

Operations Performance Measures:

The Foundation for Performance-Based Management of Transportation Operations Programs



U.S. Department of Transportation
Federal Highway Administration

Transportation Operations: Cost-Effective Congestion Solutions

Transportation agencies have traditionally focused on building physical facilities such as highways, bridges, and transit systems. However, it has become increasingly difficult to build new highways or expand existing ones due to environmental impacts and the high cost of construction. Further, it has been estimated that roughly half of all congestion experienced by U.S. highway travelers is due to nonrecurring events or disruptions, such as traffic incidents, inclement weather, work zones, and special events (e.g., sporting venues, evacuations).

As a result, *transportation operations* has emerged as a highly cost-effective solution to the national congestion problem. Its focus is to *manage* the flow of traffic efficiently on the existing highway system, in other words, to get the most out what we already have. In concept, this is similar to how the electric grid is managed – operators constantly monitor the system looking for disruptions or areas where demand is high and take appropriate actions to address the problems.

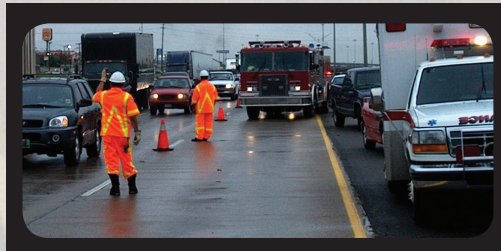
Why Measuring Operations Performance Matters

With increased public scrutiny of agency actions and limited funding, effective allocation of resources is imperative. Establishing an operations performance measurement program supports this goal in several ways:

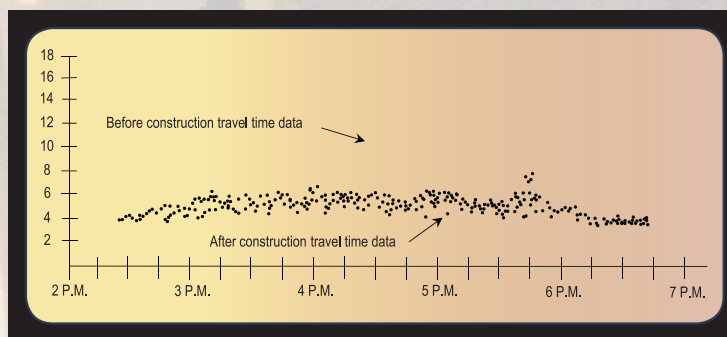
> Provide transparency to the public and accountability to public officials



> Understanding where the problems are



> Direct the best mix of investments



> Evaluate how well past investments worked

Federal Express Improves Customer Service through Performance Management

Prior to 1989, Federal Express (FedEx) assumed that on-time delivery was what its customers expected and valued most; however, input from customers showed that customers expected much more. In an effort to spur progress toward their ultimate target of 100 percent customer satisfaction, FedEx developed a 12-component index, known as the Service Quality Indicator (SQI). The SQI includes measures for on-time delivery but also other indicators of quality service such as complaints, lost packages, and damaged goods. SQIs form the basis on which corporate executives are evaluated and individual performance objectives are established and monitored. Since being placed in service in the late 1980s, the SQI has enabled FedEx to increase its on-time delivery performance from 95 percent to 99.7 percent in 2003 without adding significant costs.



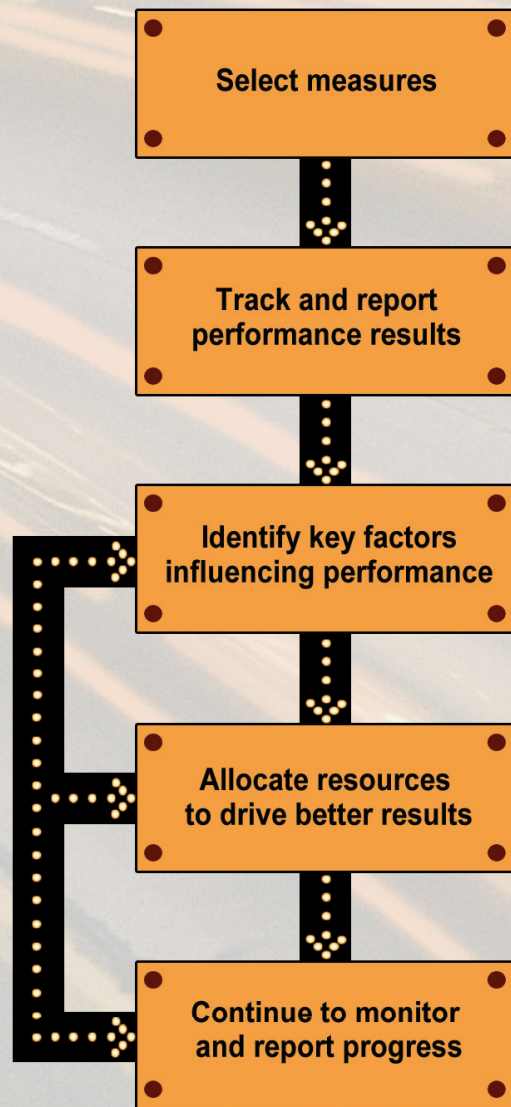
Moving Toward Performance Management of Transportation Services

How do we know if the highway systems in our cities, regions, and states are operating at the highest level of efficiency? And how do we know if our strategies are having their intended effect? The answer lies in developing a *continuous process of improvement* driven by assessing, reporting, and acting on the performance of the system and the investments we make to improve it. *Performance management* provides the basis for this process by helping transportation agencies make decisions based on objective data, communicating results to executives and the public in a meaningful way, and providing the key inputs that can and should be used to establish priorities.

Applying performance management principles to operations will help improve the effectiveness of operations programs. Traditionally, a lot of planning and analysis goes into the front-end of projects, they are implemented, but we rarely go back to see how they perform. In a customer-focused environment, however, it is critical to *evaluate constantly how well services are being delivered*, and to devise ways to improve delivery. A performance management approach enables us to not only detect problems but also to learn from our successes and failures in dealing with them. It also provides an *early warning of emerging problems*. Making more effective investment decisions is even more critical today because of the strained financial environment transportations agencies face.

The private sector has been successfully managing their businesses by tracking performance of their services, evaluating whether particular strategies worked well, and sending funding to those activities that have produced the best results. More recently, public agencies have begun to apply this performance management approach to their services.

A Performance Management Process



How the City of Bellevue, Washington Justified Staff Increases with Performance Data

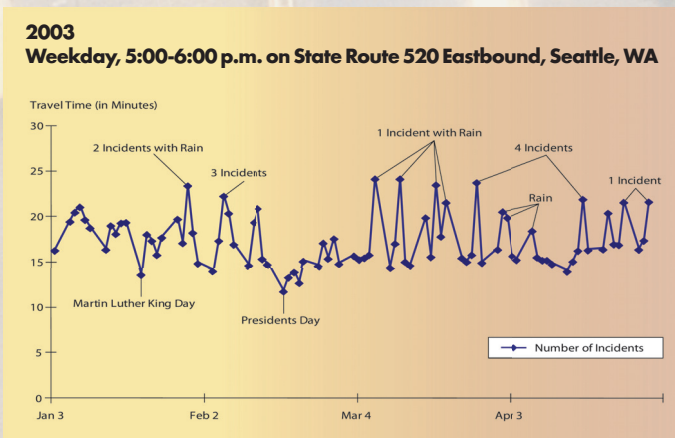
The City of Bellevue, Washington, used emergency medical response time data to garner city council approval for an increase in staffing at one of the City’s fire stations. The City Manager’s office and fire department presented the council with detailed performance data regarding response time and staffing for fire stations across the City. The data showed slower response time from call entry to arrival on-scene for one geographic area of the City. Using performance measurement data, city staff determined – and explained to the City Council – that the addition of eight firefighters would allow the fire department to staff an additional dedicated two-person aid unit on a 24/7 basis – greatly decreasing the risk of a fire station being without a crew.



Creating Effective Operations Performance Measures

One of the primary outcomes operations programs strive for is reduced congestion. Congestion is determined by interplay of multiple causes or sources. Knowing the sources of congestion provides a blueprint for constructing operations performance measures.

Reduced congestion is the outcome we want, and a variety of *travel time-based measures* have been developed and applied by many agencies. These measures can be used to measure the aspects of congestion: spatial extent (how many roads are congested?), temporal extent (how long does congestion last?), and severity (how deeply are travelers delayed?). Additionally, a fourth dimension – *travel time reliability* – has been recognized as a serious problem. Reliability describes how congestion varies over time; because disruptions and demand are never constant from day to day (a severe incident may happen one day, the next day may be incident free), congestion also varies.



Travel Time Reliability: Congestion is different every day because of disruptions like incidents and bad weather. Operations deals with these disruptions directly.

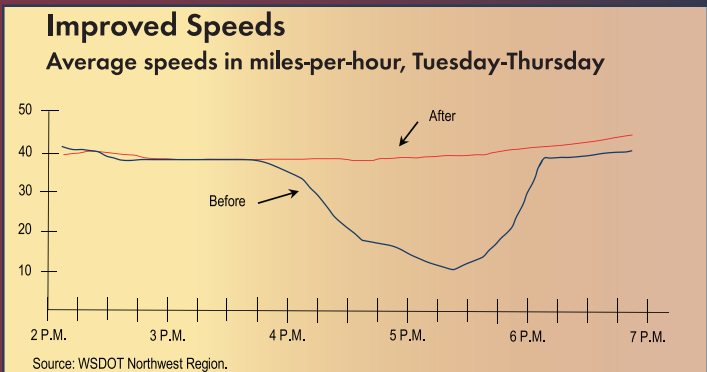
Measuring trends in travel times and reliability tells us that conditions are better or worse than in the past and also can provide benchmarks for comparisons to our peers or national standards. But we also need to measure our activities for improving them. Examples include:

- **Incidents** – How long does it take to detect, respond to, and clear incidents? Are crashes concentrated in a few locations or are certain types more frequent? How many service patrol assists were made and what were the reasons for the assists?
- **Work Zones** – How long do work zones exist and how many traffic lanes are lost during them?
- **Weather** – How long did it take to clear snow or ice covered roadways after the precipitation event? How many weather-related crashes occurred? How many severe weather events occurred?
- **Arterial Control** – How many signals were retimed?

Finally, we operate the transportation system in order to improve our customers' experiences. Measuring the satisfaction of our customers is a key component of an operations performance measurement program.

Evaluating Performance: Ramp Metering in Seattle

An illustration of the benefit is the improvement of speeds on the exit ramp from northbound I-5 to U.S. 2. The average speed after the projects were complete was very close to free-flow (42 mph, as dictated by the curvature of the ramp) for the entire evening peak period.



Using Operations Performance Measurement to Make Better Investment Decisions

The ultimate purpose of operations performance measurement is not just reporting the performance of the system, but the development of actions that improve performance. In a data-driven decision environment, specific operational problems can be pinpointed and appropriate actions can be tailored to the problems.

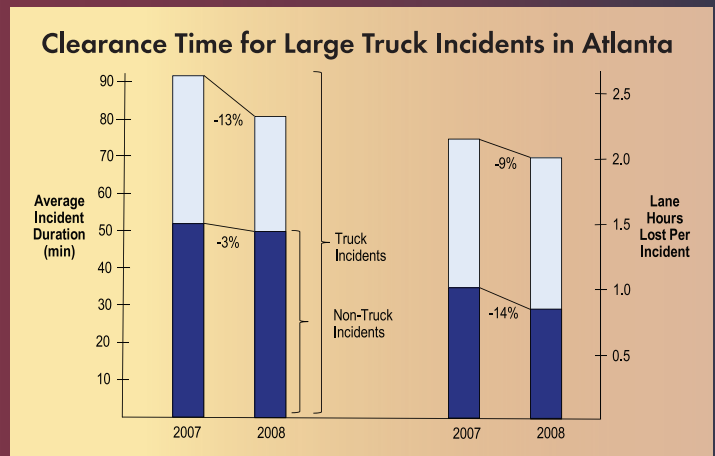
Operations performance measurement also can be used to demonstrate the value of operations through a process of *continuous evaluation*. Once a performance program is in place, it is a simple matter to focus it on before and after conditions for implemented projects and policies. Continuous evaluation of newly implemented projects – and what is learned from them – will enable better investment decisions in the future. Examining what worked or failed, the reasons for success and failure, and modifications to the initial deployment to make it work is part of the learning process for operational performance management.



Continuous Evaluations through Performance Management Improve How We Operate Our Highways.

Evaluating Performance: Reducing Clearance Time for Large Truck Incidents in Atlanta

In 2006, Georgia's Traffic Incident Management Enhancement (TIME) Task Force developed a Strategic Vision of initiatives to improve TIME services in Metro Atlanta. One of several high-priority recommendations in this Vision was to quickly and safely remove large vehicle crashes from the roadways in a timely manner. The Georgia Towing and Recovery Incentive Program (TRIP) program was developed as part of this Strategic Vision. TRIP is a recovery incentive program that pays heavy-duty recovery companies a monetary bonus for clearing commercial vehicle crashes quickly in an attempt to meet a goal that all incidents be cleared within 90 minutes. The program was initiated in 2008. By using data already being collected on incident management activities, the positive effect of this policy on incident impacts was easily documented.



Evaluating Performance: Coordinated Work Zone Management Program, Michigan DOT

Problem: Work zones and bad weather create congestion and decrease travel time reliability.

- Work zones are not managed on a corridor level.
- Work zones lack standardized implementation.
- More communication needed between DOTs and emergency responders/snow plow operators.

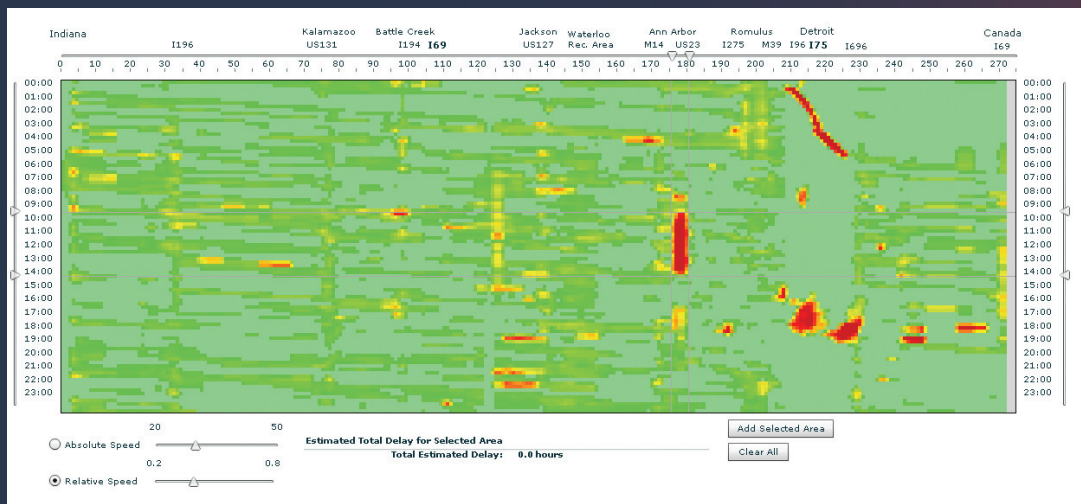
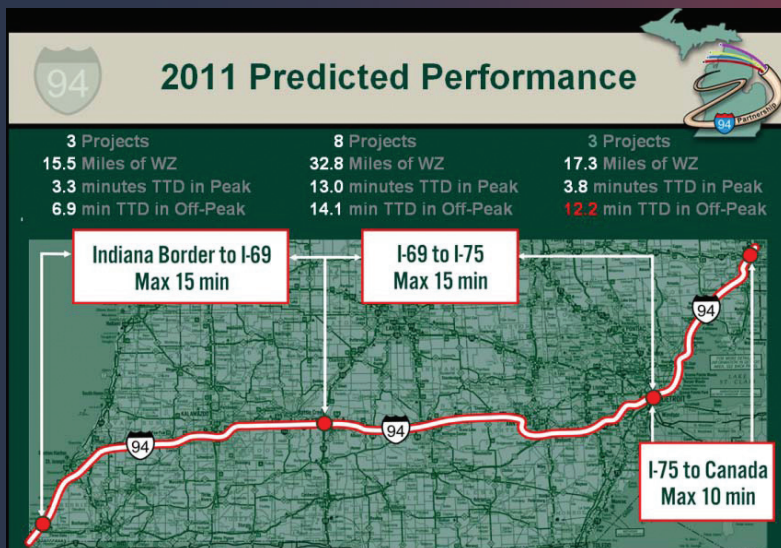
Solution: Standardizing work zones on a corridor level and increasing communication reduces user delay costs.

Project Description: Michigan DOT formed a partnership to implement the following:

- Set travel time goals, measures, and strategies to account for work zone performance.
- Increase collaborative effort with emergency responders and snow plow operators.
- Use traffic data and performance management software to measure program results.
- Increase communication clarity, consistency, and frequency to public.

Results: MDOT developed an operations performance measurement system using travel time, incident, and work zone data. The system allows them to conduct a variety of useful analyses:

- User delay costs from work zones, incidents, and weather events reduced 25 percent year to date for the first segment under study.
- Bi-weekly meetings and communication efforts have increased collaboration among partners.
- Work zones in corridor are coordinated and procedures have been standardized.
- Travel time and other performance metrics are measured and analyzed using new accountability and reporting software.



“Heat Map” Showing Congested Areas of I-94

How to Get Started on an Operations Performance Management Program

Developing a formal operations performance management program is not difficult – many agencies already are doing it – but it does require commitment. An agency should proceed stepwise in developing a program:

- Identify stakeholders of performance measurement: roles and responsibilities.
- Develop a vision, goals, and objectives for your operation program, either part of a formal strategic planning process or by consensus of stakeholders.
- Identify the initial set of performance measures to be used. The literature on this subject contains a wide variety of both outcome and activity measures from which to choose.
- Develop a Data Business Plan for collecting, managing, analyzing, reporting, and disseminating data to support the performance measures. Look for opportunities for multiple uses of the data beyond performance measurement, such as for model inputs. Assign responsibility for governance of the data, including: oversight, the party responsible for maintaining the data archive, and funding requirements.
- Develop reporting formats and publication frequencies to satisfy the stakeholders for operations performance measures.
- Identify and set “targets” for key performance measures. This may be an activity undertaken after the basic reporting system has been in place for a short period of time. Targets may be set using a variety of techniques, including: analysis and extrapolation of past trends, comparison with peer agencies or national benchmarks, or using forecasting models for scenario analysis.
- Routinely evaluate the performance of completed congestion mitigation projects using the data and performance measures already identified. Report successes and try to understand the conditions that led to failures.
- Develop a formal process for routinely reviewing performance. Understanding why certain trends emerged is key to this process – this can be done initially through discussions with field managers but may eventually lead to instituting new performance measures.

With the fiscal and environmental constraints now faced by transportation agencies in adding new highway capacity, the time has come to maximize the efficiency of the existing system with operations. Effective operations relies on monitoring the performance of the system continuously, and making adjustments to operations strategies. Performance measurement is the engine that drives effective operations.

How to Report Performance

In addition to evaluating specific projects, mobility, and congestion performance should be routinely reported on the system. Observing trends is a useful way of identifying problems and assessing the effectiveness of overall programs. For example, the Congestion Management Process (CMP) used by metropolitan planning organizations requires that performance be tracked and related to the original goals set for the community. Operations performance measures should be an integral part of the CMP.

Many agencies have started to produce periodic performance reports. The links below provide examples. Because this is a new concept, some experimentation in graphical design and reporting formats is desirable.

<http://www.wsdot.wa.gov/accountability/GrayNotebook.pdf>

http://www.grta.org/valentin/2010_Transportation_MAP_Report.pdf

<http://www.mwcog.org/transportation/activities/congestion/default.asp>



- For more information on this report, contact Rich Taylor:
rich.taylor@dot.gov
- Visit the Operations Performance Measures web site for more information:
http://www.ops.fhwa.dot.gov/perf_measurement/index.htm
- For more information on Planning for Operations, visit:
<http://www.plan4operations.dot.gov/>