

Training's Return on Investment

Can We Measure
What Training
Provides?

M-TRAC Technical Trainers Workshop

August 20-21, 2008 Albuquerque, NM

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New Mexico DOT - TTCP Administrator

Are we getting a good return on our investment?

- Many of our states spend hundreds of thousands of dollars on technical training each year. What do we get for that investment?
 - A trained technician
 - A “certified” technician
 - Meeting the requirements of 23 CFR 637
 - Keeping our State and Federal bosses happy
 - More cohesive workforce

Are we getting a good return on our investment?

- Many of our states spend hundreds of thousands of dollars on technical training each year. What do we get for that investment?
 - A trained technician, **that is better prepared**
 - A “certified” technician, **that makes better decisions**
 - Meeting the requirements of 23 CFR 637 - **YES**
 - Keeping our State and Federal bosses happy - **YES**
 - More cohesive workforce - **YES**

Are we getting a good return on our investment?

- How can trainers measure the success of good training?
- How can trainers get immediate feedback from the student?
- What type of long-term measurements can be taken?

Instructional System Design Evaluation Phase


- **Kirkpatrick's Four Levels**
 - **Reaction**
 - **Learning**
 - **Performance**
 - **Impact**

Instructional System Design Evaluation Phase

- Kirkpatrick's Four Levels
 - Reaction
 - How was their training?
 - Was the room comfortable?
 - Did the instructor do a good job?
 - Did they get the information you expected them to get?
 - Basically, the class evaluation or "smile sheet"

Instructional System Design Evaluation Phase



- Kirkpatrick's
Four Levels
 - Reaction
 - "Smile Sheet"

NMDOT Course Evaluation Form 

Instructor's Name: _____ Date of class : _____
Title of Class: _____
Your Name & Phone # (optional): _____

Please place a checkmark in the ONE box for each question that most closely describes your reactions to this class. Written comments are also welcome at the end of this form. Thank you for making time to provide your input. Your honest feedback is important to us and will impact future classes.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure or N/A
1. Material taught was what I expected to be taught.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The content of this class met my needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The exercises and activities in this class met my needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The class flowed in a logical and organized manner for me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The class handouts and materials met my needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. There was enough time allotted for questions and completing the exercises and activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The instructor adjusted the pace of the class to various student levels.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The instructor was courteous and helpful to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. The instructor was prepared, knowledgeable, and informed on the class topics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please turn this paper over and complete the reverse side, too.

Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Learning

- What did the student learn in training?
- Completing a written examination can show the knowledge obtained.



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Learning

- What did they learn in training?
- Can they demonstrate their ability with the hands-on examination?



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Performance

- When checking the student in the field in a "real-world" situation, is the sampling and testing being performed correctly?



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Performance

- Independent Assurance (IA) is a method of verifying that the skills learned by the student are carried on into the field and laboratory.
- Have any bad habits been picked up?



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Impact

- Of the four levels, Impact is the most difficult to measure.
- Is it completing the road or bridge project with proper testing and inspection?



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Impact

- How do we know it is correct until it is proven many years from now with long-lasting performance or failure?



Instructional System Design Evaluation Phase

■ Kirkpatrick's Four Levels

□ Impact

- Another way to look at Impact is the term, "Return on Investment" (ROI).
- Can we quantify the monetary return?
- Can we quantify the performance return?
- Will the ROI be immediate or take many years to determine?

Return on Investment

- How do we quantify ROI?
 - Gather information over time
 - Check with other sources
 - Improved quality
 - Compare year-to-year on reduced maintenance costs
 - Improved teamwork

National Cooperative Highway Research Program (NCHRP)

- **NCHRP Research Project 20-24(37)B**
 - Identify the top five states with respect to pavement smoothness
 - Obtain information on pavement construction and maintenance practices for the top five performers and document conclusions about these practices for achieving smoother pavement

National Cooperative Highway Research Program (NCHRP)

- **NCHRP Research Project 20-24(37)B**
 - **Thirty-three states submitted roughness data on Interstate routes**
 - **Interviews were performed with state DOT and contractor representatives familiar with design, construction, inspection and pavement management practices to determine specific factors contributing to success of smoother pavements**

National Cooperative Highway Research Program (NCHRP)

- NCHRP Research Project 20-24(37)B
 - The top five states for smoothness were:

National Cooperative Highway Research Program (NCHRP)

- NCHRP Research Project 20-24(37)B
 - The top five states for smoothness were:
 - Arizona
 - Missouri
 - New Mexico
 - Tennessee
 - Washington

National Cooperative Highway Research Program (NCHRP)

- **Some reasons for New Mexico's smooth roads:**
 - Performance measures - tracks tangible performance outcomes (IRI)
 - Pavement Preservation Program
 - Smoothness specifications and incentives
 - Competent contractors
 - Training Program

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National Cooperative Highway Research Program (NCHRP)

- The report states:
 - New Mexico provides training courses conducted through a cooperative effort between the Department and the ACNM to both department and industry personnel
 - By training and certifying both DOT and contractor personnel, there is an increased consistency in the practices being used
 - All participants are hearing the same message

New Mexico Technician Training and Certification Program (TTCP)

- Training and Certification Requirements for Inertial Profiler:
 - Inertial Profiler Inspector Training
 - One-day class
 - Reviews Smoothness specification
 - Requirements of the Inspector
 - Requirements of the Operator
 - Data collection and use
 - Training is attended by **INDUSTRY**

New Mexico Technician Training and Certification Program (TTCP)

- **Training and Certification Requirements for Inertial Profiler:**
 - **Inertial Profiler Operator Certification**
 - One-day class
 - IP Inspector Training - Prerequisite
 - Requirements of the Operator
 - Demonstrated ability with profiler
 - Calibrate, operate, data collection
 - Certification is open only to profiler operators

New Mexico Technician Training and Certification Program (TTCP)

- **Training and Certification Requirements for Inertial Profiler:**
 - **Inertial Profiler Machine Certification**
 - Annual certification (late March)
 - All profilers run on same test track
 - Check accuracy, repeatability and cross-correlation according to AASHTO
 - Many profilers have minor to major adjustments each year

New Mexico Technician Training and Certification Program (TTCP)

- Hot Mix Asphalt Construction Inspection Training
 - NHI Course No. 131032
 - Training includes:
 - Surface Preparation
 - HMA Delivery
 - HMA Placement
 - Joint Construction
 - Compaction / Smoothness
 - QC/QA

Return on Investment

- Can we quantify?
 - Even though the data shows smoother roads and one contributing factor out of several is "TRAINING", can we really put a dollar amount on savings?
 - Is it too soon to measure the life expectancy and potential savings?

Return on Investment

- Can we quantify?
 - Missouri DOT
 - Pavement Smoothness and Fuel Efficiency Report
 - 22-mile loop of I-70 used in study
 - Average IRI before resurfacing was 130
 - Average IRI after resurfacing was 61

Prepared by
Organizational Results Division
Missouri Department of Transportation

November 2006
For more information, contact:
Dave Amos, Ernie Perry or Mara
Campbell

Staff summary

**Pavement Smoothness and Fuel Efficiency:
An Analysis of the Economic Dimensions of the
Missouri Smooth Roads Initiative**

MoDOT Summary Statement
It's widely accepted that smooth roads provide greater driver comfort and satisfaction, decreased vehicle maintenance costs, and better fuel economy. Now thanks to a recently completed study, the affect of pavement smoothness on fuel efficiency has been confirmed for Missouri drivers on Interstate 70. Specifically, the study examined the miles per gallon in fuel savings for smooth versus rough pavement.

The study found that a 53 percent improvement in road smoothness, as part of the Smooth Roads Initiative, resulted in a 2.46 percent improvement in miles per gallon for large trucks. With approximately 9,000 trucks per day on I-70, over the course of a year the annual fuel savings would be 3,120,750 gallon of diesel. At the Nov. 16 average price per gallon of \$2.56, the annual cost savings would be \$7,989,120.



Figure 1, Interstate 70 Pavements Before and After Pavement Resurfacing.

MoDOT Project Overview
Previous research has confirmed a relationship between smooth roads and fuel efficiency¹. And although this research has had significant variations in results and conditions, the majority of the research supports a positive relationship between smoother road surfaces and greater fuel efficiency. Smooth roads lead to lower rolling resistance and thus greater fuel efficiency.



¹ WesTrack Track Roughness, Fuel Consumption, and Maintenance Costs. Research, Development and Technology, Turner-Fairbank Highway Research Center, January 2000.

Return on Investment

- Can we quantify?
 - Missouri DOT
 - Pavement Smoothness and Fuel Efficiency Report
 - 53% improvement in road smoothness
 - 2.46% improvement in miles per gallon

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Return on Investment

- Can we quantify?
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 - 9,000 trucks per day on I-70
 - Annual fuel savings would be 3,120,750 gallons of diesel

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Return on Investment

- Can we quantify?
 - Missouri DOT
 - November 2006 study used an average diesel price of \$2.56 per gallon
 - June 2008 average diesel fuel cost was \$4.68 per gallon times 3,120,750

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Return on Investment

- Can we quantify?
 - Missouri DOT
 - Projected savings in this study example would be **\$14,605,110** per year for 9,000 trucks traveling 249-miles on I-70 on smoother roads

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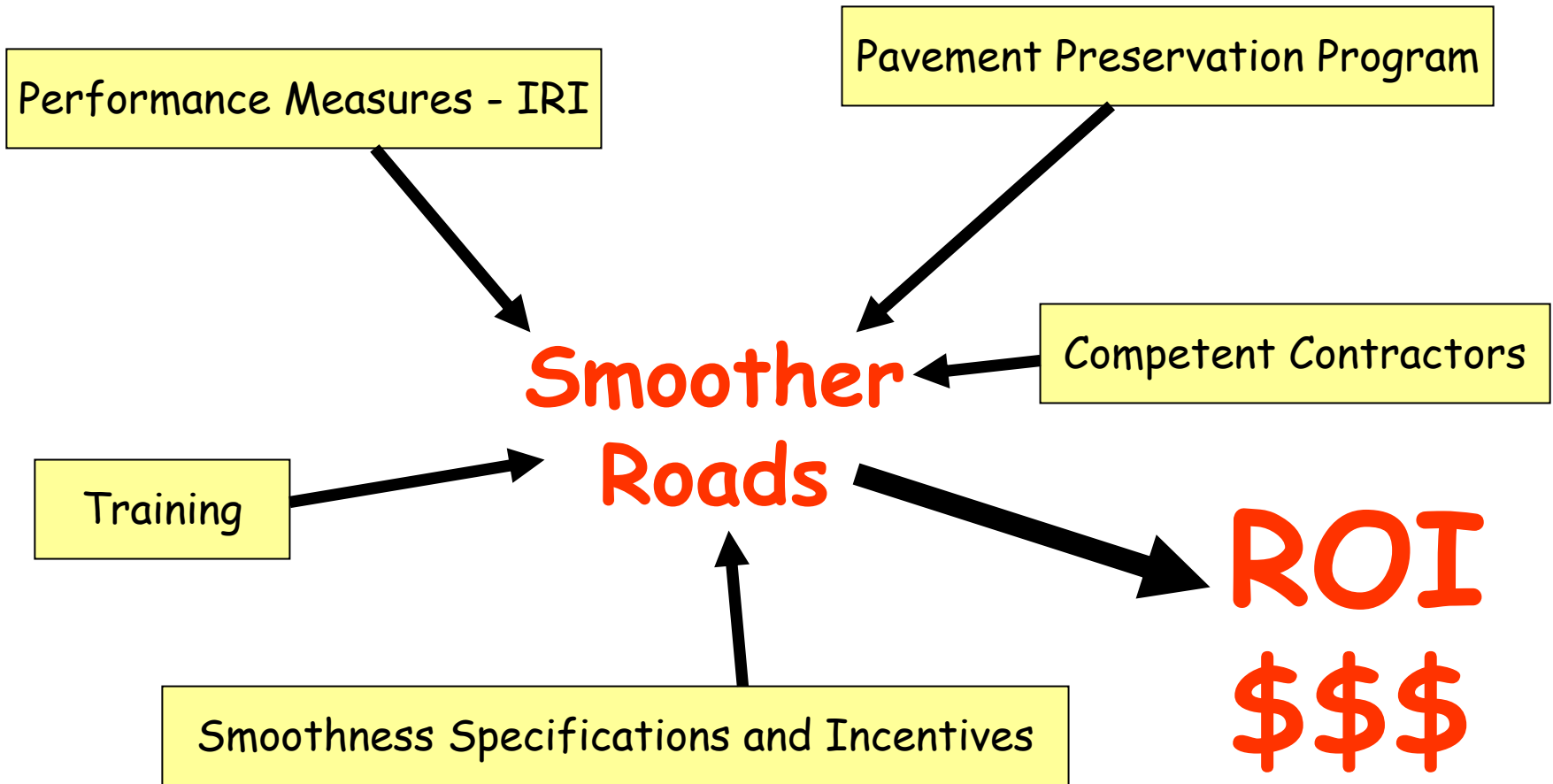
Return on Investment

- Can we quantify?
 - Annual Vehicle Distance Traveled in Miles and Related Data - FHWA 2003
 - 2.245 million multi-axel trucks in 2003
 - Average 61,611 miles per year per truck
 - 138 billion miles traveled by trucks in 2003
 - Fuel consumed by these trucks in 2003 was approximately 27 billion gallons
 - Average 5.1 miles per gallon

Return on Investment

- Can we quantify?
 - Annual Vehicle Distance Traveled in Miles and Related Data - FHWA 2003
 - 2.4% improvement in miles per gallon from the Missouri report
 - 5.22 miles per gallon vs. 5.1 miles per gallon
 - Smooth roads could provide a reduced consumption of fuel from 27 billion gallons to 26.35 billion gallons
 - 650 million gallons of fuel at the June 2008 fuel price of \$4.68 = \$3.04 billion in annual savings

Return on Investment



Return on Investment

- **Summary**

- **Smoother Roads**

- Provide better ride quality
 - Less wear and tear on vehicles
 - Less damage to cargo
 - Increased fuel savings

Return on Investment

- **Summary**

- **Training our workforce**

- **Improved knowledge and skills**
 - **Improved product life**
 - **Improved productivity**
 - **Improved cost savings**
 - **Improved satisfaction for the traveling public**
 - **Improved fuel economy**

Return on Investment

- Can we quantify?
 - Bottom line, TRAINING is a factor toward success with tangible results

References

- **Instructional System Design, Evaluation Phase - Chapter VI**
 - <http://www.nwlink.com/~donclark/hrd/sat6.html>

- **National Cooperative Highway Research Program**
 - Research Project 20-24(37)B, by Spy Pond Partners, LLC
 - May 18, 2008

- **New Mexico TTCP Inertial Profiler Manual**
 - February 2008

- **Missouri DOT - Staff Summary**
Pavement Smoothness and Fuel Efficiency: An Analysis of the Economic Dimensions of the Missouri Smooth Roads Initiative
 - November 2006

- **Annual Vehicle Distance Traveled in Miles and Related Data - FHWA - 2003**
 - <http://www.fhwa.dot.gov/policy/ohim/hs03/html/vm1.htm>

Questions?

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