

# **Intelligent Transport Systems: What Have We Learned?**

**A U.S. Perspective**

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# Overview

- **ITS Services**
  - **Successful applications**
  - **Not successful applications**
  - **“The jury is still out”**
- **Cross-cutting program areas**
  - **Technologies, Architecture, Standards, Institutional, Deployment Programs, Market forces**
- **What does the future hold?**
- **What next steps are needed?**

# Summary

- **Three critical dimensions:**
  - **Technology**
  - **Systems**
  - **Institutions**
- **Technologies: the issues are primarily cost and ease of use**
  - **Sensing**
  - **Communicating**
  - **Computing**
    - **Hardware**
    - **Algorithms - only technology area with functional issues**

# Summary

- **Systems: the issue is integration.**
- **Institutions: The major issues fall into this category.**
  - **Intra-jurisdictional questions**
  - **Regional perspectives**
  - **Funding budgets for operations**
  - **Institutionalized operations/ITS**
  - **System integration**
  - **Training and retaining qualified staff**

# Arterial Management

- **Successes**
  - **Coordinated signal control systems with tactical traffic actuation**
  - **Priority control for transit and emergency vehicles (limited deployment)**
- **“The Jury is Still Out”**
  - **Truly adaptive signal control has not made much progress in the field**
    - **U.S. initiative just beginning operational testing stage**
    - **A few implementations in U.S.A. using SCOOT or SCATS**
    - **No “best practices” or guidance on what works when**
  - **Display of information to travelers on arterials**

# Freeway Management

- **Successes**
  - **Ramp Metering**
    - **Definite benefits on mainline (more control over flow build-ups)**
    - **More research required for effects on ramps and adjacent facilities**
  - **Information Display (audio/visual)**
    - **Particularly when information is timely and provided in advance of diversion points**
- **“The Jury is Still Out”**
  - **Dynamic control signs**
    - **Lane and speed control is effective in Europe**
    - **Field tests in US required**

# Incident and Emergency Management

- **Successes**
  - **Service Patrols and Incident Management Programs are big winners**
    - **Improve capability to manage incidents**
    - **Assist in reducing delay, improving traveler safety**
  - **Surveillance**
    - **Reports from travelers with cell phones are typically much faster than sensor-based detection algorithms**
    - **Video/CCTV effective in reducing verification time**
    - **Urban freeway deployments proceeding, arterials starting**
- **Integration between agencies still could be improved**
  - **freeway, emergency, police, arterial, transit**

# Electronic Payment

- **Successes**

- **Electronic Toll Collection (big winner)**

- **Widespread deployment, systems are being installed at a fast pace, win-win benefits**
- **Regional tag compatibility fairly good, but back-office processing needs improvement**

- **Electronic Fare Payment (limited deployment)**

- **Not as far along as ETC, but catching on slowly**
- **Technology is available, but implementation has been slow**
- **Need to integrate with other services (ATM, credit cards, etc)**

# Transit Management

- **Successes**
  - Automated Vehicle Location/CAD systems are becoming widely deployed
    - Improved reliability of service, better visibility for operators, security is enhanced
- **Not Successful**
  - Dynamic rideshare programs
    - Dependence on other drivers to participate - service perceived as unreliable
    - Privacy concerns
    - Only work if self-organized (e.g., D.C. SLUG-line)
- **“The Jury is Still Out”**
  - Does better information increase ridership?

# Multimodal Traveler Information Systems

- **Successes**
  - Pre-trip, free services using the Internet
  - Niche markets for traveler services and static navigation
- **Not successful**
  - Traveler information kiosks (except for niches)
- **The jury is still out**
  - In-vehicle equipment such as dynamic route guidance
  - Fee-based services
  - ISP market
    - Public agency subsidy still seems to be needed
    - Are customers willing to pay?
    - Can advertising generate enough revenue?
    - Can new services generate more perceived value?
  - Surveillance still limited, limiting real-time information

# Rural ITS

- **Most services still in operational testing stage - deployment is very limited**
  
- **Promising Areas**
  - **Mayday/ACN**
  - **Spot hazard warnings**
  - **Coordinated rural transit**
  - **Rural/statewide/national traveler information**
  - **Road weather sensing and prediction**
  - **Rural fleet management**
  - **Extended-area traffic management**

# Commercial Vehicle Operations

- **Successes**
  - **Fleet management/tracking systems: widespread deployment**
  - **Safety Sells**
    - **Manufacturers beginning to offer safety-enhancing system (lane-tracking devices and improved brake systems)**
    - **Beginning limited deployment**
  - **Weight screening (Weigh-in-Motion) systems**
  - **Credentials administration (limited deployment): facilitated by states acceptance of Internet interfaces**
- **“The jury is still out”**
  - **Electronic screening/pre-clearance systems**

# Other Trends

- **Enforcement**
  - **Growing acceptance of using ITS for *some* enforcement**
  - **Simple and effective**
  - **Limited deployment, but *large* benefits where deployed**
- **Archiving Data**
  - **Early stages of deployment (esp. integrated archive systems)**
  - **Concepts still being tested; researchers beginning to employ**
  - **High potential for reducing data collection costs associated with field trials, evaluations**
  - **In some cases, may eliminate need to conduct field study (realistic “yoked-driver” studies can be simulated)**
  - **High potential for improved operational and long-range planning**

# Cross-Cutting Areas: Technologies

- **Communications media**
  - **Successes**
    - Internet
    - Short-range communications (DSRC) for toll-tags
    - GPS for location determination
    - Fiber (many technologies support fixed point-to-point communications)
    - Digital Subscriber Line (DSL) technologies (emerging)
  - **Not successful (for ITS)**
    - 220 MHz channels
    - FM Subcarrier
    - Cellular digital packet data (CDPD) for travelers

# Cross-Cutting Areas: Technologies

- Emerging media
  - Wireless Internet
  - Local area wireless (Bluetooth)
  - High speed wireless
- Surveillance
  - many sensor-based products exist, but loops still dominate
  - video and machine vision have grown in use
  - toll tags for probe have been successful in some areas
  - use of cell phones for providing probe data did not work well (CAPITAL Ops. Test)
    - Jury out: FCC requirement for location information may change this

# Other Cross-Cutting Areas

- **Architecture**

- Has been a key tool for promoting institutional integration
- Number of efforts currently underway to develop regional architectures
- U.S. “experiment” now being followed as a model in many other countries
- Need to ensure cost-effective means of updating

- **Standards**

- Federal support has accelerated development of needed standards
- NTCIP and in-vehicle data bus are both examples of successful standards development efforts
- Federal support may have generated too many efforts where critical need and client pull missing

# Other Cross-Cutting Areas

- **Institutional**
  - Often more difficult to resolve than technical issues
  - Make or break a successful, integrated ITS deployment
- **Deployment Programs**
  - Ability to re-program funds among various local projects increases the chance that a recipient will succeed
  - May imply benefit to larger, multi-faceted deployment projects
- **Transportation Planning**
  - Traditional analysis cannot capture benefits of more efficient operations (including ITS impacts)
  - Research has identified new modeling methods to capture these benefits

# Other Cross-Cutting Areas

- **ITS Market Drivers/Lessons learned**
  - Increasing safety has emerged as the big seller for ITS
  - ATMS is still the big market
  - Consumers appear more willing to listen to advertising than pay for a service
  - Net profitability is slow to develop due to vendor investment to boost consumer awareness
  - Vendors focusing on capturing market share
  - Mixed results for private toll roads (SR91 and Dulles Greenway vs. Toronto 407)
- **We have experienced a slower than predicted market growth (both public and private)**

# What Does the Future Hold?

- **More integration of services and components**
- **Continued technology developments and competing standards**
- **Service developments**
  - **Archiving of ITS data will lower costs of evaluation and performance monitoring**
  - **Coalescence of national traveler info**
  - **ITS for roadway maintenance added as new user service**
  - **Next-generation road weather**
  - **Expanded sensing/warning on rural roads**
  - **Statewide traffic and emergency services management**
  - **Packaged rural APTS/HHS coordination**
  - **Vehicle-based safety systems**

# What Next Steps are Needed?

- **Encourage deployment of surveillance**
  - **Key contributor to arterial and freeway management as well as ATIS**
  - **Incentives, promotion, consider establishing minimum requirements for National Highway System**
  - **Promote tags as probes where appropriate**
- **Research into performance of real-time adaptive signal control approaches: what works, how well, and under what conditions?**
- **Further R&D/field testing of efficient integrated para-transit**
- **Continue Commercial Vehicle Information and Safety Network (CVISN) roll out**
- **R&D, testing, and promotion of non-urban ATIS/ATMS, road weather**

# What Next Steps are Needed?

- **Continued support for limited set of key standards**
  - **Standards maintenance, updates, and revisions**
  - **Track deployment of standards-based traffic management and center-roadside products**
    - **React quickly if products not being developed**
    - **React quickly if problems with standards**
- **Fill in evaluation voids**
  - **Integration**
  - **Rural**
  - **Traveler information**
  - **Management of transit maintenance**
- **Continued tracking of new technology impacts and trends across program**