ITS Intelligent Transportation Systems
U.S. Department of Transportation

Integrated Corridor Management (ICM)

Agenda

- Integrated Corridor Management (ICM)
- USDOT ICM Initiative
- Program History
- Deployment sites: Dallas, TX and San Diego, CA
- Comprehensive evaluation
- Knowledge and Technology Transfer

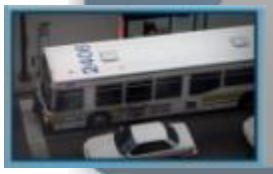
Recent Headlines (2010 and 2011)

The Wall Street Journal *USA Today* *TIME Magazine* *The Chicago Tribune*

"Rebounding areas pay price in gridlock"
"New study estimates for first time the public health costs of traffic congestion in U.S.: At least 2,200 premature deaths and $17.8 Billion" **"Expect to spend more time in traffic this year."**
"Vehicle crashes cost region $11.3 billion annually"

Corridor managed as system



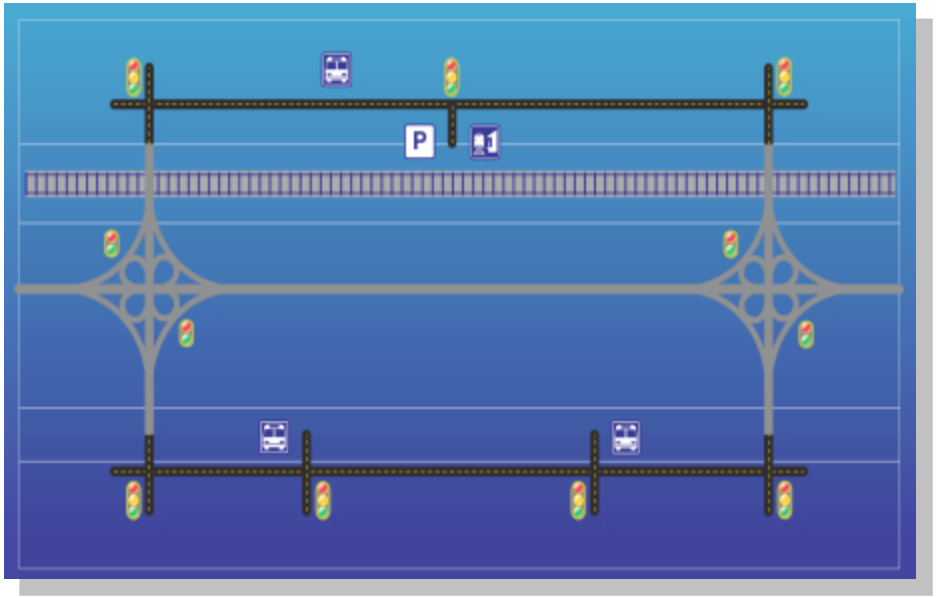



- Freeway Systems
- Integrated Operations
- Arterial Signal Systems
- Rail Systems
- Parking Systems
- Bus Systems

Management implies action

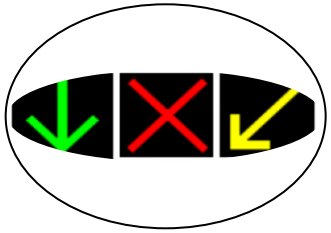
- Management" implies more than passive monitoring—It implies action.

- Pro-active, and integrated multi-modal management
- Improve Situational Awareness
- Enhance Response and Control
- Better inform travelers



Examples of Supporting Technologies

- Active Traffic Management
- Managed Lanes
- Transit only lanes
- Transit signal priority
- Multimodal, actionable traveler information
- Real-time traffic signal control
- Integrated electronic payment

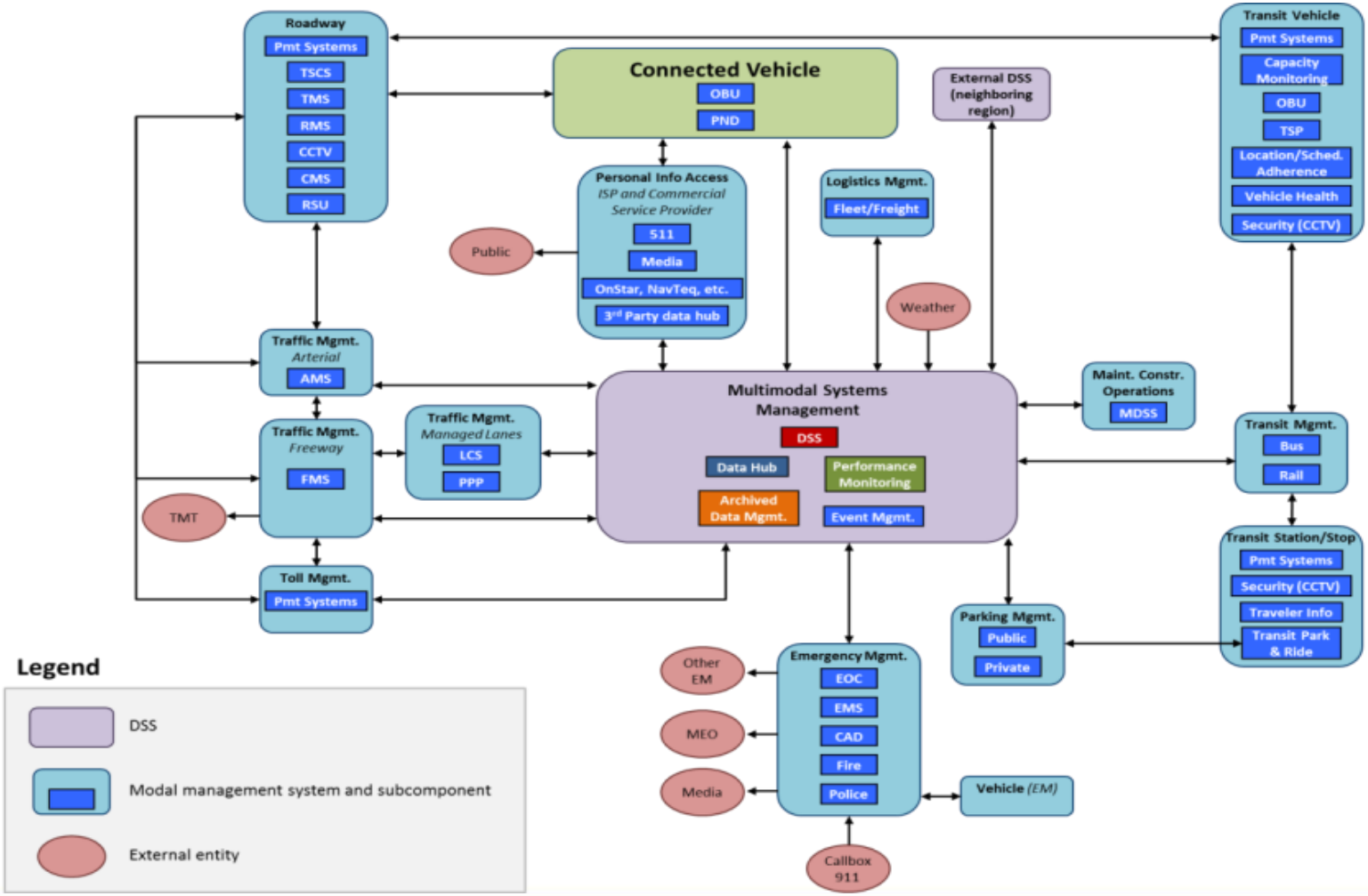





Supporting Systems

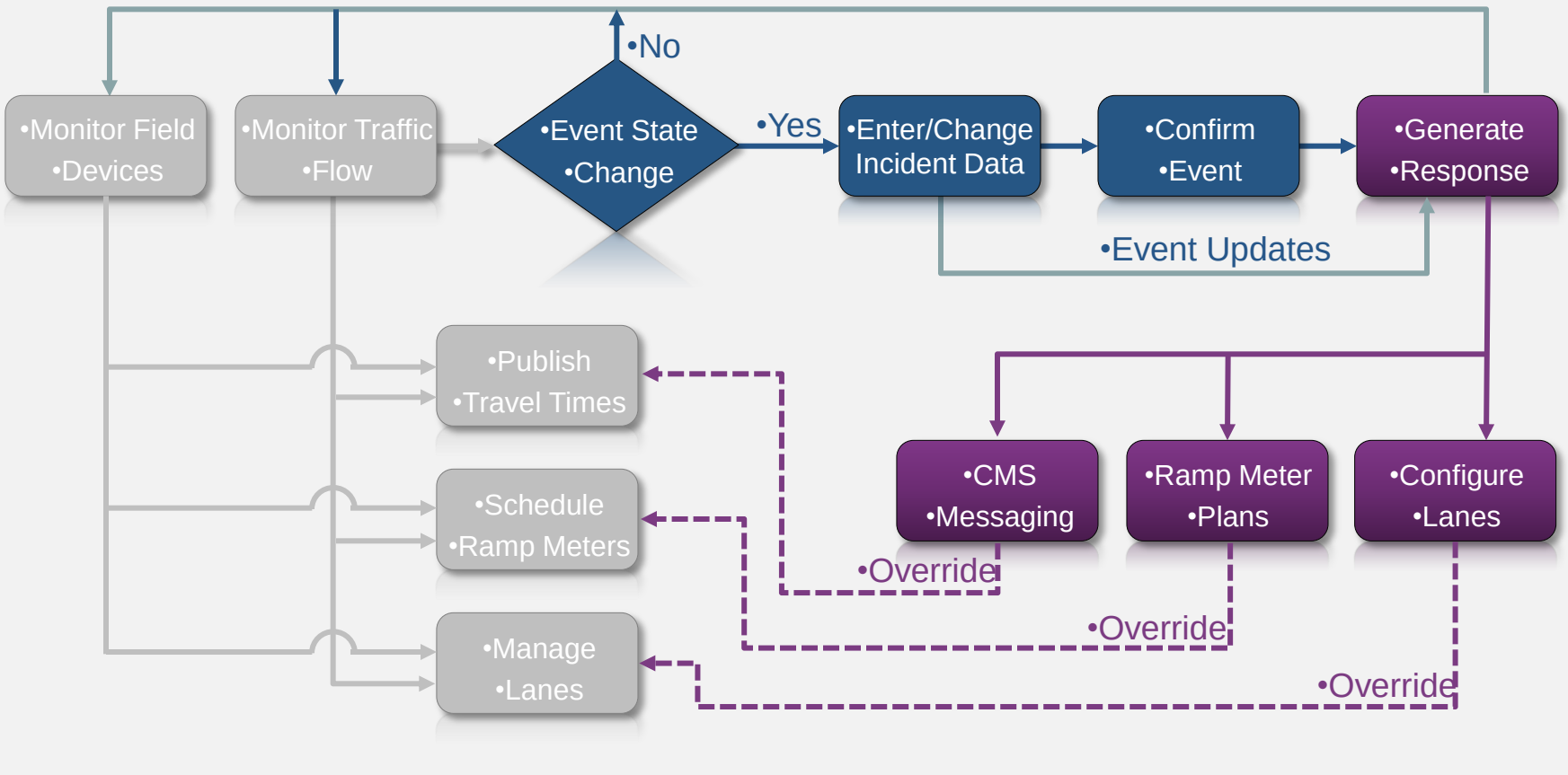
- Data fusion engines
- Decision support systems
- Predictive Capabilities
- Expert Systems
- Real-time Simulation
- Data Hub
- Performance Monitoring

ICM Systems (ICMS)



Other Supporting Processes

e.g., Joint Operating Plans, Communications



USDOT ICM Initiative

- Goals
  - Demonstrate and evaluate ICM
  - Provide tools, knowledge, and guidance

- Program Performance
  - *Success of the ICM Program will be defined by the ability of future locations to implement ICM*

ICM Pioneer Sites

- LEGEND:
- All Pioneer Sites developed ICM Concept of Operations, Sample Data, and Requirements
- *Italicized: Completed ICM AMS*
- ***Bolded/Italicized:*** Demonstration Site

•Seattle

•*Minneapolis*

•Montgomery County

•Oakland

•***San Diego***

•***Dallas***

•San Antonio

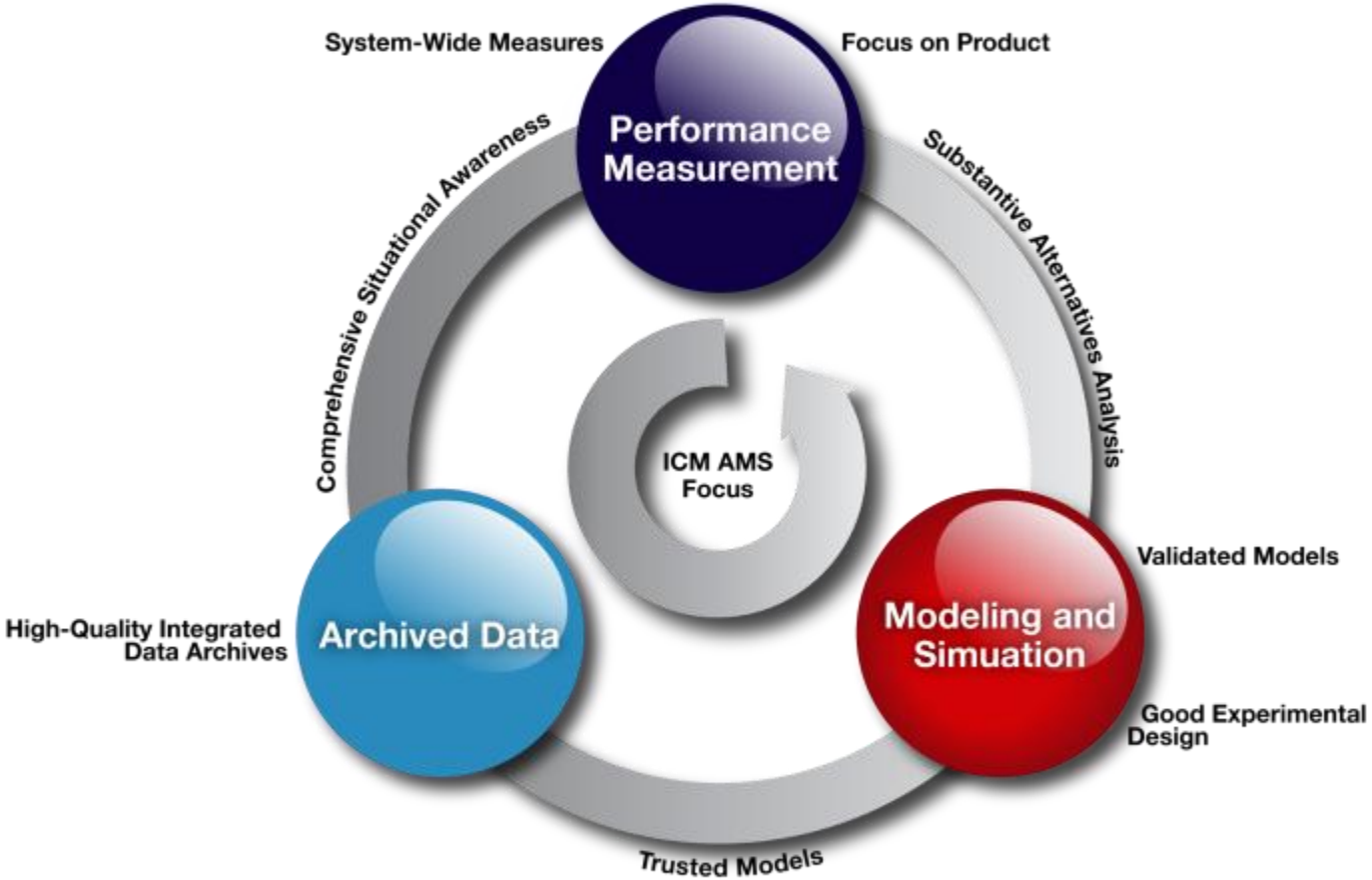
•Houston

•*Learn More: http://www.its.dot.gov/icms/*

From Research to Results: *Analysis, Modeling and Simulation*

Approach and Findings

ICM AMS Focus: Integrated Performance Measures



ICM AMS Pioneer Site Corridors

•Dallas, TX

- *Major employers*
- *No ability to expand*
- *Surrounding construction planned*

•Minneapolis, MN

- *Busy commuter corridor*
- *Limited expansion capacity*
- *Major construction planned*

•San Diego, CA

- *Popular freight, tourist and commuter corridor*
- *Lengthening peak travel periods*

<u>Strategies</u>

- Integrated management
- Coordinated incident management
- Integrated operational systems
- Increased park and ride capacity
- HOV

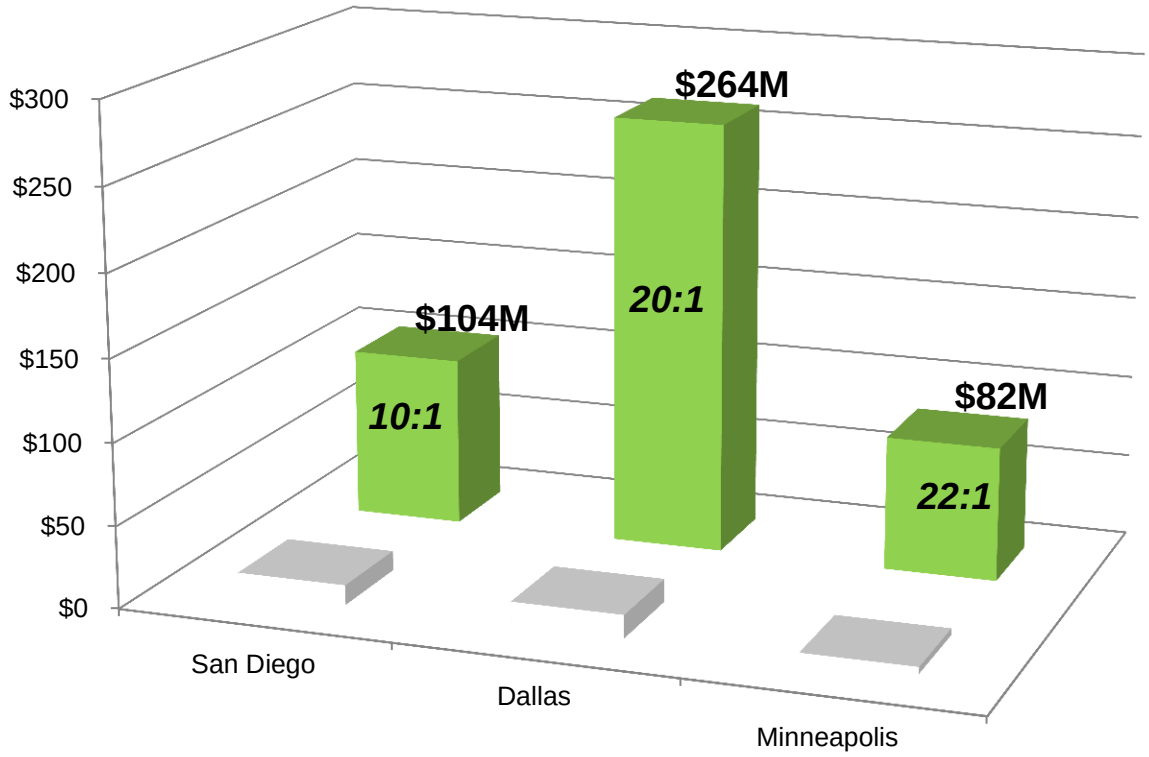
- Integrated management
- Coordinated incident management
- Multi-agency data exchange
- Managed lanes
- Transit signal priority
- Signal timing

- Integrated management
- Coordinated incident management
- Dynamic ramp metering
- Reversible HOT lanes
- Increased transit ridership
- Congestion avoidance rewards

ICM Benefits Corridor Performance

	San Diego	Dallas	Minneapolis
Annual Travel Time Savings (Person-Hours)	246,000	740,000	132,000
Improvement in Travel Time Reliability (Reduction in Travel Time Variance)	10.6%	3%	4.4%
Gallons of Fuel Saved Annually	323,000	981,000	17,600
Tons of Mobile Emissions Saved Annually	3,100	9,400	175

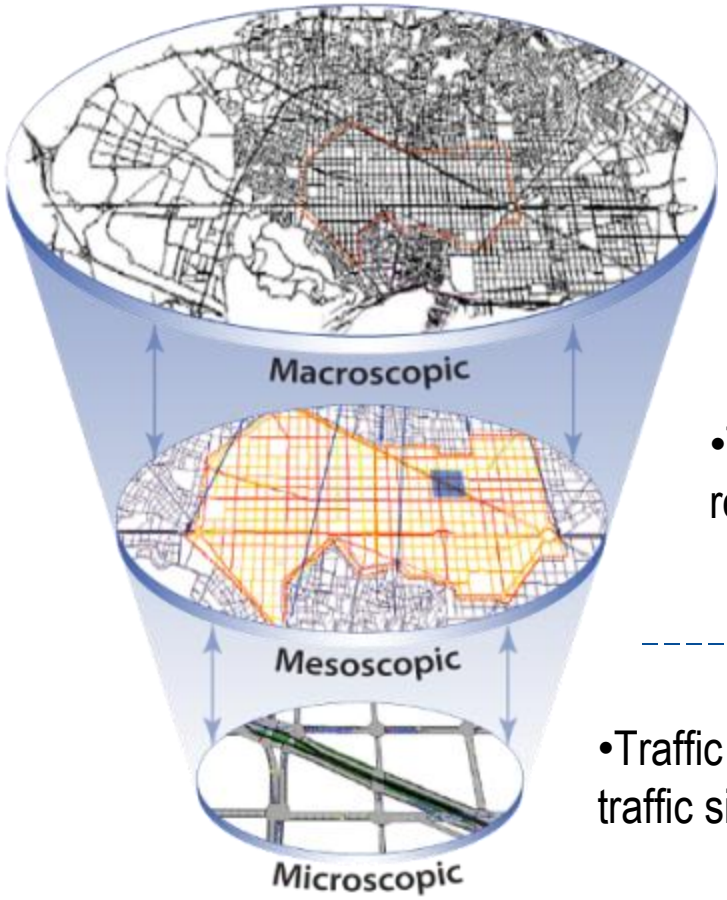
ICM Benefits Far Outweigh Costs



KEY:

- 10-Year Cost
- 10-Year Net Benefit
- ***Benefit Cost Ratio (italicized)***

Multi-level Analysis

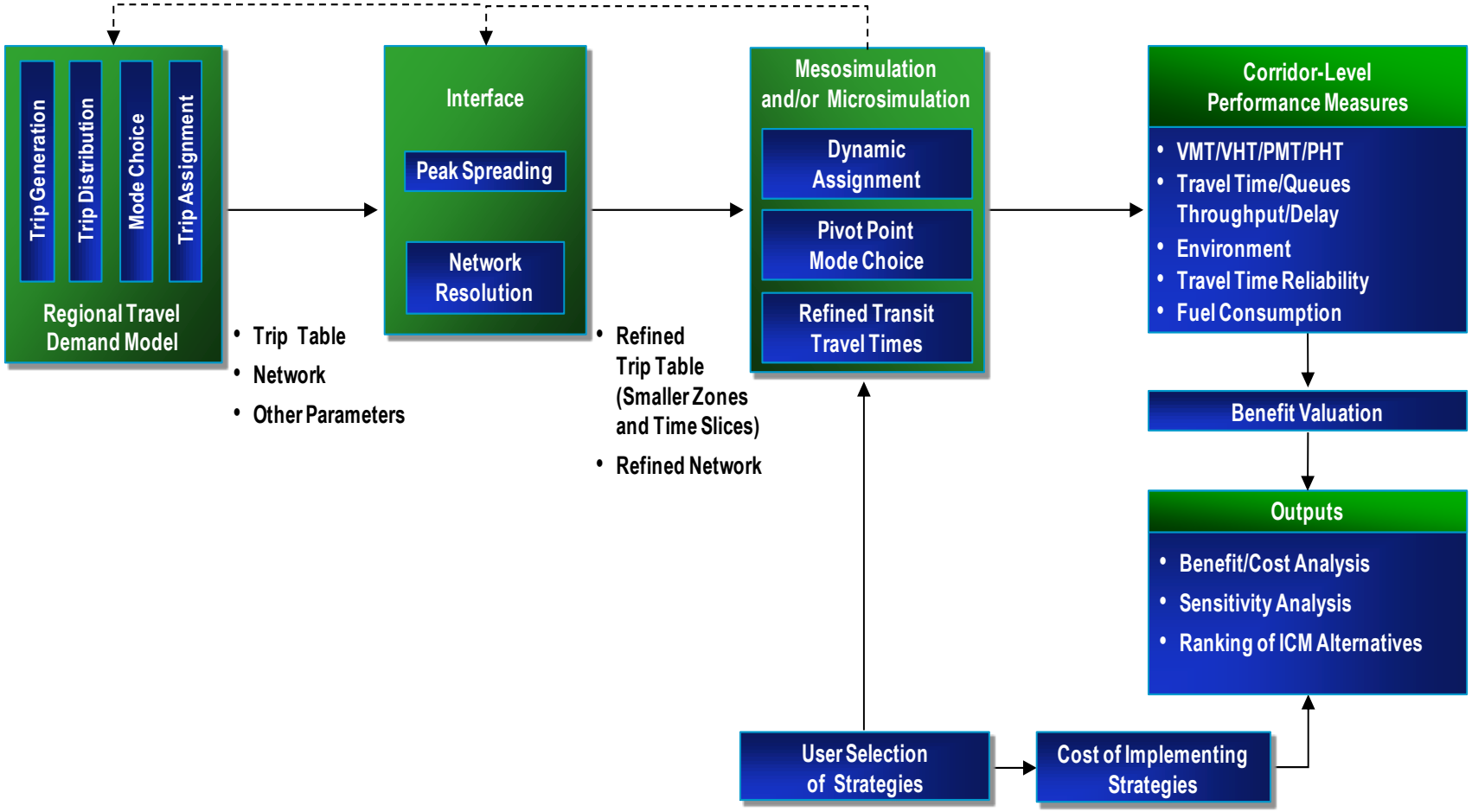


- Regional patterns and mode shift; Transit analysis capability

- Traveler information, HOT lanes, congestion pricing and regional diversion patterns

- Traffic control strategies such as ramp metering and arterial traffic signal control

Iterative Feedback Process between Macro, Meso, and Micro Models



ICM AMS Helps Corridor Managers:

- **Invest in the right ICM strategies**
  - Help determine which combinations of strategies are likely to be most effective and under what conditions
  - Enables better, tangible understanding of ICM impacts and benefits
- **Invest with confidence**
  - Minimize conflicts or unintended consequences that would otherwise be unknowable before implementation
- **Improve the effectiveness/success of implementation**
  - Help build consensus among stakeholders
  - Optimize implementation staging
  - Provide insight to operators on how to refine ICM strategies in different operational conditions
- **Provide long-term capability to continually improve implementation based on experience**

Impact of ICM AMS

- ICM AMS improved analysis tools and method
  - More comprehensive picture of corridor performance through the integration of existing models that provide visibility into full travel shed
  - New tools for analysis of transit, congestion pricing, HOT lanes, ramp metering, and active traffic management
  - Improved model calibration and data analysis methods

From Research to Results:

Demonstration

ICM Demonstration Scope

- Construct ICM Systems
- Integrate Transportation Operations
- Share and Utilize data for decision-making
- Operate differently
- Improve performance

ICM Demonstration Sites

- San Diego, CA

- Dallas, TX

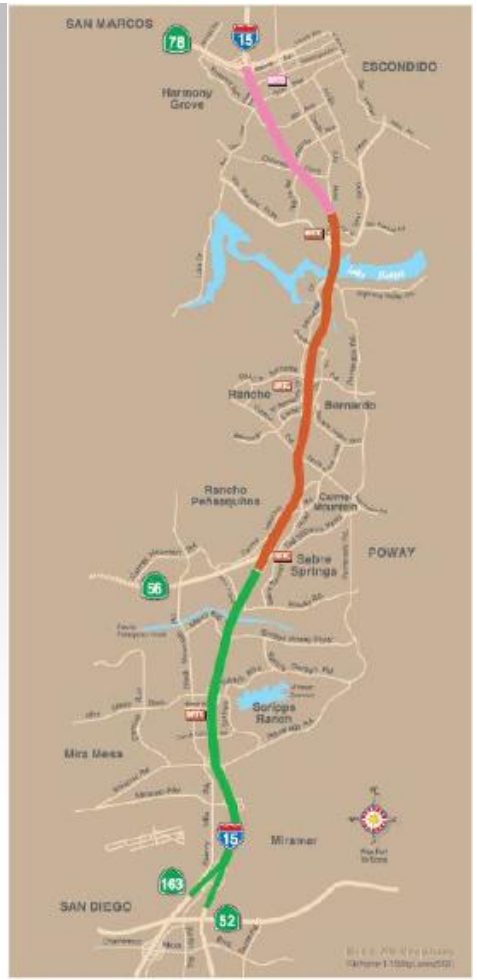
ICM Demonstration Schedule

- ICM Phase 3 Demonstration Stage Kick-off – Jan. 2010
- Design and Development – 18 months
  - Includes Pre-deployment data collection period
- Operations and Maintenance – 18 months
  - Includes Post-deployment
  - data collection period
- Evaluation –
  - 6-12 months pre-deployment
  - 18 month post-deployment

ICM Demonstration Site – San Diego

SANDAG

- ICM Strategy categories:
  - –Share/distribute information
  - –Improve Junctions/Interfaces
  - –Accommodate/promote network shifts
  - –Capacity/demand Management



•Learn More: http://www.its.dot.gov/icms/

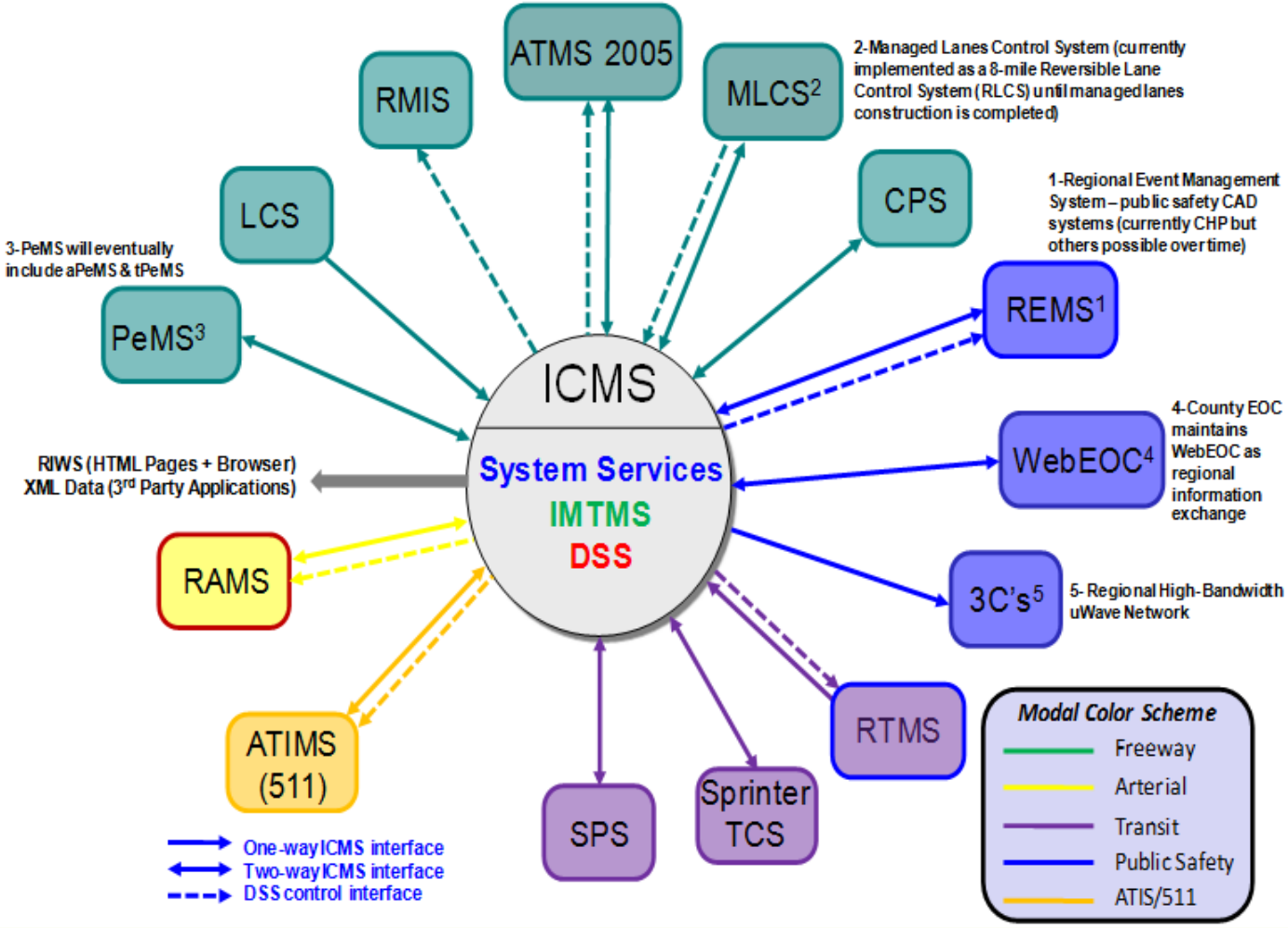
ICM Demonstration Site – San Diego

SANDAG

- Joint Operations and Maintenance Plan
- Real-time Decision Support
- Integrated regional data system
- Managed priced lanes
- Bus Rapid Transit
- Real-time transit data/information
- Actionable Traveler Information
- Coordinated Freeway/Arterial control
- Responsive signal operation
- Coordinated network management

- *Learn More: http://www.its.dot.gov/icms/*

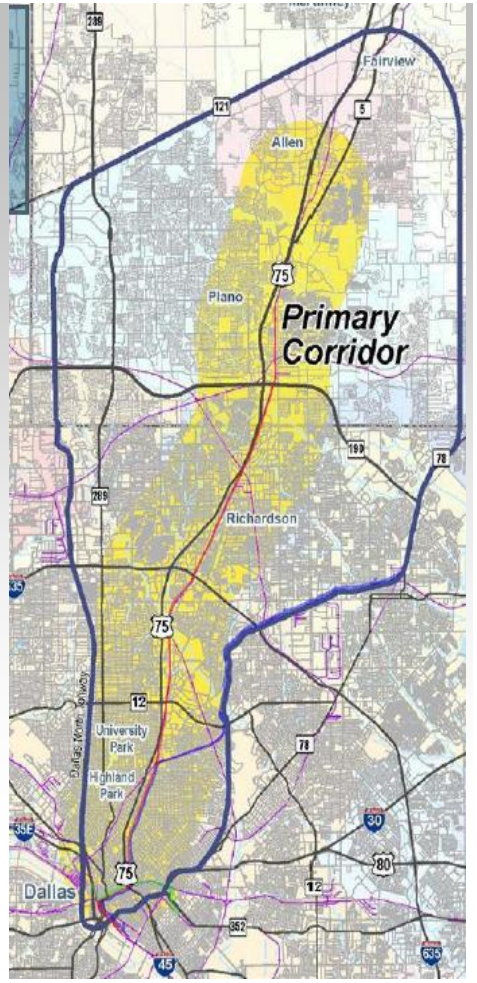
San Diego ICMS Context Diagram



ICM Demonstration Site – Dallas

DART

- ICM Approaches:
  - Increase corridor throughput
  - Improved incident management
  - Improve ravel time reliability
  - Enable intermodal travel decisions



•Learn More: http://www.its.dot.gov/icms/

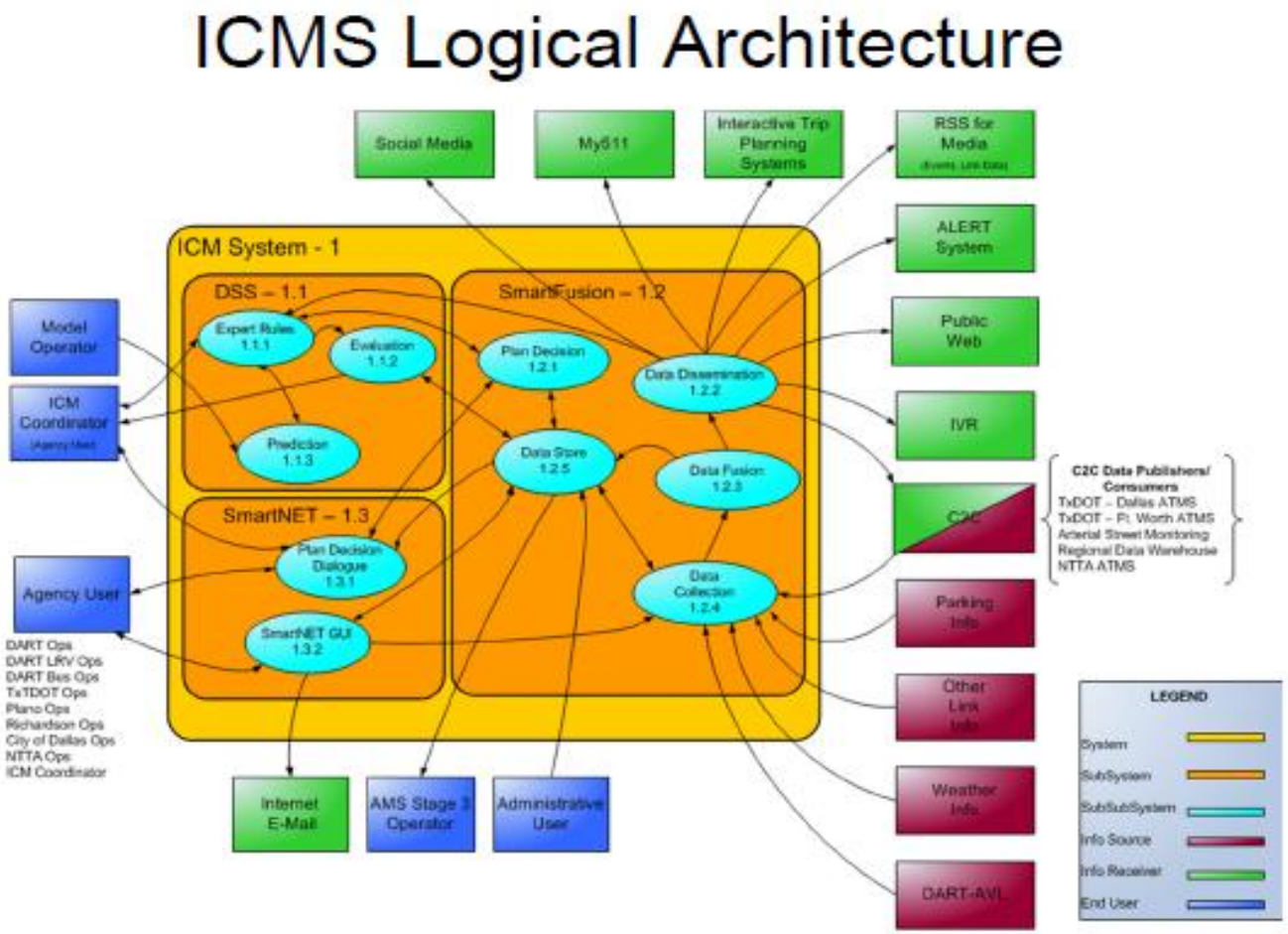
ICM Demonstration Site – Dallas

DART

- Joint Operations and Maintenance Plan
- Real-time Decision Support
- Integrated regional data system
- Managed lanes
- Light rail transit
- Real-time transit data/information
- Actionable Traveler Information
- Responsive signal operation
- Coordinated network management

- *Learn More: http://www.its.dot.gov/icms/*

ICM Demonstration Site – Dallas



•Learn More: http://www.its.dot.gov/icms/

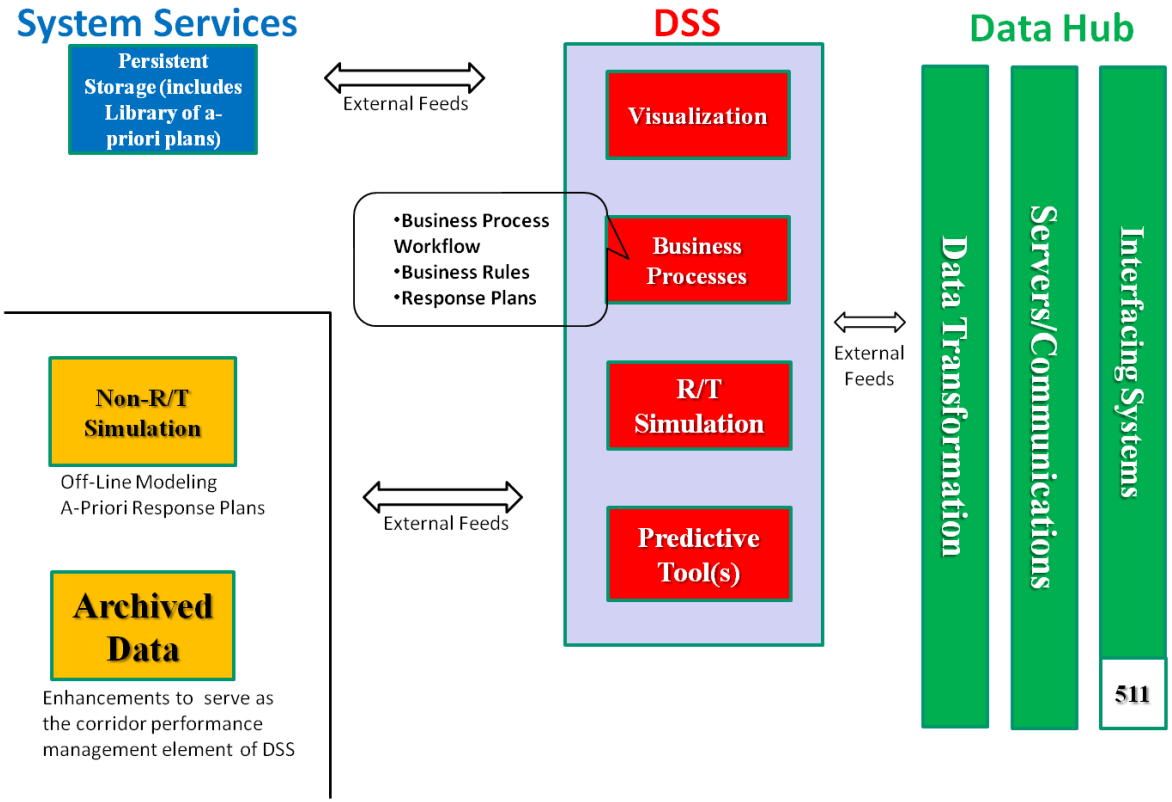
ICM – Decision Support Systems

- Decision Support System (DSS)
  - –Information systems that support multimodal, transportation operational decision-making in real-time.
  - –The significance and importance of the ICM DSS lies in the fact that modal actions in response to short-term or long-term impacts on the corridor will be coordinated and not carried out in isolation as is usually the case

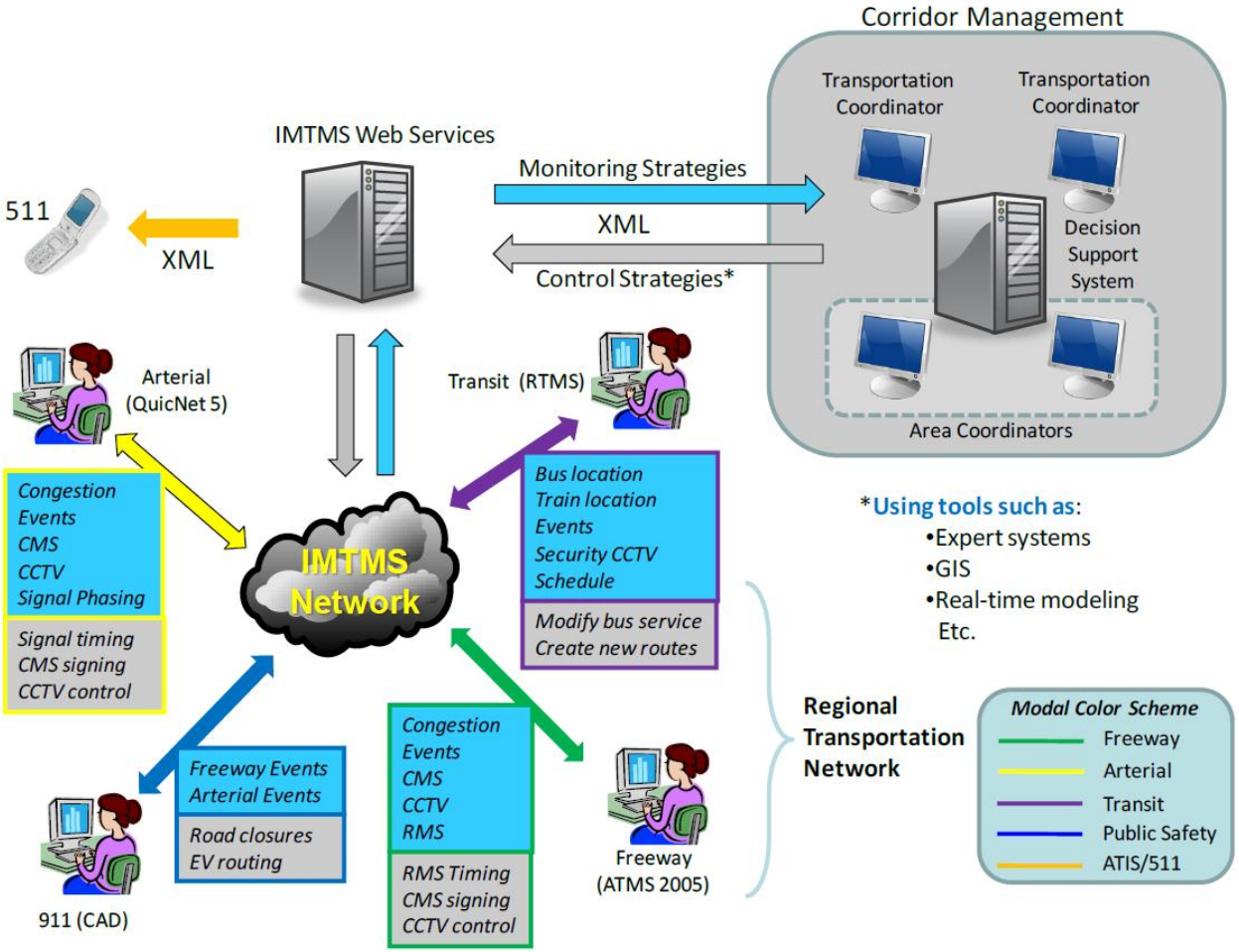
ICM – Decision Support Systems

- DSS – A family of systems
  - GIS-based visualization platform
  - Source(s) of real-time data
  - Source(s) of historical data
  - Persistent data storage
  - Business Process engine
  - Expert systems or other rule-based engine
  - Traffic-responsive algorithms
  - Predictive algorithms
  - Real-time simulation/tools
  - Off-line modeling

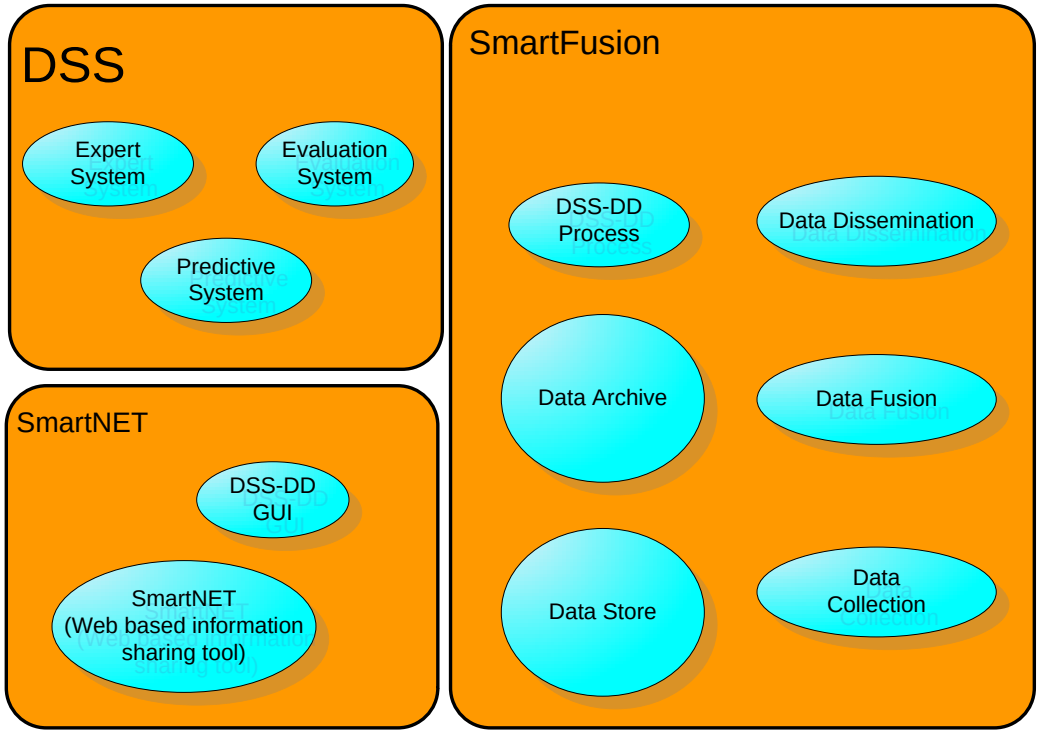
ICM – Decision Support Systems



San Diego ICM DSS Context Diagram



Dallas ICM DSS Context Diagram



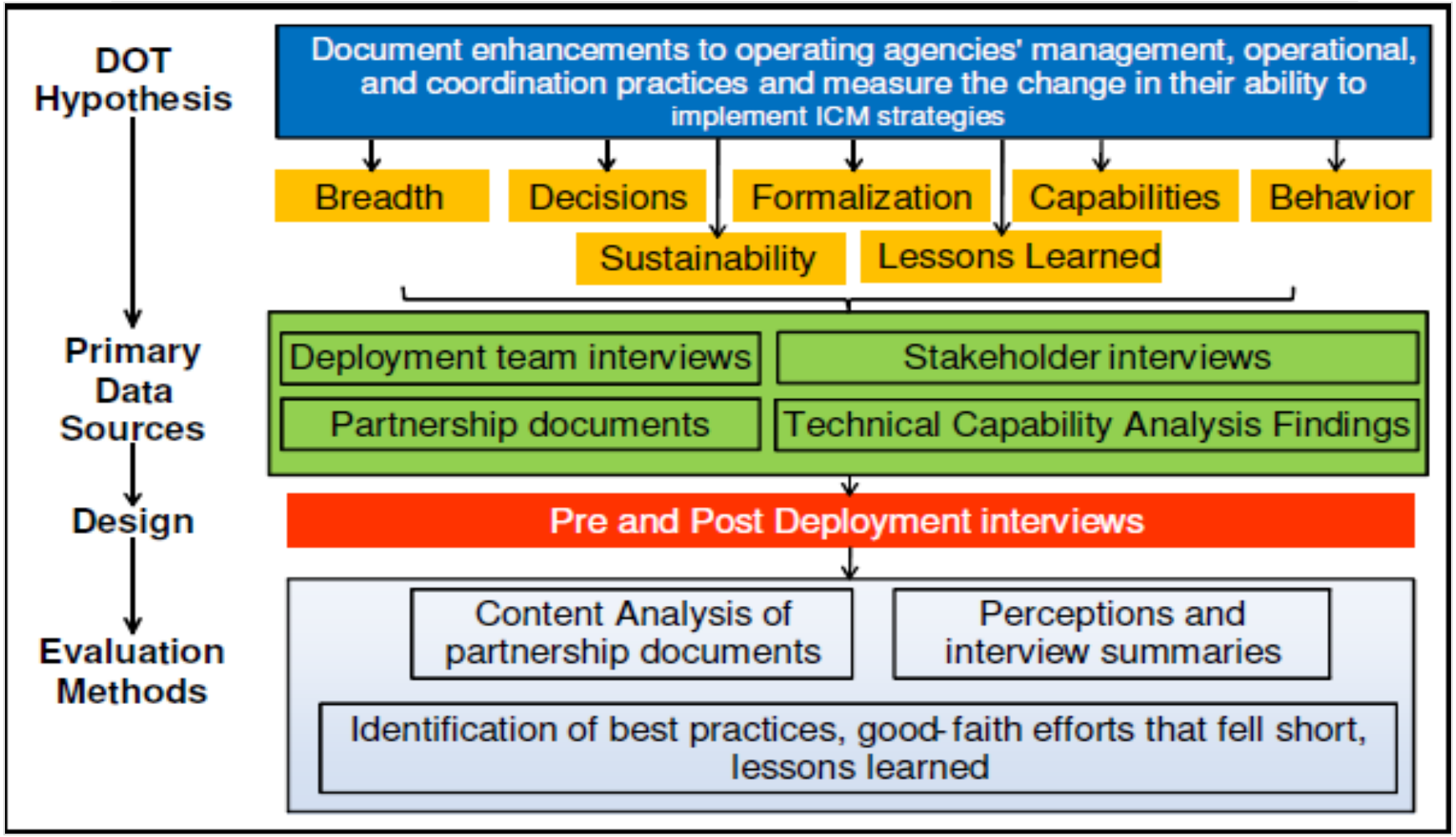
From Research to Results:

Evaluation

Comprehensive Evaluation

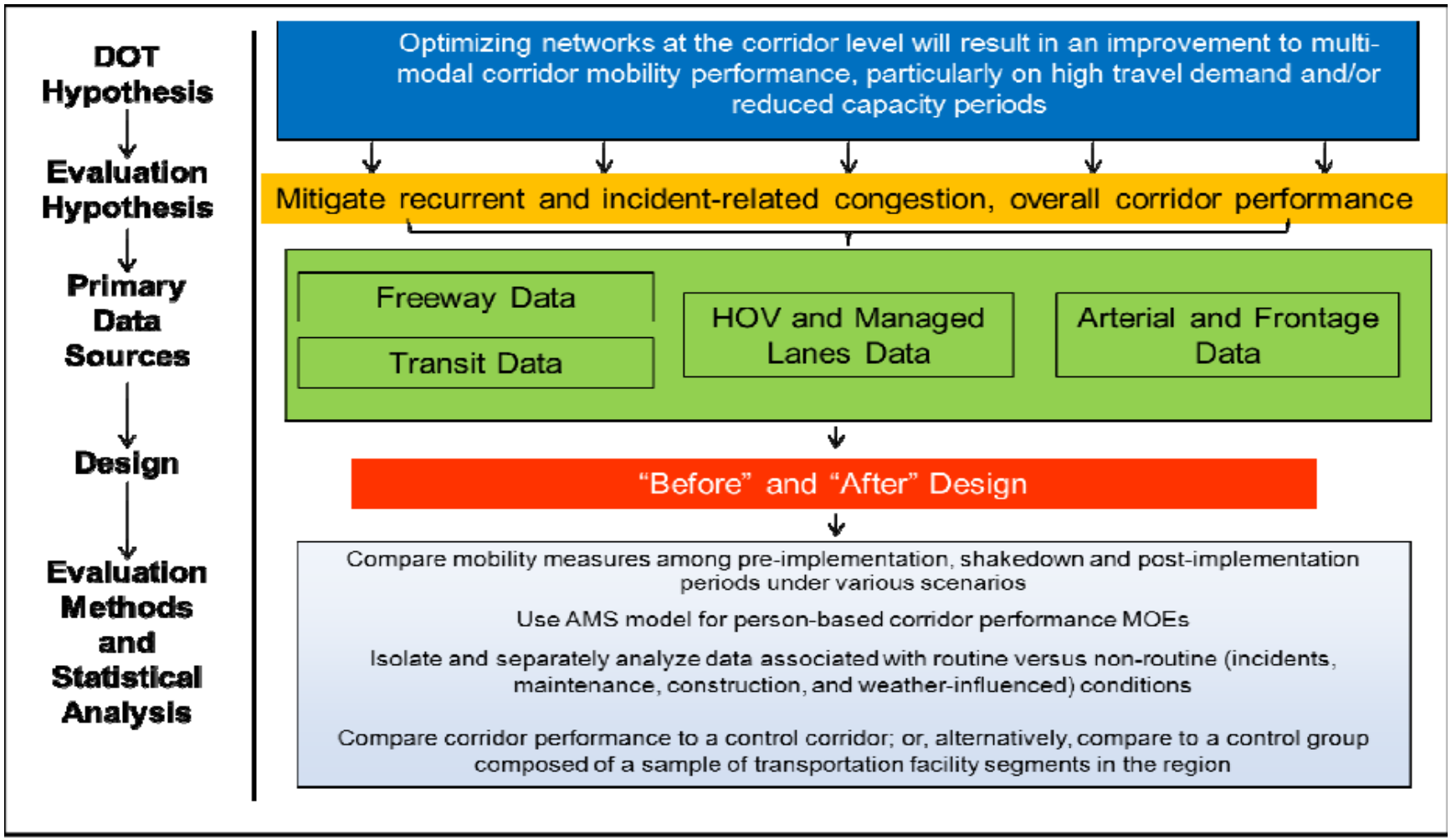
- Does the system do what it is intended to do?
- ICM Hypotheses – *"ICM will…"*
  - Improve Situational Awareness
  - Enhance Response and Control
  - Better Inform Travelers
  - Improve Corridor Performance
  - Hold other priorities harmless

Evaluation – Institutional & Organizational



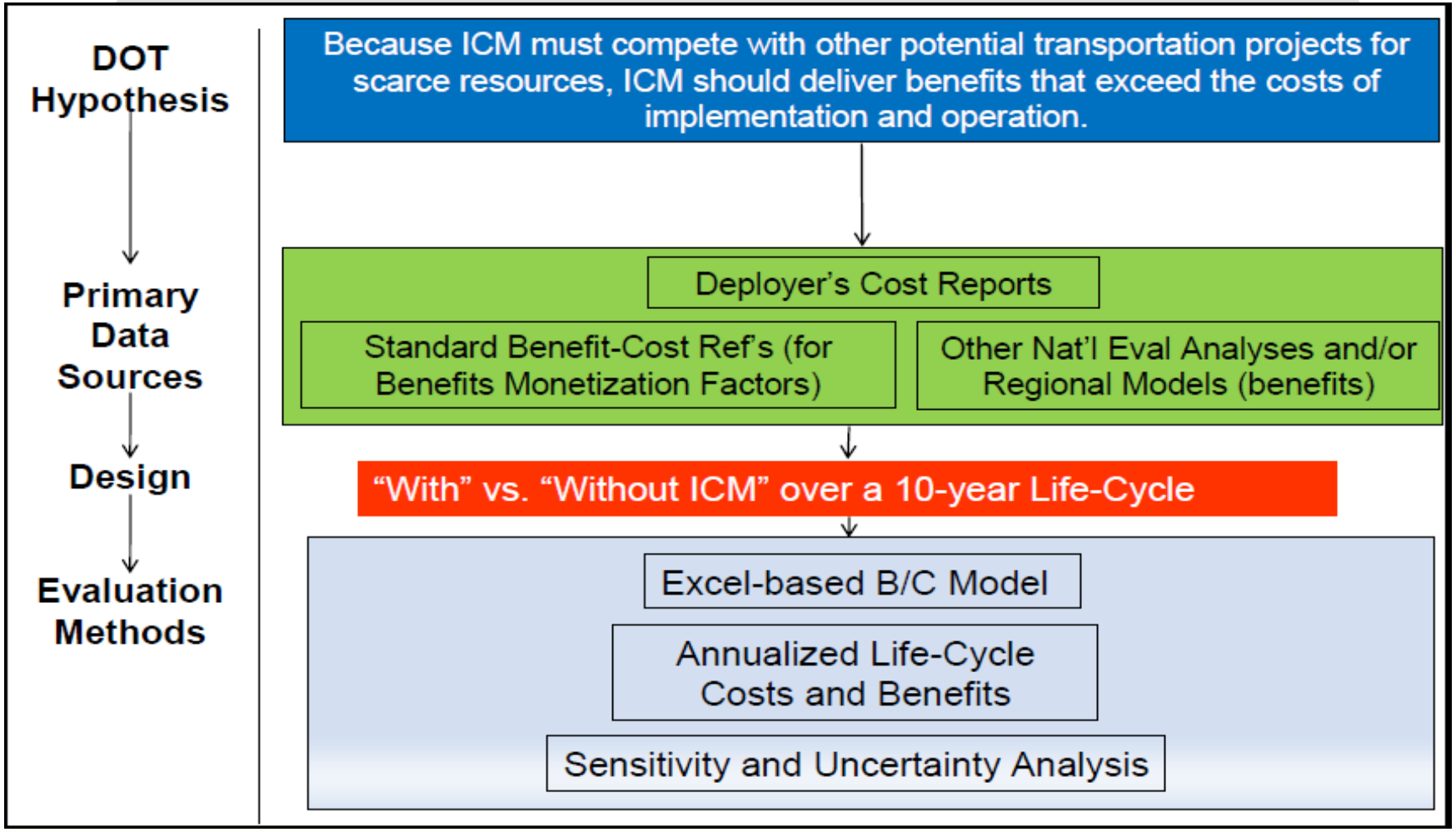
•Learn More: http://www.its.dot.gov/icms/

Evaluation – Corridor Performance



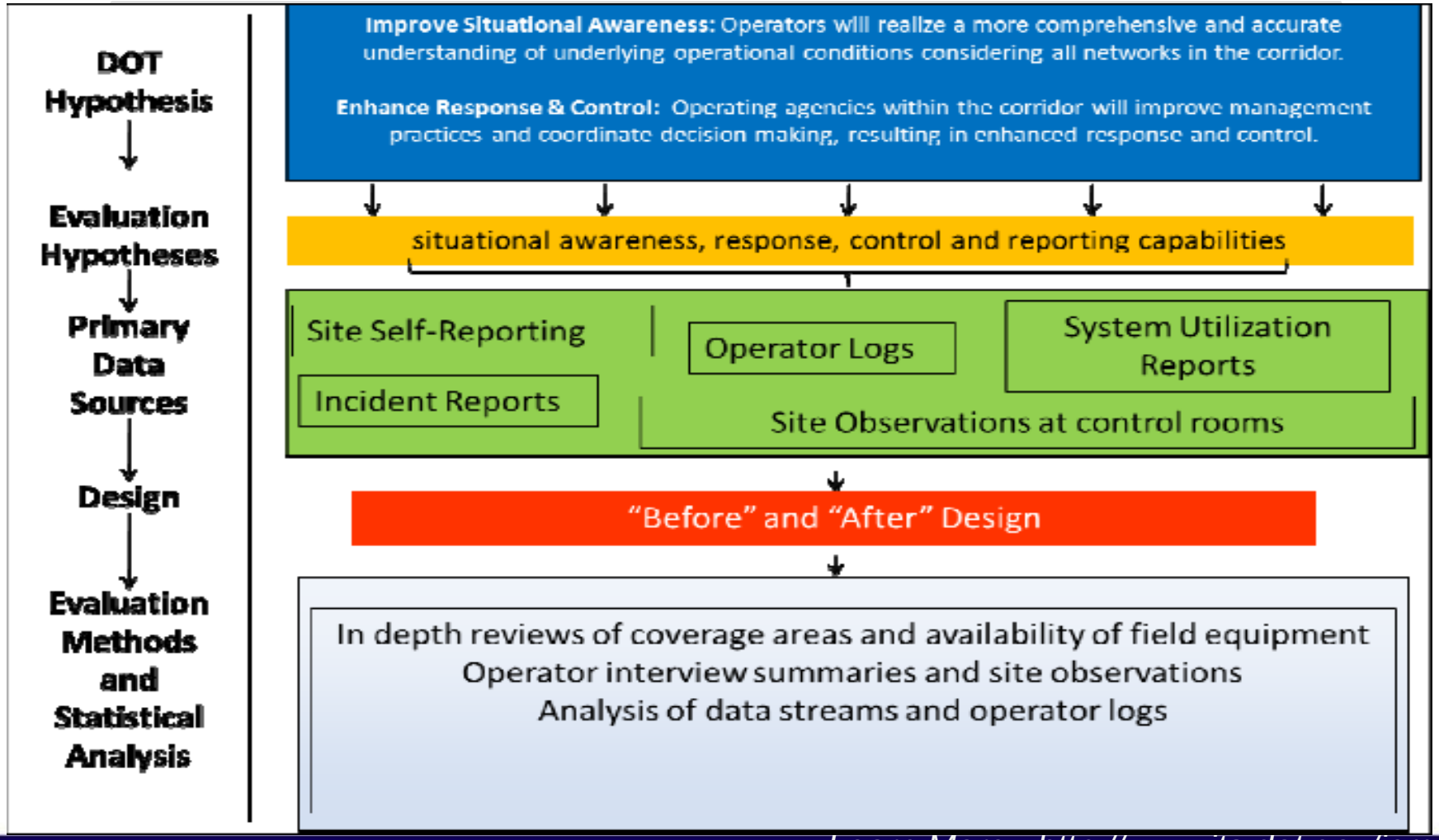
•Learn More: http://www.its.dot.gov/icms/

Evaluation – Benefit Cost

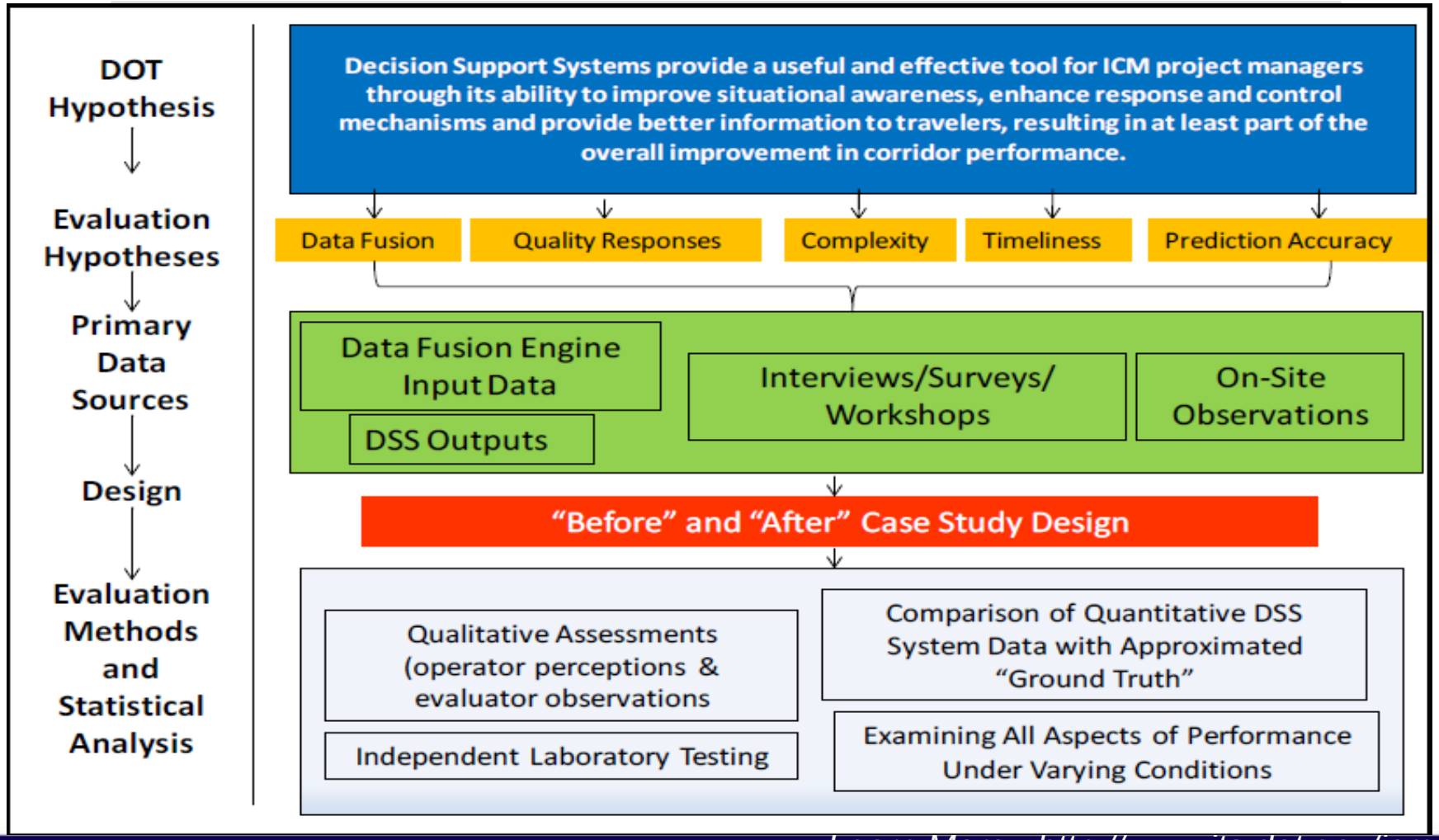


•Learn More: http://www.its.dot.gov/icms/

Evaluation – Technical Capacity

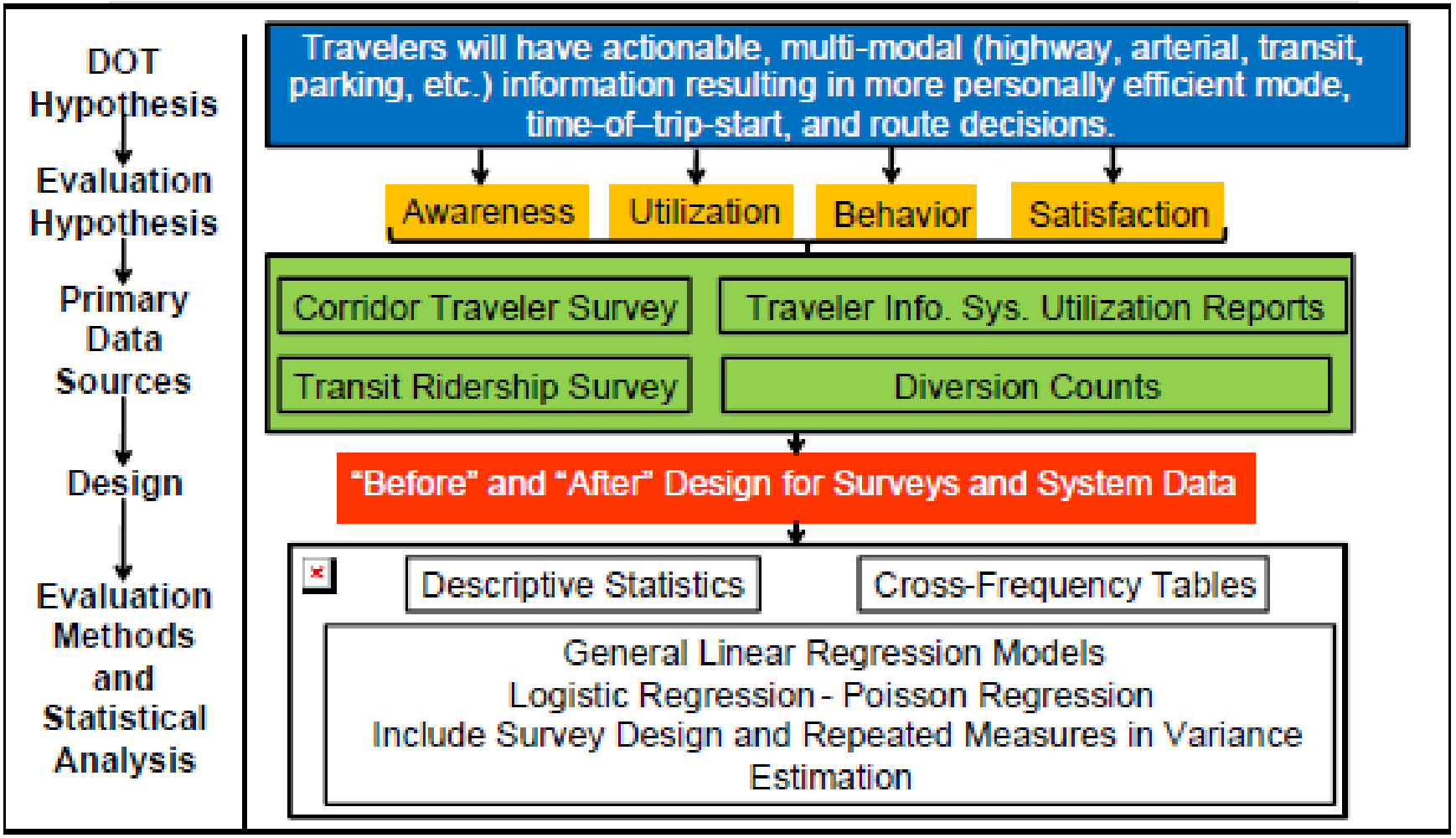


Evaluation – Decision Support Systems



•Learn More: http://www.its.dot.gov/icms/

Evaluation – Traveler Response



From Research to Results:

ICM Knowledge and Technology Transfer

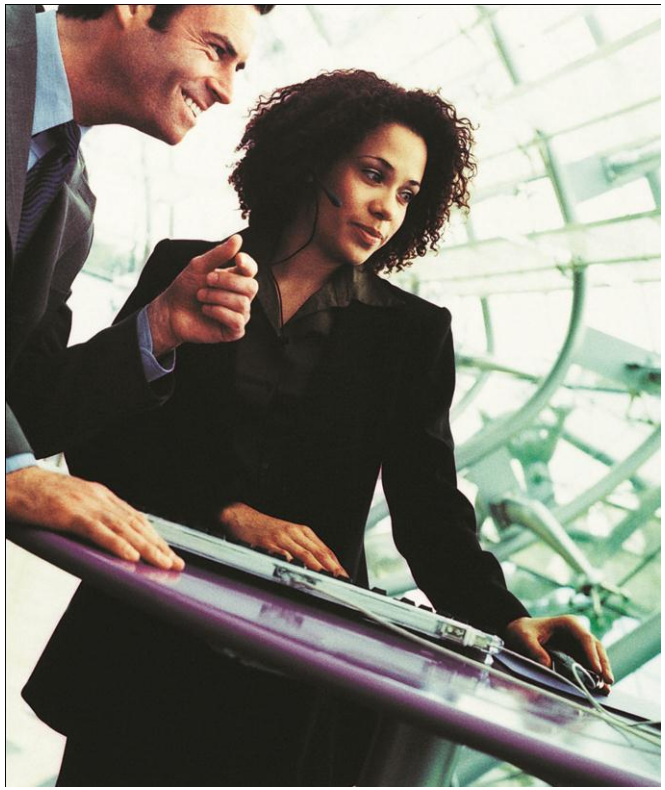
ICM Knowledge and Technology Transfer

ICM KTT Mission:

Equip corridor managers and operators across the country to implement and use ICM.

Check out the ICM Knowledgebase

http://www.its.dot.gov/icms/knowledgebase.htm



KTT Resources Coming Spring 2012:

- ICM Implementation and AMS Guides
- Early Adopter Workshops and Webinars
- ICM and Transportation Operations Information Briefs

:Resources Available *Now*:

- Pioneer site CONOPs and Requirements Documents, and Lessons Learned
- AMS Resources and Findings
- Data Gap Technical Resources
- Magazine Articles and Outreach Materials

•Learn More: http://www.its.dot.gov/icms/

Intelligent Transportation Systems
U.S. Department of Transportation

COMING APRIL 2012

ICM IMPLEMENTATION GUIDE AND AMS GUIDE

FOR PROGRAM MANAGERS

ICM Guidance Features

- Step-by-step Guidance
  - with estimates on relative levels of effort based on experience
- Multidimensional Guidance
  - Technical, Institutional, Programmatic, Operational
- Example Products and Worksheets
- Pitfalls to Avoid and Tips
  - Based on Lessons-Learned from the Pioneer Sites
- Testimonials from Implementers
- Examples (from the Pioneer Sites)
- Pointers to Related Resources~
  - National ITS Architecture, Systems Engineering or related initiatives such as FHWA's Planning for Operations resources
  - Traffic Analysis Toolbox, *of which the ICM AMS Methodology is now a part*

COMING SPRING 2012~

ICM KNOWLEDGE AND TECHNOLOGY TRANSFER WORKSHOPS

Workshop Outcomes

- Ability to apply concepts in the Guide(s)
- Genuine buy-in/commitment from all key stakeholders
- Willingness to ‘stay the course’
- Develop the ICM products to the appropriate level of detail.
- All stakeholders contribute to effective use of meeting time, and commitment to action plan

ICM Workshop Outputs

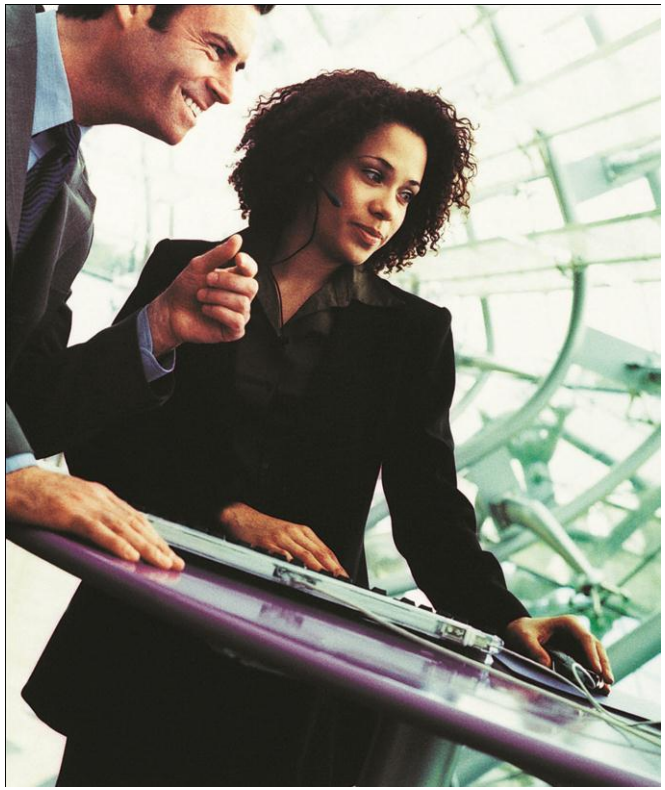
- Progress (Inputs/Agreements/ Framework) towards an ICM milestone or deliverable of interest to the host location
- Action Plan
- Feedback/input to enhance workshop design and KTT materials

ICM Workshop Building Blocks

- Information Sharing
- Peer support
- Tool or Technique Demonstration
- Learning Opportunity or Activity
- Product Development Activity
- Learning Assessment

Check out the ICM Knowledgebase

http://www.its.dot.gov/icms/knowledgebase.htm



KTT Resources Coming Spring 2012:

- ICM Implementation and AMS Guides
- Early Adopter Workshops and Webinars
- ICM and Transportation Operations Information Briefs

:Resources Available *Now*:

- Pioneer site CONOPs and Requirements Documents, and Lessons Learned
- AMS Resources and Findings
- Data Gap Technical Resources
- Magazine Articles and Outreach Materials

•Learn More: http://www.its.dot.gov/icms/

Questions?

http://www.its.dot.gov/icms/knowledgebase.htm

- Brian Cronin, RITA
  brian.cronin@dot.gov
  202-366-8841
- Dale Thompson, FHWA
  dale.thompson@dot.gov
  202-493-0259
- Bob Sheehan, FHWA
  robert.sheehan@dot.gov
  202-366-6817
- Steve Mortensen, FTA
  steven.mortensen@dot.gov
  202-493-0459