ITS Devices
Cost / Benefit Tool

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Topics

• Overall Approach to Estimating Benefits & Costs

• Detailed Example of This Approach

• Benefit / Cost Tool Status
Cost / Benefit ITS Tool - Overview

Challenges Driving This Project:

Benefit / Cost Analysis Use Increasing

Existing Tools Most Suited to Metro Areas

*Rural Areas* - Need An Easy To Use B/C Tool For Rural ITS Deployments
Cost / Benefit ITS Tool - Overview

• North/West Passage Pooled Fund

• ITS Devices Most Used by North/West Passage Member States:
  • DMS
  • CCTV
  • Traffic Detection
  • RWIS
Traditional B/C Approach
(Source: Mn/DOT Cost/Benefit Handbook)

- Benefits Defined as:
  - **Travel Time Savings**
    - Monetary Benefit Per Person-Hour in Vehicle
  - **Vehicle Operating Cost Savings**
    - Monetary Benefit Per Mile Traveled
  - **Safety Benefits**
    - Monetary Benefit of Reduced Crashes
      - Fatal: $7,100,000 (MN)
      - Injury: $91,000 - $415,000
      - Property Damage: $12,000
This Project’s Approach to Benefits:

• **Travel Time Savings**
  - Monetary Benefit Per Person-Hour in Vehicle

• **Vehicle Operating Cost Savings**
  - Monetary Benefit Per Mile Traveled

• **Safety Benefits** *(Computed but Separated)*

• **DOT Cost-Savings as a Benefit**
What is Different in This Approach

- Travel Time Savings
  - Monetary Benefit Per Person
  - Vehicle

- Vehicle Operating Cost Savings
  - Monetary Benefit Per Mile Traveled

- Safety Benefits (Computed but Separated)

- DOT Cost-Savings as a Benefit

How We Calculate These Including This
Our Approach

Two Tiered Approach:

Determine the Expected Impact & Quantity

- Reduce Delays by ____%
- Reduce Crashes by ____%
- Reduce DOT Operations Resources Needed by ____%

Determine the Monetary Benefit of Each Impact

- Traveler Time = $___
- Traveler Vehicle Costs = $___
- Per Crash (Societal) Benefit = $___
- Per Crash DOT Personnel & Infrastructure Costs = $___
DMS for Variable Speed Limit Display

What Are the Expected Impacts?

Reduce Crashes by __ %

Estimate # of Crashes Prevented / Year
DMS for Variable Speed Limit Display

What Are the Expected Impacts?

Reduce Crashes by __ %

How To Determine This?

Estimate # of Crashes Prevented / Year
DMS for Variable Speed Limit Display

What Are the Expected Impacts?

Reduce Crashes by ___ %

How To Determine This?

Estimate # of Crashes Prevented / Year
DMS for Variable Speed Limit Display

What Are the Expected Impacts?

Reduce Crashes by ___ %

WyDOT : VSL
38% Crash Reduction
(High Wind)

Estimate # of Crashes Prevented / Year
What Are the Expected Impacts?

Reduce Crashes by ___ %

WSDOT: VSL 30% Crash Reduction (Mtn. Pass)

Estimate # of Crashes Prevented / Year
What Are the Expected Impacts?

Reduce Crashes by __ %

Factors (Intended Use):
- High Wind Zone (e.g. 38%)
- Mountain Pass (e.g. 30%)
- Low Visibility (e.g. 30%)

Estimate # of Crashes Prevented / Year
For Each Crash Prevented

What Are the Monetary Benefits?

<table>
<thead>
<tr>
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<th>Per Crash DOT Personnel &amp; Infrastructure Costs</th>
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For Each Crash Prevented

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Real-World Example

Wyoming VSL Deployment

Determine the Expected Impact & Quantity

154 Crashes Prevented per year

Determine the Monetary Benefit of This

- Traveler Time & CVO Vehicle $ Benefit = $219,851
- (Societal) Crash Reduction Benefit = $18 Million
- Crash Response DOT Personnel & Infrastructure Benefit = $145,000
DOT Cost Savings

Crash Response DOT Personnel & Infrastructure Benefit = $145,000

For Each Accident:

• DOT Vehicle(s) Costs
• DOT Staff Time to Drive to Site
• Responders on Scene for X Hours
• Return Drive Time

• Infrastructure (signs, guardrails, spills)
DOT Cost Savings

Per Crash DOT Personnel & Infrastructure Benefit = $145,000

Factors That Determine These Costs:

- ITS Device “Area of Influence”
- Distance from Responders
- Typical Clearance Time per Location
- Typical Infrastructure Damage Costs per Location
5 Year Analysis – Costs Estimated!!
VSL Deployment on I-90

Costs:
- Deployment Costs: $1,000,000
- Equipment O&M: $20,000
- Total 5 year costs: $1,100,000

Benefits:
- DOT Benefits: $725,000
- Traveler Time Benefits: $1,099,000

B/C = 1.65
<table>
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<tr>
<th>Benefits Over Period Selected</th>
<th>DOT Benefits Only</th>
<th>Costs Over Period Selected</th>
<th>DOT &amp; Societal Benefits</th>
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<tr>
<td>DOT Operations Cost Savings</td>
<td>$726,572</td>
<td>Deployment Costs:</td>
<td>$1,000,000</td>
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<tr>
<td>Traveler Time and Vehicle Use</td>
<td>$1,226,706</td>
<td>Annual Maintenance Costs</td>
<td>$100,000</td>
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<tr>
<td>Societal Benefits</td>
<td>$94,283,333</td>
<td>Total Costs:</td>
<td>$1,100,000</td>
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<tr>
<td>Total Benefits (Entire Period)</td>
<td>$96,236,612</td>
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B/C Analysis over 5 year Period

B/C = 0.66052

B/C = 1.78

B/C = 87
What is the Tool?

- Portable and Open to All
  - Excel Spreadsheet
- Usable in Rural Areas
  - Not Require MPO Models or Many Details
- Can Be Executed Easily, With Minimal Preparation
What About the Assumptions?

- **Transparent and Modifiable**
  - All Assumptions Visible & Sources Cited (when available)

- **Invite the ITS Community to Give Input**
  - If an Agency Disagrees With Values, They May Edit Them & Share Their Ideas
  - Each Year, the B/C Tool Will Improve
  - Can Help Guide Future Research & Evaluations
MetaData

• Sources’ Parameters of Deployment
  • Wy/DOT’s VSL Deployment:
    • Were speed limits advisory or enforceable?
    • What triggered Speed Reductions?
    • How much were speeds reduced?
    • How high were the Winds when activated?

• This is Being Added in Phase 2
Questions the Tool Asks

• Deployment and O&M Costs

• # of Years for B/C Analysis
Questions the Tool Asks

- Area of Influence information:
  - ADT
  - # of Crashes
  - Distance from Nearest DOT Response
  - Estimated Crash Scene Durations @ this site
  - Estimated Personnel Costs
  - DOT Vehicle Cost/mile
  - Typical Infrastructure Damage Costs in this Area
Summary

- Early Stages of the Tool
- North/West Passage Webinar in September to Validate other Devices
- Release of Version 1.0 Soon After to Any Agency Interested
- Encourage Industry Input
Questions

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