Integrated . . *combining or coordinating separate agencies so as to provide a harmonious, interrelated "whole" . . .*

Corridor . . *a travel shed of trips anchored by one or more highway, arterial, or rail line*

Management . . *the coordination of jointly managing all the travel therein in order to achieve defined objectives*

Traditional Agency “Stovepipe” Responsibilities

Auto → Autonomous response to Incidents on ‘their’ facilities . . → **Roads**

Rail → . . Traveler information is limited to their own agency’s facility . . → **Ridership**

Bus → . . There is “facility” response, but not necessarily “corridor” response” . . → **Commute routes**

Parking → . . They are slowly reactive to intervene in others’ incidents → **Supply**

Integrated Management

Auto

Rail

Bus

Parking

Resource – shared management of travel shed

Mode choice.
Mode shift.
Proactivity.
Communication.
Pre-determined interventions.

Travel efficiency

Traveler information
511
Apps
Ability to make trip choices among entire corridor

“10 Attributes of a Successful ICM Site”

1. Is there ***Significant*** Congestion and Unreliability?
   - The most critical – and most obvious – attribute is . . need.
2. Infrastructure Available?
   - Parallel arterials, transit routes, mode hubs, alternatives to the clogged freeway.
3. Multimodal Capabilities?
   - Bus, rail, transit, freeway, incident, must be able to communicate with each other.
4. Is there a Centralized Data Hub?
   - A TMC center makes it easier to organize and analyze the data dump.
5. Are there Successful Regional Procurement Practices?
   - Needed: ITS experts who understand expertise requirements.
6. Is Transit readily available?
   - Bus routes? BRT? HOV lanes? Commuter rail? All of these can relieve a clogged hwy.
7. Are current systems Optimized?
   - Validate that roads cannot be improved by physical or operational means except ICM.
8. Is there Public Engagement?
   - A dedication to transparent and real-time public information and access.
9. Is there Open-mindedness for Change?
   - Educating the public to accept mode and route changes is paramount.
10. Is there Institutional Support?
    - A strong ICM Champion, strong leadership, a clear vision, and robust participation are vital to laying the foundation for success. This includes ConOps, Systems Engineering Plans (SEMPs) and such.

What is a “DSS”?

A computer-based ***information system*** that supports business or organizational ***decision-making*** activities, typically resulting in ranking, sorting, or choosing from among alternatives.

- A **communication-driven DSS** supports more than one person working on a shared task. (meetings, webs, client servers, instant messaging)
- A **data-driven DSS** emphasizes access to and manipulation of a data library. (Medical diagnosis; executive dashboards, i.e., visual presentations of performance metrics and efficiencies)
- A **document-driven DSS** manages, retrieves, and manipulates unstructured information in a variety of electronic formats. (Research)
- A **knowledge-driven DSS** provides problem solving expertise stored as decision trees, facts, rules, or procedures. (electrical grid allocation, resource allocation, banking, trucking and product delivery efficiencies)
- A **model-driven DSS** emphasizes access to and manipulation of a statistical, financial, optimization, or *simulation* model. Model-driven DSS use data and parameters provided by users to assist decision makers in modeling a situation. (“what if” scenarios”, military planning, scheduling)

What are “Business Rules”?

Business rules are predefined and agreed-upon organizational and inter-agency permissions, constraints, or criteria that bind the participating agencies and affect the DSS solutions.

- They may or may not be the Concept of Operations (ConOps), Systems Requirements, or other documents.
- They may be only loosely be known, and rarely documented to an extreme degree.
- They have been described as “ephemeral” aids (temporary; literally “one use” or purpose; seasonal) that often only serve one user or user group, then expire or disband.

Business Rules can be thought of as a Chess Board

- The chess **board** constitutes the geographical constraints of play
- The chess **pieces** (moving parts) are the managers, operators, and agencies, each having its own unique capability, i.e., pawns, bishops, knights, rooks, Queen, King
- The game **rules** are the “business rules” by which everyone agrees to play/operate.
- The DSS is the innumerable **strategies** that exist, i.e., evaluating, “looking ahead”, reacting to loss or challenge, etc.

ICM Grantee Site Commonalities

- Motivated by recurring congestion, but “atypical” congestion is the real driver
- Concerned about effects of non-recurring freeway congestion on arterials – better freeway/arterial coordination
- Need multi-agency, multi-modal, coordinated response
- Need integrated management and operations
- Proactive, integrated traffic management strategies
- Traveler information pre- and en route

"Integrated" . . . .

Institutional Integration

Coordination to collaboration between various agencies and jurisdictions that transcends institutional boundaries. (MoA's, Working agreements)

Operational Integration

Multi-agency and cross-network operational strategies to manage the total capacity and demand of the corridor. (Signals, routes, proactive actions, responses)

Technical Integration

Sharing and distribution of information, and system operations and control functions to support the immediate analysis and response. (Shared data, cross-approvals for actions, complementary response assistance)

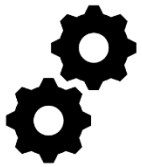
Source: FHWA "Integrated Corridor Management" presentation

Project Planning & Management

- Understand the scope and develop ConOps using systems engineering and design
- Prioritize high value/likelihood strategies
- Focus on data needs, collection, & sharing
- Plan $$ and time for systems and software
- Mainstream performance measures into the ConOps
- Plan resources/time for new operating processes
- Plan funding for the future

Institutional & Organizational

- Need an agency champion + people champions
- Develop a shared vision / cross-jurisdictional mindset
- Understand capabilities and limitations
- Establish formal agreements/partnerships
- Engage stakeholders early and sustain
- Celebrate “wins”
- Expect “communication breakdowns”



Technical & Operational

- Develop realistic multi-modal response plans
- Implement “your” decision support system (DSS)
- Understand operational scenarios and activation thresholds
- Evaluate reality of being able to run the scenarios
- Improve alternate route infrastructure and operations
- Be prepared to “Test and Adjust”

Additional Lessons Learned

- Partnerships are critical, it is ideal when operational trust already exists from prior traffic management teams and incident management teams
- Building on existing institutional arrangements was key to building consensus
- Need to build on existing agreements, business rules, and MOU's
- Need to build trust with public on the accuracy and reliability of information

Additional Lessons Learned (continuation)

- With multiple agencies working together, the collaborative aspect of the projects has been one of the biggest successes
- Identify several stakeholder “champions” in multiple agencies and enable them to “own” corresponding elements of the ICM program
- Keep stakeholders engaged and communicate with them regularly regarding the ICM process and progress
- Empower stakeholders to shape and guide the process, and furnish substantive inputs

Additional Lessons Learned (continuation)

- A surprising amount of data exists within agencies that could be of value and thus relayed to partner agencies
- Operational opportunities exist within and between agencies with collaborative operation
- Adherence to the System Engineering requirements is very important to ensuring a methodical approach to delivery of multiple ICM project elements

ICM Moving Forward

- Before ICM…
  - Pre-existing systems—freeway, arterial, transit
  - Robust infrastructure—communications, detection, and standard operating procedures
  - Real-time data and functioning model—to determine the extent of the problems in the corridor
- During ICM…
  - Champion required
  - Funding required
  - Processes are paramount. Continue to Expand capabilities.
  - Maintain continuous coordination
  - Focus on *corridor-wide* objectives