A Federal R&D Evaluation Framework for Influencing Safety Culture Change in the U.S. Rail Industry

Strengthening Safety Culture Symposium
October 1-2, 2014
Halifax, Nova Scotia
1999 Study: Compliance with Railroad Operating Rules and Corporate Culture Influences
Safety Culture in U.S. Railroad Industry

Research and Evaluation Strategy, 2001

- Identify, develop, and implement innovative safety culture pilot projects in U.S. railroad industry
- Develop safety culture interventions applicable across different organizations and environments
- Evaluate utilization, impact, and effectiveness of pilot projects
- Where successful, support broad-scale adoption and implementation across industry

Develop a “business case” for safety culture in the railroad industry
# Safety Culture Demonstration Pilot Impact Evaluations in U.S. Railroad Industry

<table>
<thead>
<tr>
<th>Approach</th>
<th>Carriers</th>
<th>Start Date</th>
<th>Functions</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participative Safety Rules Revision</td>
<td>ACBL, CSXT, KCS, CN-IC</td>
<td>1999</td>
<td>All Operating</td>
<td>30% reduction in reportable injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drop in liability claims</td>
</tr>
<tr>
<td>Root-Cause Analysis Problem Solving</td>
<td>Canadian Pacific</td>
<td>2003</td>
<td>Mechanical</td>
<td>50% drop in injury rates (all injuries)</td>
</tr>
<tr>
<td>Clear Signal for Action (CSA)</td>
<td>Amtrak</td>
<td>2001</td>
<td>Station Services</td>
<td>76% drop in injury rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>71% drop in reportable injuries</td>
</tr>
<tr>
<td></td>
<td>Union Pacific</td>
<td>2005</td>
<td>Road Crews</td>
<td>79% drop in L.E. decertification rates</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>81% drop in derailments</td>
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<tr>
<td></td>
<td>Union Pacific</td>
<td>2006</td>
<td>Yard Crews</td>
<td>65% drop in yard-derailment rates</td>
</tr>
<tr>
<td>Confidential Close Call Reporting System (C³RS)</td>
<td>Union Pacific</td>
<td>2007</td>
<td>Road &amp; Yard Crews</td>
<td>31% reduction in derailments at 1 site</td>
</tr>
<tr>
<td></td>
<td>Canadian Pacific</td>
<td>2008</td>
<td></td>
<td>90% drop in discipline cases</td>
</tr>
<tr>
<td></td>
<td>New Jersey Transit</td>
<td>2009</td>
<td></td>
<td>48% drop in excess-speed reports</td>
</tr>
<tr>
<td></td>
<td>Amtrak</td>
<td>2011</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Safety Culture Rail Industry Policy Influences

<table>
<thead>
<tr>
<th>Organization</th>
<th>Policy Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Union Pacific</td>
<td>“Total Safety Culture” Program</td>
</tr>
<tr>
<td>Toronto Transit</td>
<td>System-wide safety culture change</td>
</tr>
<tr>
<td>Canadian Pacific</td>
<td>Re-committed to ISROP</td>
</tr>
<tr>
<td>RSIA of 2008</td>
<td>Requires “Risk Reduction Programs”</td>
</tr>
<tr>
<td></td>
<td>Relies on pilot programs for promulgate regulations</td>
</tr>
<tr>
<td>Amtrak</td>
<td>Began implementing “Safe-2-Safer” Program;</td>
</tr>
<tr>
<td></td>
<td>Joined C3RS</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Joined C3RS</td>
</tr>
<tr>
<td>BNSF</td>
<td>Began major safety culture change initiative</td>
</tr>
</tbody>
</table>

*Body of evidence suggests R&D pilots strongly influenced industry wide changes.*
From Pilots to Carrier-wide and Industry-wide Change

**Pilots**
- CSA
  - Yard
  - Road
  - Mechanical
- C³RS
  - Yard
  - Road
  - Mechanical
  - Engineering

**Carrier-wide**
- Union Pacific - TSC
- BNSF - AO
- Amtrak – S2S
- Norfolk Southern

**Industry-wide**
- Passenger Rail CSA
- C³RS
- Short Line Safety Institute
FRA’s Confidential Close Call Program (C3RS)
FRA’s PAX Industry Clear Signal for Action (CSA) Program

- No-cost customizable CSA software and training materials
- Low-cost implementation support
Objective - Enhance Safety and Security in *entire* company by:

- Safety leadership
- Peer-to-peer feedback
- Continuous improvement
- Simultaneous implementation
- All crafts, all locations nationwide
BNSF’s Strategic Safety Culture Initiatives

**Needs**
- Align Field and Safety Functions
- Provide managers with safety leadership skills
- Strengthen . . .
- Engaging workforce

**Responses**
- System Safety Organization Restructuring
- Safe Align® (Safety Leadership Development)
- BAPP® (Behavioral Accident Prevention Process -- continuous improvement)
- “Approaching Others” (Employee-led training)
  - Identifying exposure and risk
  - Cues for pausing work
  - Providing effective feedback
HOW CAN AN EVALUATION FRAMEWORK INFLUENCE SAFETY CULTURE?

Stakeholder engagement is key
## Evaluation Framework: Roles of Evaluation

<table>
<thead>
<tr>
<th>When:</th>
<th>FORMATIVE</th>
<th>SUMMATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <em>Before or during</em> R&amp;D projects/programs</td>
<td>• <em>After</em> R&amp;D projects/programs</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Purpose:</th>
<th>FORMATIVE</th>
<th>SUMMATIVE</th>
</tr>
</thead>
</table>
| To *guide*: | • Program planning  
• Program design  
• Implementation strategies | To *assess*:  
• Completed projects or project lifecycles  
• Accomplishments  
• Impacts  
To meet accountability requirements |

<table>
<thead>
<tr>
<th>Primary Focus:</th>
<th>FORMATIVE</th>
<th>SUMMATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To <em>improve</em> programs</td>
<td>• To <em>prove</em> program merit or worth</td>
<td></td>
</tr>
</tbody>
</table>
# Roles and Types of Evaluation

<table>
<thead>
<tr>
<th>Context</th>
<th>Inputs</th>
<th>Implementation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formative Evaluation</strong></td>
<td><strong>Identifies:</strong> - Needs - Problems - Assets</td>
<td><strong>Assesses:</strong> - Alternative approaches</td>
<td><strong>Monitors:</strong> - Implementation - Documents issues</td>
</tr>
<tr>
<td>Helps set:</td>
<td><strong>Develops:</strong> - Program plans - Designs - Budgets</td>
<td><strong>Guides:</strong> - Execution</td>
<td><strong>Assesses:</strong> +/- outcomes</td>
</tr>
<tr>
<td></td>
<td><strong>Reassess:</strong> - Project/program plans</td>
<td><strong>Informs:</strong> - Performance metrics - Strategic planning - Policy development</td>
<td></td>
</tr>
<tr>
<td><strong>Summative Evaluation</strong></td>
<td><strong>Assesses:</strong> Original program goals and priorities</td>
<td><strong>Assesses:</strong> Original procedural plans and budget</td>
<td><strong>Assesses:</strong> - Execution</td>
</tr>
<tr>
<td></td>
<td><strong>Assesses:</strong> - Outcomes - Impacts - Side effects - Cost-effectiveness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evaluation Standards*
Guiding principles for conducting evaluations

• Utility (useful): to ensure evaluations serve the information needs of the intended users.

• Feasibility (practical): to ensure evaluations are realistic, prudent, diplomatic, and frugal.

• Propriety (ethical): to ensure evaluations will be conducted legally, ethically, and with due regard for the welfare of those involved in the evaluation, as well as those affected by its results.

• Accuracy (valid): to ensure that an evaluation will reveal and convey valid and reliable information about all important features of the subject program.

• Accountability (professional): to ensure that those responsible for conducting the evaluation document and make available for inspection all aspects of the evaluation that are needed for independent assessments of its utility, feasibility, propriety, accuracy, and accountability.

* The Program Evaluation Standards were developed by the Joint Committee on Standards for Educational Evaluation and have been accredited by the American National Standards Institute (ANSI).
## Evaluative Framework – Safety Culture

### Illustrative Questions

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<tr>
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<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formative Evaluation</strong></td>
<td>What are the highest priority needs for improving safety and safety culture? What is the existing culture and the context of that culture?</td>
<td>Given the need for safety culture change, what are the most promising alternatives? How do they compare (potential success, costs, etc.)? How can this strategy be most effectively implemented? What are some potential barriers to implementation?</td>
<td>To what extent is the program proceeding on time, within budget, and effectively? Is the program being implemented as designed? If needed, how can the design be improved?</td>
</tr>
<tr>
<td><strong>Summative Evaluation</strong></td>
<td>To what extent did the program address this high priority need?</td>
<td>What strategy was chosen and why, compared to other viable strategies (re. prospects for success, feasibility, costs)?</td>
<td>To what extent was the program carried out as planned, or modified with an improved plan?</td>
</tr>
</tbody>
</table>
# Example Core Evaluation Questions: Short Line Safety Institute

**Mission:** to enhance safety culture and safety compliance of short line and regional railroads through voluntary, non-punitive partnerships

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<th>Implementation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formative Evaluation</strong></td>
<td>What is the context leading ASLRA to commit to the SLSI? What are the industry’s high priority safety needs?</td>
<td>What are the possible tools and alternative approaches for improving safety culture and safety compliance?</td>
<td>What aspects of the original SLSI are being implemented as planned? To what extent are the safety culture and safety compliance assessment tools being used as designed? How can they be improved?</td>
</tr>
<tr>
<td><strong>Summative Evaluation</strong></td>
<td>To what extent did the SLSI effort address ASLRA’s high priority safety needs and goals?</td>
<td>What were the actual activities and outcomes delivered as part of the SLSI? How well did the assessment tools and processes map to the industry safety needs?</td>
<td>To what extent was the SLSI carried out as planned? How strong was the implementation, in collaboration, confidentiality, facilitating use, etc.?</td>
</tr>
</tbody>
</table>
**Mission:** Enhance safety culture and safety compliance of short line and regional railroads through voluntary, nonpunitive partnerships.

**Context:**
- **Priority:** Improve crude-by-rail transportation safety
- **Situation:** Rapid increase in crude oil production and related incidents

**Inputs**
- **FRA R&D Funding**
  - ASLRRA grant and matching funds
  - UCONN grant
  - Volpe IAA

**Outputs**
- **FRA R&D Team**
  - **Assessment Tools:**
    - Safety culture
    - Safety compliance
    - Interview protocols
  - **Educational Materials:**
    - Employee
    - Manager
  - **Organizational Plan**
  - **ASLRRA Team**
    - Onsite assessments
    - Assessment reports
    - Participant feedback
    - Buy-in

**For whom**
- Short line and regional railroads
- Employees/labor unions
- Management
- FRA RRS
- Other railroads
- DOT at-large
- Congress
- Citizenry

**What we get**

**What we see**
- Fully functioning Safety Institute
- Safety action plans
- Ongoing assessments
- Site-based training programs
- Improved safety culture
- Increased safety compliance
- Use of Institute repository resources
- Reduced accidents and injuries

**What we invest**
- FRA R&D Funding
  - ASLRRA grant and matching funds
  - UCONN grant
  - Volpe IAA

**For whom**
- Short line and regional railroads
- Employees/labor unions
- Management
- FRA RRS
- Other railroads
- DOT at-large
- Congress
- Citizenry

**What we see**
- Reduced accidents and injuries
FRA Safety Culture Selected Bibliography


Conclusion: Research and development programs in federal agencies can play a major role influencing industry safety culture, but it is much more than simply publishing results. Incorporate Evaluation as a Key Strategy Tool.

• Ask, then answer, questions that matter.
  → About processes, products, programs, policies, and impacts
  → Helped identify, develop, and design pilot safety culture implementation projects

• Monitor the extent to which, and the ways, in which projects and programs are being implemented.
  → What’s working, and why, or why not?
  → Monitored pilot implementations for ongoing improvement

• Measure the outcomes and impacts.
  → Inform others about lessons learned, progress, and program impacts
  → Documented safety and safety culture outcomes from pilot implementations

• Refine program strategy, design, and implementation.
  → Where successful programs are confirmed, supports broad-scale adoption across the industry
  → Helped identify industry partners and inform strategy for company and industry-wide scale-up

• Systematically engage key stakeholders to improve program success.
  → Identify and actively involve intended users
  → Clarify intended uses and potential misuses
  → Increased the utilization, impact, and effectiveness of pilot safety culture project outcomes for broader scale adoption and sustainability
Contact Information

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- Federal Railroad Administration
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- Surface Transportation Human Factors
- Volpe, The National Transportation Systems Center
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EXTRA SLIDES
## Evaluation Standards

*Guiding principles for conducting evaluations*

<table>
<thead>
<tr>
<th>Utility (useful)</th>
<th>Feasibility (practical)</th>
<th>Propriety (ethical)</th>
<th>Accuracy (valid)</th>
<th>Evaluation Accountability (professional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Evaluator Credibility</td>
<td>• Project Management</td>
<td>• Responsive &amp; Inclusive Orientation</td>
<td>• Justified conclusions &amp; decisions</td>
<td>• Evaluation Documentation</td>
</tr>
<tr>
<td>• Attention to Stakeholders</td>
<td>• Practical Procedures</td>
<td>• Formal Agreements</td>
<td>• Valid Information</td>
<td>• Internal Metaevaluation</td>
</tr>
<tr>
<td>• Negotiated Purposes</td>
<td>• Contextual Validity</td>
<td>• Human Rights &amp; Respect</td>
<td>• Reliable Information</td>
<td>• External Metaevaluation</td>
</tr>
<tr>
<td>• Explicit Values</td>
<td>• Resource Use</td>
<td>• Clarity &amp; Fairness</td>
<td>• Explicit Program &amp; Context Description</td>
<td></td>
</tr>
<tr>
<td>• Relevant Information</td>
<td></td>
<td>• Transparency &amp; Disclosure</td>
<td>• Information Management</td>
<td></td>
</tr>
<tr>
<td>• Meaningful Processes &amp; Products</td>
<td></td>
<td>• Conflicts of Interest</td>
<td>• Sound Design &amp; Analyses</td>
<td></td>
</tr>
<tr>
<td>• Timely &amp; Appropriate Reporting</td>
<td></td>
<td>• Fiscal Responsibility</td>
<td>• Explicit Evaluation Reasoning</td>
<td></td>
</tr>
<tr>
<td>• Concern for Consequences &amp; Influence</td>
<td></td>
<td></td>
<td>• Communication &amp; Reporting</td>
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</tbody>
</table>

Note: The Program Evaluation Standards were developed by the Joint Committee on Educational Evaluation and have been accredited by the American National Standards Institute (ANSI).
American Evaluation Association (http://www.eval.org)
• 3000 members in 2001
• over 7700 members today
• all 50 states
• over 60 countries
• $95/year membership, includes
  – American Journal of Evaluation
  – New Directions in Evaluation
  – online access to full journal articles
### Evaluation Resources

- **Affiliate Evaluation Associations**
  - Washington Research and Evaluation Network (WREN)
  - Federal Evaluator’s Network

- **Evaluation Journals**
  - American Journal of Evaluation (AJE)
  - New Directions for Evaluation (NDE)
  - Evaluation Review
  - Evaluation and the Health Professions

- **The Evaluator’s Institute** ([http://tei.gwu.edu/courses_dc.htm](http://tei.gwu.edu/courses_dc.htm))
  - George Washington University

- **The Evaluation Center** ([http://www.wmich.edu/evalctr/](http://www.wmich.edu/evalctr/))
  - Western Michigan University
Common Elements of Successful Safety Culture Change

• Commitment from all key stakeholders
• Voluntary, confidential/anonymouse, non-punitive participation
• Systematic and objective data gathering, analysis, and reporting
• Problem solving, barrier identification and removal, corrective action process
• Long-term sustaining mechanisms
Corrective actions were not just focused on the individuals involved in the event

ISROP results led to system-wide improvements

Safety Alert issued across company in 2004

Updated jacking guidelines prepared in 2006
§ 20156. Railroad safety risk reduction program

(1) PROGRAM REQUIREMENT.— ... the Secretary of Transportation . . . shall require each railroad carrier . . . “(A) to develop a railroad safety risk reduction program under subsection (d) that systematically evaluates railroad safety risks on its system and manages those risks . . .

(2) RELIANCE ON PILOT PROGRAM.—The Secretary may conduct behavior-based safety and other research, including pilot programs, before promulgating regulations under this subsection and thereafter. The Secretary shall use any information and experience gathered through such research and pilot programs under this subsection in developing regulations under this section.”
Policy Influence at U.S. DOT Safety Council

- Safety Culture Action Team
  - Safety Culture Research Paper
  - DOT Safety Policy Statement
U.S. DOT and Safety Culture

The traditional view of Federal intervention

DOT Actions

Actions:
Industry Organizations
States Public

Safety Outcomes

Safety Culture:
Industry Organizations
States Public

How do DOT’s actions and culture affect the safety culture of industry, organizations, states, and public we oversee and influence?
CSA Overview

What is CSA?

- Safer Culture
- Continuous Improvement
- Safer Workplace
- Safer Practices
- Peer-to-peer Feedback
- Confidential Data

Safety Leadership
### Program Evaluations: Company and Industry-wide Safety Culture Change Initiatives*

<table>
<thead>
<tr>
<th>Organization/Program</th>
<th>Company or Industry-wide Changes</th>
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<tr>
<td>Confidential Close Call Reporting System (C³RS)</td>
<td>Transitioning from pilots to systemwide program</td>
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<tr>
<td>CSA PAX Operations</td>
<td>No-cost training and educational materials</td>
</tr>
<tr>
<td>Amtrak</td>
<td>“Safe-to-Safer” Program</td>
</tr>
</tbody>
</table>
| BNSF                                  | Safe Align®  
|                                       | “Approaching Others” (EST/AO)                                                                     |
|                                       | Behavioral Accident Prevention Process (BAPP)®                                                    |
|                                       | Safety System Organizational Restructuring                                                        |
| ASLRRRA                               | Short Line Safety Institute                                                                     |

* Ongoing FRA R&D Evaluation Projects
Short Line Safety Institute Vision, Mission, and Strategic Goals

Mission: Enhance safety culture and safety compliance of short line and regional railroads through voluntary, nonpunitive partnerships.

- **Vision:** for the short line and regional railroad industry to be recognized as one of the safest in the world
- **Mission:** to enhance safety culture and safety compliance of short line and regional railroads through voluntary, nonpunitive partnerships
- **Strategic Goals:**
  - to enhance and improve safety practices
  - to increase the short line and regional railroad industry’s culture of commitment to safety
Short Line Safety Institute Pilot Project Overview

**Mission:** Enhance safety culture and safety compliance of short line and regional railroads through voluntary, nonpunitive partnerships.

• **FRA R&D Team (FRA, Volpe, UCONN) Activities:**
  – Tool development: Pilot test, design, and implement protocols, tools, and procedures for assessing safety culture and safety compliance
  – Program development: Conduct organizational structure needs assessment, and recommend appropriate and effective organizational structure for Safety Institute
  – Evaluate project development, implementation processes, and ongoing outcomes to inform efforts for larger-scale Safety Institute

• **ASLRRRA/Safety Institute Team Activities:**
  – Conduct safety culture and safety compliance assessments
  – Provide safety education, training, and development to managers and employees
  – Implement the Safety Institute’s organizational development plan

• **Transition:** Following Pilot Project evaluation, transition to a permanent, expanded Short Line Safety Institute with embedded continuous improvement