NTOC: Performance Management

Program Management for Traffic Signals Systems
Professional Development Series
January 18, 2012
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Research Engineer

Seminar Information

- Target Audience:
  - Directors of traffic engineering, traffic operators
  - Practitioners responsible for day-to-day operation of signal systems
  - Decision makers responsible for budgeting decisions regarding signal systems
Your Instructor

Gary Thomas

- Research Engineer, Texas Transportation Institute (College Station, Texas)
- Certified instructor for the National Highway Institute
- Fellow at the Institute of Transportation Engineers

Learning Outcomes

1. Identify the elements of a performance management system and describe the benefits that can be gained from using one
2. Explain how a performance management system can be applied to traffic signal operations
3. Identify measures and supporting data sources for traffic signal management and operations
4. Explain ways to integrate performance measures into the agency processes
What is Performance Management

- Goals are being met
- Effective and efficiently
- Focus can be broad or narrow
- Can be a product, service, process, etc.

What is Performance Measurement

The process whereby an organization establishes the parameters within which programs, investments, and acquisitions are reaching the desired results.

Simple: A way to quantify how well a transportation system is working.

FHWA: The use of statistical evidence to determine progress toward specific defined organizational objectives.
Roadblocks

- Lack of clear guidelines
- Lack of documented objectives and standards
- Funding geared towards projects, not O&M
- Governance structure
- Proprietary nature of existing systems
- Tort liability
- Equipment issues

Why use a Performance Management System

- Legislative mandates
- Planning processes
- Quality initiatives
- Congestion management systems and evaluation
- ITS operations and evaluations
- Safety management systems
Benefits

- Agency leaders set a strategic agenda and motivate staff
- Agency managers improve business processes
- Improve accountability to funding grantors and external stakeholders
- Better customer service
- Develop tools to predict future performance
- Transform public images and reduces risk

Performance Management Structure

Learning Outcome #1 From NCHRP Report 660
Selecting Measures

- Strategic plan is the guiding document
- Measures are specific enough to address objectives
- Measures are relevant
- Measures can be tracked incrementally
- Consistency in measurement and evaluation
- Desire to improve measures over time

Learning Outcome #1
Setting Targets

- Specific
- Measurable
- Ambitious
- Realistic
- Time dependent

Performance Management System

Select Measures

Evaluate System

Set Targets

Use Measures in Decision-Making

Resource Allocation

Resource Efficiency

Learning Outcome #1

Using Measures in Decision-Making

- Strategic decisions
- Resource allocation decisions
- Programming decisions
- Operational decisions
- Human resource decisions

Learning Outcome #1
Evaluating the System

- Regularly updated
- Technological advances
- Feedback from employees
- Regular O&M

Learning Outcome #1

TRAFFIC SIGNAL MANAGEMENT PLANS
Traffic Signal System Performance

- Improper timing accounts for 5-10% of all delay (295 million vehicle-hours)
- Average peak-period traveler delayed 38 hours by congestion

Sources:
- Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2
- 2007 Urban Mobility Report

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Typical Signal Operations

Adapted from Outcome-oriented Performance Measures for Management of Signalized Arterial Capacity, Day et al.
National Report Card

- Traffic Monitoring and Data Collection received an “F”
- Greatest potential for improvement
- 43% reported “little to no” regular, ongoing program for collecting and analyzing traffic data for signal timing
- Half of agencies do not assess the quality of data collected


Principles

- Attainable performance evaluation
- Standards of Performance
- Resource requirements

Clear Objectives

- Clear and consistent communication
- Systems engineering in thought and deed

Learning Outcome #2
Customer Expectation

I want to drive to my destination at my desired speed with the minimum of attention. Or at least I want to be treated fairly and predictably so that I can plan my day with the minimum of uncertainty.

Agency Objective

We will do our best to avoid making drivers stop, and when we must make them stop, we will delay them as little as possible, within the context of safe operation.
Objectives

What are some of your objectives?

Setting Performance Measures

1. Must be linked to the objective(s)
2. Must be “SMART”

Signal Systems
- Agency Objective
- Performance Measure

Systems Engineering
- User Need
- Functional Requirement
Example

<table>
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<tr>
<th>Performance Measure</th>
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<th>R</th>
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<td>Reduce travel time</td>
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<tr>
<td>Reduce travel time by 3% for normal traffic conditions when signals are retimed</td>
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Learning Outcome #2

What Do We Need to Measure

- Reduce travel time by 3% for normal traffic conditions when signals are retimed
- Travel time
How Do We Measure

- Manually collected data
- Automatically collected data
- Simulated data
- Observation

What Resources Do We Need

- People?
  - Manual collection of license plates and time stamps
  - Employees driving routes

- Equipment?
  - Automated collection of license plates and time stamps
  - Probe vehicle(s) instrumented with GPS
  - Bluetooth readers at key intersections
<table>
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<th>Method</th>
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<tr>
<td>Observation</td>
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</table>

**Manual Data Sources**

- Test runs
- Citizen complaints
- Traffic studies
- Trouble calls
Automated Data Sources

- Loop detectors
- Video detectors
- Traffic signal controllers
- Probe vehicles
- Bluetooth technologies
- Connected vehicles (in the future)

Learning Outcome #3

Collecting v/c Ratios

- Arizona research project
- Used existing video detection
- Additional equipment required
- Collected v/c ratios cycle-by-cycle

For more info see TRR 2192: Supplementing Signalized Intersection Infrastructure to Provide Automated Performance Measures with Existing Video Detection Equipment, Smaglik et al.

Learning Outcome #3
Collecting Queue Lengths

Learning Outcome #3

Signal Pole/Mast Arm
Video Detection Camera
Pull Box

To TMC

Controller Cabinet
Conduit
Detection Zone

Adapted from Performance Measures for Traffic Signal Operations: Final Report

Collecting Travel Times

Learning Outcome #3
Factors for Success

- Focusing on the challenges
- Include managers and employees
- Expand over time
- Focus on customer needs
- Ensure the program is not connected to an individual
- Distribute performance data

Reporting

- Building credibility, accountability and trust
- Strengthening support for budget
- Promoting friendly competition
- Creating an expectation
Reporting

Learning Outcome #4

http://dashboard.virginiadot.org

CASE STUDY
Denver Regional Council of Governments

- 2008 Study
- Review of performance measures being recorded
- Steering committee of local agency volunteers
- Initial study will lead to pilot implementation

http://ops.fhwa.dot.gov/publications/fhwahop09046/

DRCOG – Key Questions

- What types of data should be collected?
- What will be the storage approach?
- What frequency of data collection?
- How will the information be disseminated?
- What information will be provided to the public?
DRCOG – Issues and Challenges

- Capability to store recorded data for longer periods of time
- Good communication to field devices
- Educating the public
- Possible unrealistic performance measures
- Difficulty in field-verifying problems
- Manual data collection is labor-intensive
- Manual data collection represents only a snapshot

DRCOG – Concept of Operations
Review of Learning Outcomes

1. **Identify** the elements of a performance management system and **describe** the benefits that can be gained from using one
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3. **Identify** measures and supporting data sources for traffic signal management and operations
4. **Explain** ways to integrate performance measures into the agency processes

Resources for More Information

- Transportation Research Record 2192
QUESTIONS