

# Overcoming Roadblocks Facing the Implementation of Innovations: Three Case Studies at Caltrans

Larry Orcutt

Chief, Division of Research and Innovation

And

Mohamed AlKadri, Ph.D., PE

Branch Chief, Research Evaluation and Decision Support  
Division of Research and Innovation



# What is Innovation?

- *Innovation:* (Webster Dictionary Definition)
  - 1 : the introduction of something new
  - 2 : a new idea, method, or device
- *Innovation:* (Our Definition)

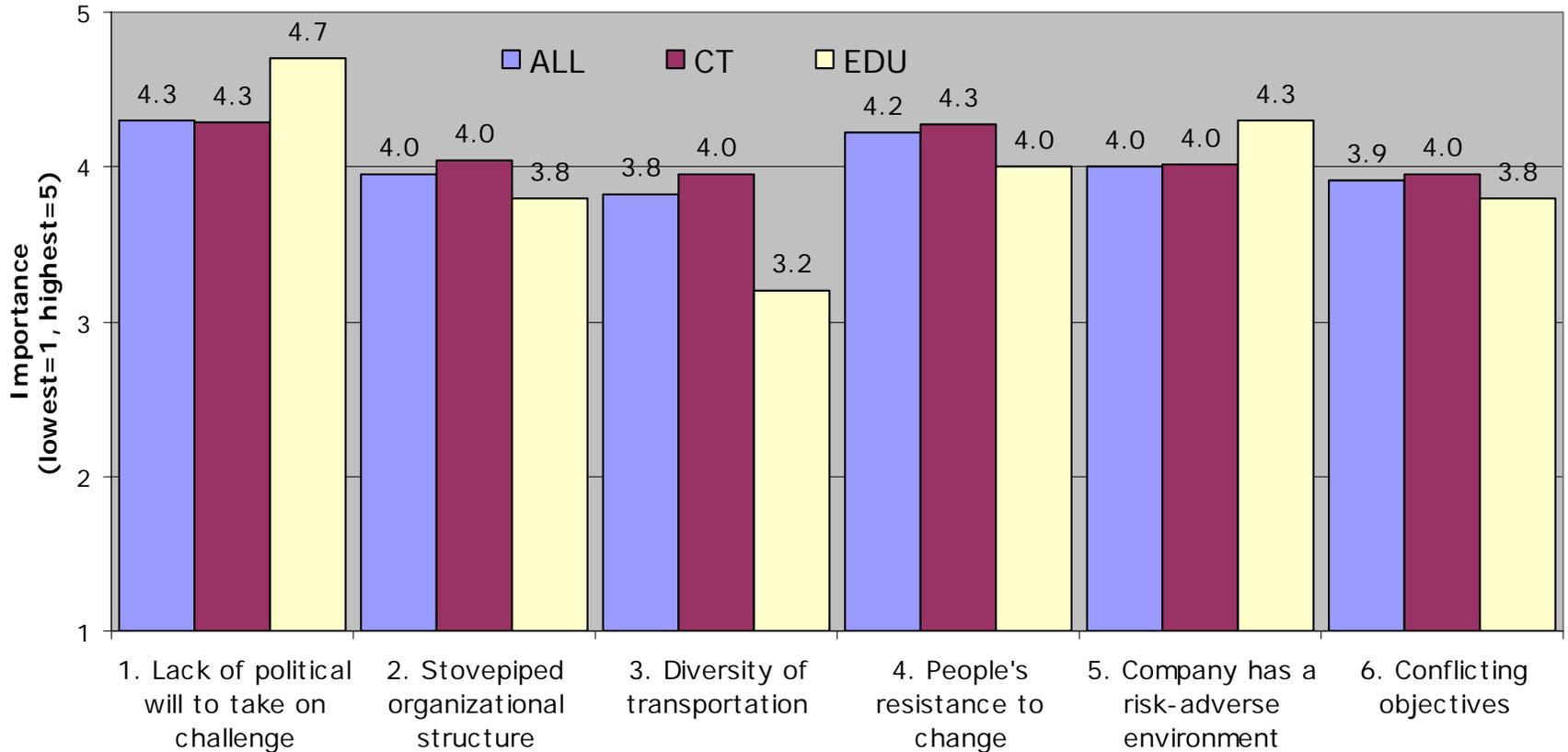
The creation AND successful implementation of a new product or process into a working system that becomes widely used by the transportation industry.

# Real World Survey

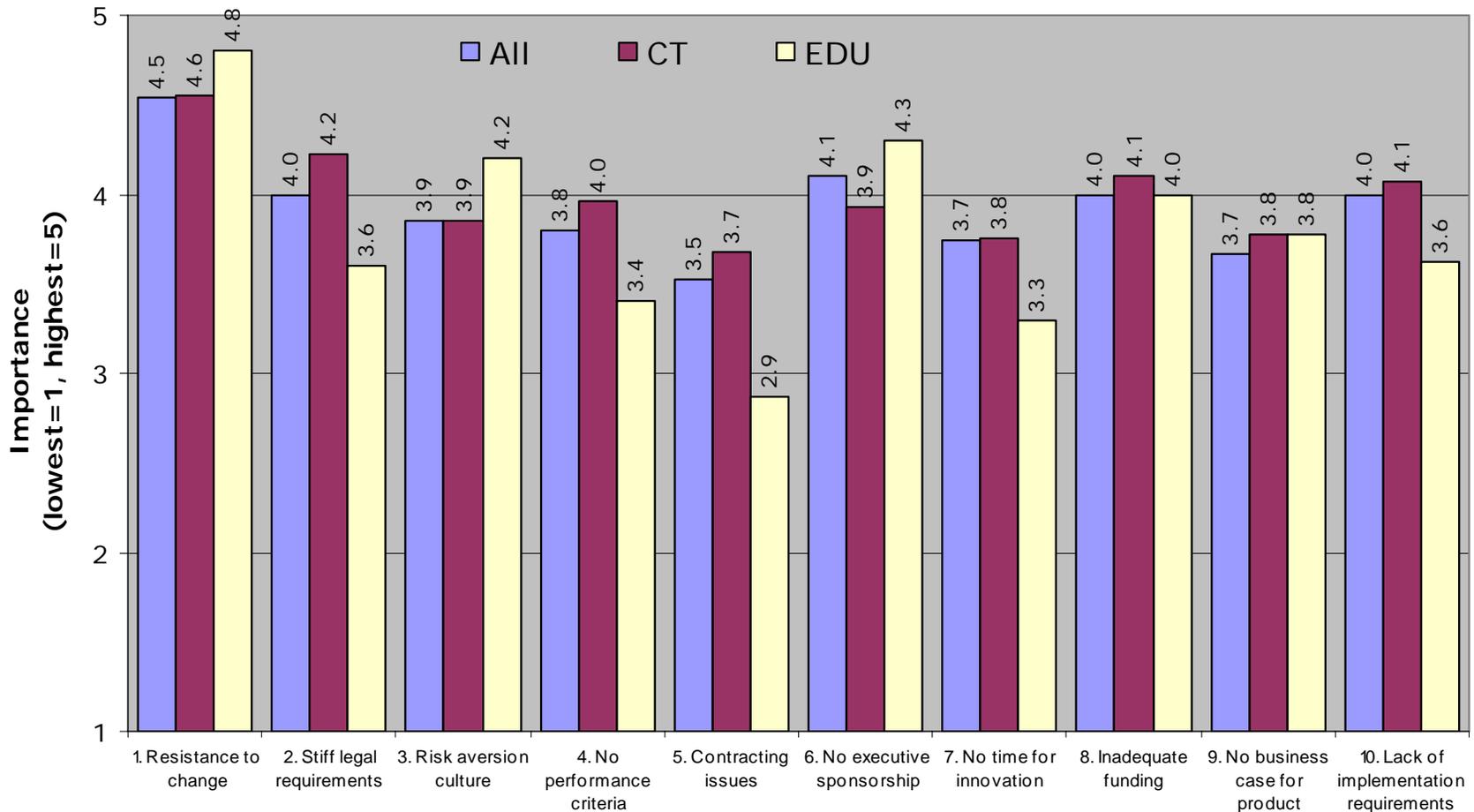
## Survey Instrument:

- 10 Questions used to test assumptions “hypothesis.”
- Survey sent to 150 transportation research professionals in California, 49 states, and Canada.
- Respondents completed 109 “usable” surveys.
- Asked respondents to rate the importance of each roadblock and enabler.
- Asked respondents if they prefer sustaining or disruptive technologies.
- Asked respondents to prioritize innovation in safety, performance, cost-effectiveness, quality, and environmental protection.
- Asked respondents to provide suggestions on how to improve the process of innovation.

# Institutional Barriers to Innovation



# Respondents' ranking of the importance of innovation roadblocks.



# 3 Case Studies at Caltrans

- Balsi Beam
  - A mobile safety steel frame designed to protect highway maintenance workers.
- Rapid Rehab (aka CA4PRS)
  - A software that simulates highway construction, predicting traffic delays associated with simulation scenarios, to optimize construction quality, costs and traffic impacts.
- Sensys™
  - A compact, low cost wireless traffic sensing system that can replace less reliable, more expensive inductive loops.

# Balsi Beam Case Study



For more information

Contact: Bob Meline at  
[bob.meline@dot.ca.gov](mailto:bob.meline@dot.ca.gov)

- Innovative mobile work zone protection system that was envisioned by Caltrans Division of Maintenance
- Named after Mark Balsi
- Designed by Division of Equipment
- District 3 critical in getting this deployed

# Balsi Beam Crash Test



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# Balsi Beam Barriers

Barrier	Mitigating Measure Used by Caltrans DRI
<p>Unfamiliarity of customers with Balsi Beam</p>	<ul style="list-style-type: none"> <li>• Demonstrations by the crew using the Balsi Beam helped get the word out to the maintenance community.</li> <li>• Training that is well developed and supported.</li> <li>• Having champions at all levels to support the Balsi Beam is critical for the success of implementing this innovation.</li> </ul>
<p>Lack of evaluation criteria and uncertainty about its efficacy</p>	<ul style="list-style-type: none"> <li>• Establishing the business case using worker safety data and in-field evaluations overcomes the institutional issues.</li> <li>• DRI commissioned CCIT to perform an evaluation. DRI funded research at University of California at Davis to perform benefit-cost and risk evaluation study.</li> </ul>
<p>High capital cost of the new innovative product</p>	<ul style="list-style-type: none"> <li>• DRI is using commercialization to reduce capital cost by improving the design and optimizing manufacturing procedures as well as mass-producing the units to domestic and international customers.</li> </ul>
<p>Balsi Beam patent restricted competitive bidding at other state agencies, California law prohibited sharing (gifting) this technology with (to) other states</p>	<ul style="list-style-type: none"> <li>• DRI is developing licenses to grant other states right to use Balsi Beam. DRI will be issuing an RFP to sell Balsi Beam license to multiple qualified vendors.</li> </ul>
<p>Uncertainty in evaluating market value for Balsi Beam</p>	<ul style="list-style-type: none"> <li>• DRI conducted a study and estimated a fair market value for Balsi Beam</li> </ul>

# Balsi Beam Lessons Learned

- Performance standards
- Functional Standards
- Documenting business case was essential for receiving additional purchasing resources
- Recruit champions at all levels from field crews to management.
- Conduct a market assessment
- Patent/Intellectual Property issues are an important part of implementing innovation.

# Rapid Rehab Case Study



- A software package developed by the UC Pavement Research Center with funding from DRI
- Aids engineers and contractors in selecting economical highway rehabilitation strategies that minimize disruptions to drivers and the surrounding community.
- Identifies optimal construction management strategies that balance construction schedules with traveler inconvenience while minimizing agency costs.
- I-710 and I-15 – two tests

For more information on Rapid Rehab, please contact Michael Samadian at [michael\\_samadian@dot.ca.gov](mailto:michael_samadian@dot.ca.gov)

# Need of Tools for Rapid Rehab

- Highway Renewal for Sustainability
  - We must rehabilitate highways under live traffic
- Work-zone (WZ) Impacts Mobility and Safety
  - Mobility issues with travelers, local communities, and neighboring businesses
  - Causing 12% permanent delay and 4000 yearly injuries
- Federal Work-zone Rule
  - Improve WZ Safety and Mobility (Oct 2007)
  - Develop agency-level policy & statewide process (DD60)
  - Implement project-level standard procedures

# Case Studies

- Completed
  - I-10 Pomona Concrete Project (D7) - 2000
  - I-710 Long Beach Asphalt Project (D7) – 2002
  - I-15 Devore 1 Concrete Project (D8) - 2004
  - I-15 Devore 2 Concrete Project (D8) – 2007
  - WSDOT I-5 Seattle Concrete Project (2006)
  - MNDOT I-494 and I-394 AC Projects (2006)
- Construction in Process
  - I-710 II LA Project (D4) - 2008
  - I-15 Ontario Concrete (D8) – 2009
  - I-15 Mountain Pass AC Project (D4)- 2009
  - US-101 San Jose AC Project (D4) - 2009
  - I-280 San Jose Concrete (D4) - 2009

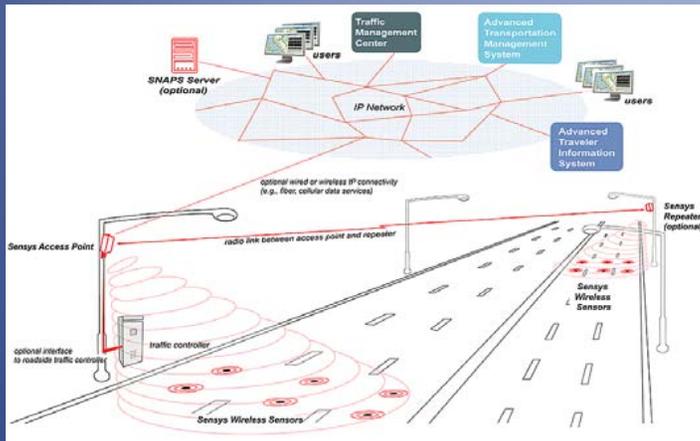
# Rapid Rehab Barriers

Barrier	Mitigating Measure Used by Caltrans DRI
Lack of product evaluation approval process for IT related technologies	<ul style="list-style-type: none"> <li>• DRI had to rely on traditional FSR</li> </ul>
Resistance to change, breakdown in bottom-up communications	<ul style="list-style-type: none"> <li>• Communication and marketing of case study results.</li> <li>• Continuing to work with and train customers.</li> <li>• Briefings were provided to key decision-makers to support innovation.</li> </ul>
Risk aversion	<ul style="list-style-type: none"> <li>• DRI used CA4PRS in pilot studies that demonstrated its success.</li> <li>• DRI won credibility for CA4PRS through winning national/international recognition.</li> <li>• DRI used champions at staff/management levels throughout all stages of deployment.</li> </ul>
Lack of profit motive	<ul style="list-style-type: none"> <li>• Construction and traveler delay cost and savings were documented.</li> <li>• Establishing the savings in support costs is very important to Capital Outlay Support managers, and this information helped make decisions that supported the use of CA4PRS.</li> </ul>
Difficulty in sharing innovations with other states	<ul style="list-style-type: none"> <li>• CA4PRS has been demonstrated at numerous AASSHO forums such as the Standing Committee on Highways and Research Advisory Committee.</li> <li>• DRI worked with FHWA to provide national videoconferences to other DOTs.</li> <li>• DRI established a UC based curriculum, trained approximately 700 users in and outside CA.</li> <li>• DRI played leadership role in securing federal funding via <i>Highways for Life Program</i> to help other states purchase CA4PRS.</li> <li>• UC established \$150,000 license fee for all states exclusive rights to use CA4PRS.</li> <li>• Current CA4PRS enterprise license is \$5,000 - relatively inexpensive.</li> </ul>

# Rapid Rehab Lessons Learned

- Performance standards
- Functional standards
- Be flexible and resourceful
- Marketing is critical
- Seek external recognition
- Without curriculum and training plans, innovation will not be used
- District 8 – Integrating Rapid Rehab, why not more?

# Sensys™ Case Study



- Compact, easy-to-install, reliable, low cost wireless sensor system.
- May replace traditional inductive loops.
- Data transferred over twisted pair, coaxial cable, fiber-optic cable, and cellular data services.
- Access points relay data to local or remote receivers.
- CCIT evaluated three elements.
- Additional in-house testing was performed

# Sensys™ Barriers

Barrier	Mitigating Measure Used by DRI
Lack of funding to explore new concepts in complex systems	<ul style="list-style-type: none"> <li>• Created a small (\$25K) and limited (1-year) research grants to investigate and test new ideas.</li> </ul>
Lack of functional requirements, specifications, and evaluation criteria	<ul style="list-style-type: none"> <li>• Commissioned CCIT to perform an evaluation</li> <li>• Performed a supplemental in-house evaluation using comparable criteria.</li> </ul>
Lack of provider credibility	<ul style="list-style-type: none"> <li>• Assured end users Sensys was a reliable product backed by the manufacture and approved by Caltrans.</li> </ul>
Resistance to change and risk aversion	<ul style="list-style-type: none"> <li>• Proactive communication was pursued through reports and informal discussions.</li> <li>• DRI recruited champions at Caltrans Division of Traffic Operations who sanctioned the additional testing.</li> </ul>
Sole-sourcing contracts	<ul style="list-style-type: none"> <li>• DRI had relied on use performance-based specifications.</li> </ul>

# Sensys™ Lessons Learned

- Logical criteria must be established in a timely fashion to test the new innovation.
- Performance standards for new products must be as rigorous as the performance standards for existing products.
- Functional requirements must be specified and used.
- Developers must involve the client in the product approval process.

# What Next?

- Where do we get innovators?
- How do we get large companies to be innovators?
- Why will people want to try new things?
- The best way to predict the future, is to invent it.

# Current Innovations



Pothole Patcher “Python 5000” Machine

Remote Control Culvert  
Excavator- Tunnel  
Mucker



For more information on both of these products, please contact: Bob Meline at [bob.meline@dot.ca.gov](mailto:bob.meline@dot.ca.gov).

Want more?

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