Michigan Department of Transportation
Highway Operations - Performance Measures & Management

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Engineer of Systems Operations & Maintenance
Overview

- Performance Management vs. Performance Measures
- User Delay Cost (UDC)
- Performance Management Process
- Mobile Data Source
- Outcomes
User Delay Cost

• Traditional project level taken to Transportation Systems Management & Operations level
  – Calculation based on travel volumes, speeds (constants: vehicle occupancy, cost per vehicle, segment, etc.)
  – Sensor and probe vehicle data (HERE previous Navteq)
    • Travel Times and Mi Drive website
    • User Delay Cost

• Performance Measurement Tool
  – “Red Images”
  – Regional Integrated Transportation Information System (RITIS)
User Delay Cost Method

1. Capture Delays (red images)

2. Review images, document delays

3. Sum the number delays, convert to a user cost

\[
\text{User Delay Cost} = \text{# Images} \times \frac{10 \text{ min of delay}}{\text{image}} \times \frac{1 \text{ hour}}{60 \text{ min}} \times \frac{\text{Users}}{\text{Day}} \times \frac{1 \text{ Day}}{24 \text{ hours}} \times \frac{$19.42}{\text{hour}}
\]
User Delay Cost Method

UDC on I-94 Work Zone Incident Example: 09/09/2013

<table>
<thead>
<tr>
<th>10 AM</th>
<th>11 AM</th>
<th>12 PM</th>
<th>1 PM</th>
<th>2 PM</th>
<th>3 PM</th>
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<th>8 PM</th>
<th>9 PM</th>
<th>10 PM</th>
<th>11 PM</th>
<th>Daily Totals</th>
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<td>$2.2K</td>
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</tbody>
</table>

**Delay cost:**
- Total: $122,631.56
- Per vehicle: $54.64
- Per person: $45.48

**Hours of delay:**
- Person-hours: 6,259.41 hours
- Vehicle-hours: 5,209.59 hours
- Per vehicle: 2.32 hours

**Volume:**
- Passenger: 1060 vph
- Commercial: 312 vph

**Data validity:** 94.89%

*Click the table cell to see links to congestion scans*
RITIS – Congestion Scan

Speed on I-696 between 11 Mile Rd/Exit 21 and Evergreen Rd/Exit 11
Data shown is averaged on Wednesday Jul 24, 2013 at 15 minute intervals.

Westbound

11 MILE RD/EXIT 21
DEQUINDRE RD/EXIT 20
COUZENS AVE/EXIT 19
675/EXIT 18
10 MILE RD/EXIT 17
M-1/WOODWARD AVE/...

Eastbound

10 MILE RD/EXIT 14
GREENFIELD RD/EXIT 13
SOUTHFIELD RD/EXIT 12
EVERGREEN RD/EXIT 11

User Delay
Cost: $87,000

~4 hours
7 miles

Gawking - additional UDC
Managing User Delay Cost

Goal: Limit 2013 User Delay Cost to $304.4 Million by 12/31/13

Winter Weather sub-goal:
Regain normal speeds in 2 hours or less 80% of time

- Lead Measure 1: Perform After Storm Huddles 80% of the time
- Lead Measure 2: Compliance with Salting Policies 80% of the time

TIM sub-goal:
Limit the number of traffic incidents closing 1+ lanes lasting longer than 2 hours to 203

- Lead Measure 1: Perform Post Incident Reviews 75% of the time

Work Zone sub-goal:
Limit Non-Recurring Construction UDC to $80.3M

- Lead Measure 1: Perform WZ Reviews 80% of the time
- Lead Measure 2: Compare Predicted vs. actual Capacity & Diversion Rates

Goal: Limit 2013 User Delay Cost to $304.4 Million by 12/31/13
Limit the 2013 user delay cost to $304.4 million, between 1/1/13 and 12/31/13.
Scoreboard for Team: Statewide

Weather Travel Impacts
as of 9/17/2013: Current: 92.74% / Target: 80%

Regain normal speeds in two hours or less, 80 percent of the time for winter weather events.

Green
Continuous Improvement

• Previous goal – Regain normal speeds in two hours or less, 80% of the time for winter weather events

• Proposed goal – Maintain traffic speeds within 10 mph of normal speeds 80% of the time when a storm event impacts the AM peak (6am - 9am)

<table>
<thead>
<tr>
<th>Location</th>
<th>All Day</th>
<th>AM Peak (6-9)</th>
<th>PM Peak (3-7)</th>
<th>6am-6pm</th>
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<tbody>
<tr>
<td>Grand Region</td>
<td>74%</td>
<td>45%</td>
<td>67%</td>
<td>68%</td>
</tr>
<tr>
<td>US-127(Isabella Co.)</td>
<td>91%</td>
<td>82%</td>
<td>100%</td>
<td>89%</td>
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<tr>
<td>I-94(Jackson TSC)</td>
<td>79%</td>
<td>75%</td>
<td>80%</td>
<td>80%</td>
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<tr>
<td>I-94(Taylor TSC)</td>
<td>51%</td>
<td>41%</td>
<td>65%</td>
<td>58%</td>
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<tr>
<td>I-94(Marshall TSC)</td>
<td>68%</td>
<td>73%</td>
<td>57%</td>
<td>74%</td>
</tr>
</tbody>
</table>
Managing User Delay Costs

Goal: Limit 2014 User Delay Cost to $300 Million by 12/31/14

**Winter Weather sub-goal:**
Maintain traffic speed w/in 10 mph of normal speeds 80% of time (6am-9am)

- Lead Measure 1: Perform After Storm Huddles 80% of the time
- Lead Measure 2: Compliance with Salting Policies 80% of the time

**Traffic Incident Mgt sub-goal:**
Limit the number of traffic incidents closing 1+ lanes lasting longer than 2 hours to 203

- Lead Measure 1: Perform Post Incident Reviews 75% of the time

**Work Zone sub-goal:**
Limit Non-Recurring Construction UDC to $80.3M

- Lead Measure 1: Perform WZ Reviews 80% of the time
- Lead Measure 2: Compare Predicted vs. actual Capacity & Diversion Rates
Example I-94 Taylor TSC

Maintain speeds within 10 mph of normal speeds 80% of the time during AM Peak winter storm events.
Example I-94 Corridor Winter Sub-WIG

Maintain traffic speeds within 10 mph of normal speeds 80% of the time when a storm event impacts the AM peak.
### MiScorecard Performance Summary

**Business Unit:** Transportation  
**Executive/Director Name:** Kirk Steudle  
**Reporting Period:** Apr 2014

#### Categories & Metrics
- **Economic Growth**
- **Safety**
- **Condition**
- **Accountability**
- **Mobility**
- **Customers**
- **Financial Health**
- **Environmental**
- **Employees**

#### Metrics
- **Economic Growth**
  - **1 Commercial vehicle traffic miles**
    - **Status:** Green  
    - **Target:** 5.81B 2012  
    - **Current:** 5.74B  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Maintain or increase the number of commercial traffic miles in billions traveled on Michigan roads.

- **Safety**
  - **7 Statewide crash fatality reduction**
    - **Status:** Red  
    - **Target:** 936  
    - **Current:** 889  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Reduce crash fatalities from 889 in 2011 to 750 in 2016.
  - **8 Statewide crash serious injury reduction**
    - **Status:** Red  
    - **Target:** 5,676  
    - **Current:** 5,706  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Reduce crash serious injuries from 5,706 in 2011 to 4,800 in 2016.

- **Condition**
  - **13a Sufficiency surface condition**
    - **Status:** Yellow  
    - **Target:** 90%  
    - **Current:** 78.8%  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Improve or sustain 90% of trunkline pavements in fair or better condition.

- **Mobility**
  - **19 Deliver approved projects**
    - **Status:** Green  
    - **Target:** 92.2%  
    - **Current:**  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Obligate 95% of projects approved for funding by the State Transportation Commission.
  - **20 Manage traffic incidents timely**
    - **Status:** Green  
    - **Target:** 93.1%  
    - **Current:**  
    - **Frequency:** Monthly  
    - **Metric Definition:** 75% or greater with less than 120 minute delay.
  - **21 Peak Hour Winter Travel Speed**
    - **Status:** Green  
    - **Target:** 87.2%  
    - **Current:**  
    - **Frequency:** CY Annually  
    - **Metric Definition:** Maintain traffic speeds within 10 mph of normal speeds 80% of the time when a storm event impacts the morning peak.

[www.michigan.gov/mdot](http://www.michigan.gov/mdot)

“MDOT Performance”
“Transportation Scorecard”
## Vehicle Data Sources

<table>
<thead>
<tr>
<th>SIGNAL</th>
<th>DAS or Smart Phone</th>
<th>OBD-Key</th>
<th>Surface Monitor</th>
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<tbody>
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<td>Dew point</td>
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Potential Applications

- Data quality checks (ground truth - RWIS stations, MDSS, third party speed data)
- Targeted individual messages (augments DMS & website)
- Provide travel times and incident updates
- Performance Measure/Management
- In-the-storm performance (how well are you managing the event)
- Maintenance Decision Support System
- Remote imaging and physical monitoring of environment (camera photos)
- Visibility monitoring (i.e.: snow squalls, localized lake effect white outs, fog, rain, etc.)
- Slippery surface notification (ABS lockup & differential wheel speed)
- Pin point icy road conditions (driver & maintenance staff)
- Early notification to First responders, Hospitals, Work place, Schools, Community events, etc.
- Regional and cross jurisdictional alerts (Great Lake Regional Transportation Operations Coalition ties into the Northwest Passage and other regional coalitions)
- Provide in-vehicle alerts
- Vehicle/device health monitoring (are devices installed on vehicles working?)
- Vehicle diagnostics (fleet monitoring and management (miles, hours, routine maintenance, etc.)
Lessons Learned

• Performance Measures w/o Performance Management does not achieve improved system performance
• Process requires full support from top management.
• Need automation to help manage the process. Can’t let the process itself overrun other staff daily duties
• Are we measuring the right things? Choosing the right measure (and wording) takes time
• Tracking project performance 24-7 maintains staff focus on mobility and improves decision making toward operations
• Performance Measures - User Delay Cost provides accountability and helps justify Highway Systems Operations for legislators, transportation partners, and the motorists
THANK YOU!

MDOT
Michigan Department of Transportation