a \$399,993, 24-month contract (NCHRP Project 14-33, FY 2014) to identify and develop pavement performance measures that consider the contributions of preservation to performance, service life, and life-cycle costs.

For more information, contact Amir N. Hanna, TRB, at 202-334-1432 or ahanna@nas.edu.

SECOND STRATEGIC HIGHWAY RESEARCH PROGRAM NEWS



VISION FOR DATA—Amir Tamrakar, SRI, presents information on a comprehensive coding system for driver behavior analysis at a workshop of the second Strategic Highway Research Program (SHRP 2) July 11 at the National Academies' Keck Center in Washington, D.C. The workshop focused on the development of tools to support and analyze the vast collection of naturalistic driving study data assembled under SHRP 2. Other topics included video analytics to quantify driver distraction and engagement, machine learning for automated video analysis, and identity masking systems.

Guidelines for Maintaining Small-Movement Bridge Expansion Joints

Bridge expansion joints accommodate bridge movement and rotation and protect bridge elements from runoff water and deicing chemicals. Proper performance of bridge expansion joints strongly affects the service life of bridge elements and the bridge's long-term serviceability.

Because many extensive bridge rehabilitations and replacement projects are the results of poor joint condition, bridge owners often invest significant resources in the design, construction, and maintenance of expansion joints. Improper sizing of the joint seal, poor substrate preparation, and bad application are common problems in bridge joint performance. Bridge owners need clear guidelines for evaluating and maintaining bridge expansion joints to overcome these failure mechanisms.

The University of Delaware has received a \$150,000, 18-month contract (NCHRP Project 12-100, FY 2014) to develop proposed guidelines with commentary for evaluating and maintaining small-movement bridge joints.

For more information, contact Waseem Dekelbab, TRB, at 202-334-1409 or wdekelbab@nas.edu.

The number of bicycle-vehicle crashes at intersections decreases as the number of bicyclists passing through the intersection increases, University of Colorado researchers found.



PHOTO: LAURA SANDT, WWW.PEOPLEIMAGE.ORG

More Bicyclists, Fewer Collisions

Researchers at the University of Colorado, Denver, examined bicycle-vehicle crashes in Boulder, comparing crash data with bicycle count data in a city that has one of the highest rates of bicycling in the country—approximately 12 percent of the population. Researchers created safety performance functions (SPFs) to model the mathematical relationship between the frequency of crashes and major related factors for bicycles in Boulder and also studied crashes at intersections throughout the city.

According to study coauthors Bruce Janson and Krista Nordback, the chance of collision at a given intersection decreased as the number of bicyclists rose. More accidents occurred at intersections with fewer than 200 bicyclists per day. The reasons for the inverse relationship between the numbers of cyclists and bicycle-vehicle crashes are unknown, but hypotheses include driver behavior changes in areas known to have heavier bike traffic and a possible preference for safer areas on the part of cyclists.

For more information, contact Ann Williams, University of Colorado, Denver, at 303-880-0597 or Ann.Williams@ucdenver.edu.

Tax Options for Funding Transit

Most Americans support higher taxes for transportation—under certain conditions—according to a report from the Mineta Transportation Institute (MTI). The national public opinion poll, a random-digit dialing of 1,503 respondents in March and April

2014, was conducted in English or Spanish. Respondents were asked if they would support 11 specific tax options for raising federal transportation revenues: variations on raising the federal gas tax rate, creating a new mileage tax, and creating a new federal sales tax. Other questions explored perceptions surrounding public transit and taxes that would support public transportation.

According to the MTI findings, 69 percent of respondents supported a gas tax increase of 10 cents per gallon to improve road maintenance; however, when the use of the revenues was described generally as maintenance and improvement of the transportation system, only 25 percent of respondents supported the measure. A hypothetical sales tax for undefined transportation purposes received much higher support than did a gas tax increase or a new mileage tax.

Researchers collected data on the standard sociodemographic factors and on the travel behavior of respondents, such as public transit use, annual miles driven, and vehicle fuel efficiency. Most respondents affirmed that they wanted good public transit service in their state, and approximately two-thirds of respondents supported spending gas tax revenues on transit. Few expressed support for raising the gas tax or transit fare rates, however, and many did not know that fares generally do not cover the full cost of trips taken on public transportation.

To view the report, go to <http://transweb.sjsu.edu/project/1031.html>.

New Road Base Structure Saves Money in Louisiana

Researchers at the Louisiana Department of Transportation and Development conducted full-scale tests of new base structure materials on the shoulders of US-61 in Sorrento, Louisiana. Moisture in the old, nonstandard base was causing sections of the road to fail, but replacing the base with crushed stone was cost-prohibitive.

Researchers from the Louisiana Transportation Research Center added ground granulated blast furnace slag (GGBFS) into the blended calcium sulfate base course as a stabilizer. The difference in cost between adding GGBFS and removing and replacing the base course is estimated to save more than \$100,000 per lane mile.

The projects were tested in the field and laboratory; a subsequent laboratory study examined the deterioration of blended calcium sulfate strength in a wet environment and explored stabilization with various cementitious agents.

For more information, see www.ltrc.lsu.edu/pdf/2014/implementation_project_v3.pdf.

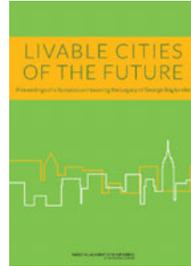
A hypothetical tax to fund “road maintenance” received more support in a Mineta Transportation Institute poll than did a more vaguely worded measure about maintenance and improvement of the transportation system.



PHOTO: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Livable Cities of the Future: Proceedings of a Symposium Honoring the Legacy of George Bugliarello

Edited by Mohammad Karamouz and Thomas F. Budinger. National Academies Press, 2014; 172 pp.; \$45; 978-03-0930-009-4.



This volume summarizes the proceedings of a 2012 symposium honoring the legacy of George Bugliarello, longtime president of the Polytechnic Institute of New York and Foreign Secretary of the National Academy of Engineering. Examined are such critical issues as energy, water supply and treatment, public health, security infrastructure, transportation, telecommunications, and environmental protection.

Street Design: The Secret to Great Cities and Towns

Victor Dover and John Massengale. John Wiley & Sons, 2014; 448 pp.; \$85; 978-11-1806-670-6.

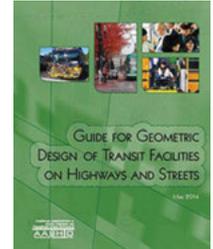


More than 600 communities in the United States have

adopted “complete streets” policies that encourage walking and bicycling. In this manual, authors share insights on how street design can contribute to community health and well-being, improve economies, and bring neighborhoods together. Included is a foreword by Prince Charles.

Guide for Geometric Design of Transit Facilities on Highways and Streets, 1st Edition

American Association of State Highway and Transportation Officials (AASHTO), 2014; 436 pp.; AASHTO members, \$180; nonmembers, \$216; 1-56051-522-7.



Provided is a comprehensive reference of current practice in the geometric design of transit facilities on streets and highways. Examined are local buses, express buses, bus rapid transit operating in mixed traffic, bus lanes, and high-occupancy vehicle lanes—as well as bus-only roads within street and freeway environments.

The titles in this section are not TRB publications. To order, contact the publisher listed.

TRB PUBLICATIONS

Using Infrared and High-Speed Ground Penetrating Radar for Uniformity Measurements on New HMA Layers

SHRP 2 Report S2-R06C-RR-1

This report explores infrared imaging and ground-penetrating radar technologies as nondestructive techniques to assess HMA density and degree of segregation and suggests ways to incorporate these technologies into specifications for verifying HMA construction quality.

2013; 80 pp.; TRB affiliates, \$41.25; nonaffiliates, \$55. Subscriber categories: construction; highways; materials; pavements. An e-book version of this report is available at Amazon, Google, and iTunes.

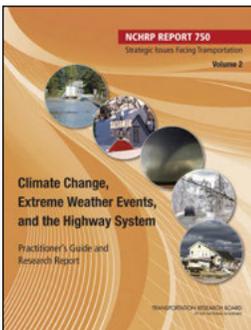


Real-Time Smoothness Measurements on Portland Cement Concrete Pavements During Construction

SHRP 2 Report S2-R06E-RR-1

Real-time smoothness measuring technologies for concrete paving are explored in this volume, along with suggested specifications and guidelines for the use of these technologies.

2013; 132 pp.; TRB affiliates, \$48; nonaffiliates, \$64. Subscriber categories: construction; highways;



pavements. An e-book version of this report is available at Amazon, Google, and iTunes.

Strategic Issues Facing Transportation, Volume 2: Climate Change, Extreme Weather Events, and the Highway System: Practitioner's Guide and Research Report
NCHRP Report 750, Volume 2

The second in a series of reports on long-range issues, this volume provides guidance to departments of transportation (DOTs) on adaptation strategies to possible future impacts of climate change on infrastructure planning, design, construction, operation, and maintenance.

2014; 214 pp.; TRB affiliates, \$63.75; nonaffiliates, \$85. Subscriber categories: design; highways; planning and forecasting.

Strategic Issues Facing Transportation, Volume 4: Sustainability as an Organizing Principle for Transportation Agencies
NCHRP Report 750, Volume 4

Included in this report are an analytical framework and implementation approaches designed to assist state DOTs and other transportation agencies

TRB PUBLICATIONS (continued)

evaluating current and future capacity to support a sustainable society.

2014; 268 pp.; TRB affiliates, \$60; nonaffiliates, \$80. Subscriber categories: administration and management; environment; planning and forecasting.

Strategic Issues Facing Transportation, Volume 5: Preparing State Transportation Agencies for an Uncertain Energy Future NCHRP Report 750, Volume 5

This report examines how the mandate, role, funding, and operations of state DOTs will be affected by changes in energy supply and demand in the next 30 to 50 years. The report also identifies potential strategies and actions that DOTs can employ to prepare for these changes.

2014; 338 pp.; TRB affiliates, \$66.75; nonaffiliates, \$89. Subscriber categories: highways; energy; planning and forecasting.

Effective Removal of Pavement Markings NCHRP Report 759

This report aids in the selection of safe, cost-effective, and environmentally acceptable practices for the removal of work zone and permanent pavement markings, with minimal damage to the underlying pavement or visible character of the surface course.

2013; 140 pp.; TRB affiliates, \$48; nonaffiliates, \$64. Subscriber categories: maintenance and preservation; operations and traffic management; safety and human factors.

Alternative Technical Concepts for Contract Delivery Methods NCHRP Synthesis 455

This synthesis documents various methods by which agencies have successfully implemented alternative technical concepts during the highway contracting process and identifies methods that promote transparency and fairness while protecting industry confidentiality.

2014; 116 pp.; TRB affiliates, \$45.75; nonaffiliates, \$61. Subscriber categories: administration and management; construction; highways.

Sustainability Strategies Addressing Supply-Chain Air Emissions NCFRP Report 28

Focusing on the interrelationships between economic drivers, air quality, and greenhouse gas policy and regulations, this report identifies strategies for accelerating environmental improvement, enhancing performance, and promoting social responsibility

in supply chains.

2014; 52 pp.; TRB affiliates, \$34.50; nonaffiliates, \$46. Subscriber categories: environment; freight transportation; policy.

Integrating Community Emergency Response Teams (A-CERTS) at Airports

ACRP Report 95

Comprising three parts—a description of CERTS and training guides for instructors and students—this report provides guidance and tools designed to help organize and operate a citizen volunteer program to assist airport staff in emergency events or disasters.

2013; 168 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber categories: aviation; security and emergencies.

Guidance for Estimating Airport Construction Emissions

ACRP Report 102

This report provides guidance to airports and other stakeholders in developing airport construction emissions inventories. The interactive Airport Construction Emissions Inventory Tool is included on a CD-ROM accompanying the print version of the report.

2014; 129 pp.; TRB affiliates, \$56.25; nonaffiliates, \$75. Subscriber categories: aviation; construction; environment.

How Airports Measure Customer Service Performance

ACRP Synthesis 48

The strategic importance of customer service is explored in this volume, along with methods used at airports to measure the quality of customer service.

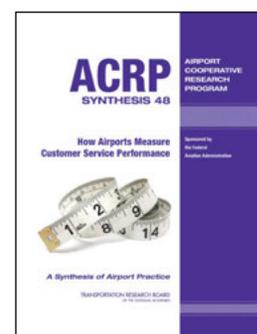
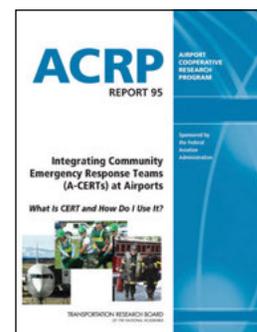
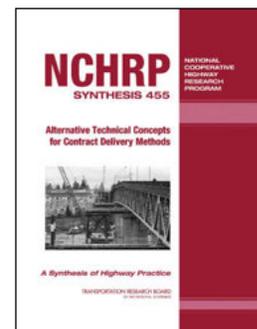
2013; 93 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber categories: administration and management; aviation.

Helping New Maintenance Hires Adapt to the Airport Operating Environment

ACRP Synthesis 49

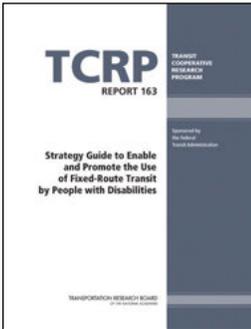
This synthesis highlights comprehensive safety and security training resources as well as successful practices for new maintenance hires at general aviation airports.

2013; 52 pp.; TRB affiliates, \$34.50; nonaffiliates, \$46. Subscriber categories: aviation; education and training; terminals and facilities.



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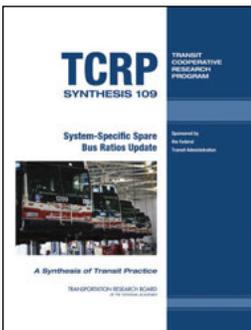
TRB PUBLICATIONS (continued)



Strategy Guide to Enable and Promote the Use of Fixed-Route Transit by People with Disabilities
TCRP Report 163

This report helps transit agencies fulfill the primary goals of the Americans with Disabilities Act of 1990 by making fixed-route bus and rail systems accessible to and usable by individuals with disabilities.

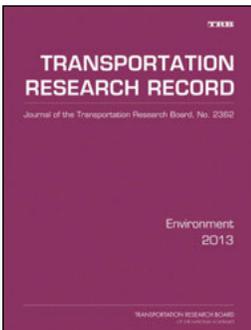
2014; 184 pp.; TRB affiliates, \$56.25; nonaffiliates, \$75. Subscriber category: public transportation.



System-Specific Spare Bus Ratios Update
TCRP Synthesis 109

Documented in this volume are successful practices in the United States and Canada and information on efforts to achieve optimal bus fleet size and effective spare-bus ratios.

2014; 60 pp.; TRB affiliates, \$36.75; nonaffiliates, \$49. Subscriber categories: public transportation; operations and traffic management; vehicles and equipment.



Environment 2013

Transportation Research Record 2362

Authors present research on such topics as the well-being of relocated box turtles during construction of a Maryland highway, Virginia quieter pavement demonstration projects, and the impact of stormwater pipe lining materials on water quality.

2013; 56 pp.; TRB affiliates, \$43.50; nonaffiliates, \$58. Subscriber categories: environment; energy.

Soil Mechanics 2013

Transportation Research Record 2363

Evaluated in this volume are pullout resistance factors for inextensible mechanically stabilized earth reinforcements in sandy backfill, the use of geothermal deep foundations for bridge deicing, stabilization of high-sulfate soils by extended mellowing, and more.

2013; 121 pp.; TRB affiliates, \$48.75; nonaffiliates, \$65. Subscriber categories: bridges and other structures; geotechnology; construction.

Safety Management 2013

Transportation Research Record 2364

Authors present research on topics including variable speed limit control strategies, opinions on safety policy, high-crash-risk intersections, road safety communication campaigns, and safety improvement programs on tribal property.

2013; 89 pp.; TRB affiliates, \$47.25; nonaffiliates, \$63. Subscriber category: safety and human factors.

Human Performance; User Information; and Simulation 2013

Transportation Research Record 2365

The papers in this volume explore driver performance and distraction, cell phone and texting among drivers in California, business logo signing, road safety and behavioral analysis software, and more.

2013; 108 pp.; TRB affiliates, \$48.75; nonaffiliates, \$65. Subscriber category: safety and human factors.

Pavement Management 2013, Volume 1

Transportation Research Record 2366

Presented in this volume are topics including a Bayesian approach to updating Markov-based models for predicting pavement performance, network-level decision making through the use of a structural capacity index, and an innovative sprinkle treatment for thin durable asphalt overlays.

2013; 126 pp.; TRB affiliates, \$53.25; nonaffiliates, \$71. Subscriber categories: pavements; environment.

Pavement Management 2013, Volume 2

Transportation Research Record 2367

Debonding conditions between hot-mix asphalt (HMA) layers in pavements, weak spot identification, the structural response of cracked pavements, slab–foundation friction, and other subjects are examined in this volume.

2013; 141 pp.; TRB affiliates, \$53.25; nonaffiliates, \$71. Subscriber category: pavements.

Pavement Management 2013, Volume 3

Transportation Research Record 2368

Topics include long-lasting perpetual asphalt pavements, top-down cracking of asphalt pavements in North Carolina, the development of a full-scale reflective cracking test, and a refined failure mode for thin and ultrathin whitetopping.

2013; 153 pp.; TRB affiliates, \$56.25; nonaffiliates, \$75. Subscriber category: pavements.

Pavement Management 2013, Volume 4

Transportation Research Record 2369

Examined are such topics as cross-anisotropy of HMA modulus on falling weight deflections and embedded sensor stress–strain, a beam-bridging filter for use in airport groove identification, and locked-wheel and fixed-slip skid systems.

2013; 134 pp.; TRB affiliates, \$53.25; nonaffiliates, \$71. Subscriber category: pavements.

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INFORMATION FOR CONTRIBUTORS TO

TR NEWS

TR News welcomes the submission of manuscripts for possible publication in the categories listed below. All manuscripts submitted are subject to review by the Editorial Board and other reviewers to determine suitability for *TR News*; authors will be advised of acceptance of articles with or without revision. All manuscripts accepted for publication are subject to editing for conciseness and appropriate language and style. Authors receive a copy of the edited manuscript for review. Original artwork is returned only on request.

FEATURES are timely articles of interest to transportation professionals, including administrators, planners, researchers, and practitioners in government, academia, and industry. Articles are encouraged on innovations and state-of-the-art practices pertaining to transportation research and development in all modes (highways and bridges, public transit, aviation, rail, marine, and others, such as pipelines, bicycles, pedestrians, etc.) and in all subject areas (planning and administration, design, materials and construction, facility maintenance, traffic control, safety, security, logistics, geology, law, environmental concerns, energy, etc.). Manuscripts should be no longer than 3,000 words (12 double-spaced, typed pages). Authors also should provide charts or tables and high-quality photographic images with corresponding captions (see Submission Requirements). Prospective authors are encouraged to submit a summary or outline of a proposed article for preliminary review.

RESEARCH PAYS OFF highlights research projects, studies, demonstrations, and improved methods or processes that provide innovative, cost-effective solutions to important transportation-related problems in all modes, whether they pertain to improved transport of people and goods or provision of better facilities and equipment that permits such transport. Articles should describe cases in which the application of project findings has resulted in benefits to transportation agencies or to the public, or in which substantial benefits are expected. Articles (approximately 750 to 1,000 words) should delineate the problem, research, and benefits, and be accompanied by one or two illustrations that may improve a reader's understanding of the article.

NEWS BRIEFS are short (100- to 750-word) items of interest and usually are not attributed to an author. They may be either text or photographs or a combination of both. Line drawings, charts, or tables may be used where appropriate. Articles may be related to construction, administration, planning, design, operations, maintenance, research, legal matters, or applications of special interest. Articles involving brand names or names of manufacturers may be determined to be inappropriate; however, no endorsement by TRB is implied

when such information appears. Foreign news articles should describe projects or methods that have universal instead of local application.

POINT OF VIEW is an occasional series of authored opinions on current transportation issues. Articles (1,000 to 2,000 words) may be submitted with appropriate, high-quality illustrations, and are subject to review and editing.

BOOKSHELF announces publications in the transportation field. Abstracts (100 to 200 words) should include title, author, publisher, address at which publication may be obtained, number of pages, price, and ISBN. Publishers are invited to submit copies of new publications for announcement.

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- ◆ All manuscripts should be supplied in 12-point type, double-spaced, in Microsoft Word, on a CD or as an e-mail attachment.

- ◆ Submit original artwork if possible. Glossy, high-quality black-and-white photographs, color photographs, and slides are acceptable. Digital continuous-tone images must be submitted as TIFF or JPEG files and must be at least 3 in. by 5 in. with a resolution of 300 dpi. A caption should be supplied for each graphic element.

- ◆ Use the units of measurement from the research described and provide conversions in parentheses, as appropriate. The International System of Units (SI), the updated version of the metric system, is preferred. In the text, the SI units should be followed, when appropriate, by the U.S. customary equivalent units in parentheses. In figures and tables, the base unit conversions should be provided in a footnote.

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Transportation Research Board 94th Annual Meeting

January 11–15, 2015 • Washington, D.C.

CORRIDORS TO THE FUTURE: TRANSPORTATION AND TECHNOLOGY

As the 94th TRB Annual Meeting relocates to a new space at the Walter E. Washington Convention Center in Washington, D.C., the theme for the meeting explores the future of transportation. It is a future that can be expected to include many changes, including increasingly autonomous vehicles, a changing energy landscape, climate change, changing demographics and travel patterns, big data, and much more. Spotlight sessions, workshops, and in-depth discussions will address the critical role that transportation innovation and research have in the development and application of new technology to create a more seamless, personalized, and multimodal user experience.

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