



**HNTB**



## **Getting smart on intelligent transportation systems**

The growing influence of ITS on transportation, why agencies are intent on considering adoption and where to begin

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## On the cusp of a transformation

Integrating intelligent transportation systems into existing projects and as stand-alone solutions is helping departments of transportation, toll authorities and transit agencies overcome congestion, funding shortages, and more importantly, improve safety.

With human errors accounting for more than 90 percent of all highway crashes – and between 30 and 50 percent of all peak-period delays being caused by crashes – minimizing the human influence in driving performance can have a two-fold benefit. Not only can smarter infrastructure and vehicles save lives and reduce injuries, they also can lead to improved mobility of the traveling public. Evolving ITS technology will make travel along our nation's transportation corridors and in our vehicles more reliable, predictable, faster and safer. In turn, job accessibility, efficient goods movement, and recreational opportunities will continue to grow.

## A national movement

Loosely defined, ITS involves the application of advanced communications and information technology to our vehicles and transportation systems, making them smarter and the driving experience safer and more efficient. Nearly every highway, toll, transit, airport and rail project in the United States incorporates some aspect of ITS. In fact, the domestic market is estimated at \$48 billion per year.

State departments of transportation are interested and actively seeking technology solutions. HNTB Corporation is working with many state DOTs and local agencies to research, design and implement connected and automated vehicle (CAV) pilot programs and develop a business climate conducive to CAV applications.

Across the U.S., numerous states have passed automated vehicle-related legislation, with many more having introduced it.

The U.S. DOT and Congress are also taking steps to support emerging mobility solutions. In September 2016, the DOT issued a draft policy on automated vehicles and, in early 2017, comments were accepted for rulemaking regarding vehicle-to-vehicle communications. Regulatory and legislative action is likely to take place in late 2017 to accelerate the deployment and benefits of CAV technologies.

State DOTs and local agencies must prepare for the adoption of these technologies, which offer the promise of significant benefits for public agencies.

## Part of a comprehensive approach

Why implement ITS? Because it can render a higher return on investment than traditional highway expansion projects alone. Its benefits include:

- **Safety.** Active traffic management systems in Michigan and the Seattle area provide motorists with advance notice of traffic conditions using variable speed limit signs, lane management signs, hard shoulder running and overhead message signs that alert drivers to congestion or collisions. ITS has reduced collisions and congestion and enhanced emergency response and emergency management.

In the near future, CAV solutions will offer increased safety through improved vehicle-to-vehicle and vehicle-to-infrastructure communications and integrated advanced driver assistance systems. The auto industry and technology companies are on a path to build vehicles that don't crash.

- **Capacity.** In urban areas where space is constrained and expansion isn't an option, owners can squeeze more capacity from existing systems through active transportation management solutions, such as ramp metering, dynamic message signs or adaptive signal control.

Unlike conventional signal systems, adaptive traffic signal control collects real-time traffic information and then adjusts the signal timing plan to facilitate maximum throughput at an intersection. Only a small percentage of traffic signals in the United States have this technology.

According to the Federal Highway Administration, DOTs can expect improvements in efficiency, ranging from 10 percent to as much as 50 percent in areas where signals are particularly outdated.

As CAV technologies are introduced, new mobility solutions will offer additional opportunities to improve highway capacity. New traffic signal algorithms, based on connected and automated vehicle data, will offer predictive capabilities to support greater mobility. On limited access highways, it is likely that new concepts involving automated vehicle platooning will be implemented as a way to increase the capacity of existing facilities.

- **Stopgap.** ITS improves performance of existing assets and buys time until sufficient resources can be found for expansion/improvements.

It is possible that operational solutions, including new concepts for managed lanes, active transportation management and integrated corridor management, will offer the necessary highway performance to hold off highway expansion until new mobility solutions using CAV technologies are feasible on a large scale.

- **Reliable travel times.** State DOTs are providing reliable travel-time information on freeways in major metropolitan areas. The reliability of such information has been enhanced with improvements in vehicle probe data and data fusion.

In some cases, whole corridors are covered. The I-95 Corridor Coalition on the East Coast provides comprehensive and continuous travel-time information on freeways and arterials using probe technology that stretches from New Jersey to Florida.

- **Systematic and strategic.** The FHWA encouraged adoption of ITS when it elevated congestion management solutions to priority status in its ITS planning and deployment strategy. The FHWA has asked DOTs not to simply consider segment-by-segment improvements but to find solutions to improve the entire trip length. For example, a DOT may only have enough funding to widen two miles of an 18-mile corridor, but by adding ITS to its full length, the DOT improves the entire corridor versus simply a single segment.
- **Greener.** ITS offers big environmental benefits. More efficient movement of traffic reduces stopping, idling, congestion and emissions. As CAV technologies become the norm, new environmental applications will enhance capabilities to generate these benefits.

When you consider all the efficiencies gained by ITS, its rate of return is much greater than simply adding capacity. That's not to say owners shouldn't consider capacity improvements, but they should not discount ITS in conjunction with or ahead of those improvements. The result can increase the facility's useful life or improve the corridor's performance.

### Creating a program

Agencies have at most five years before connected and automated vehicles take center stage. Most need all that time to prepare, especially since these technologies will impact how transportation systems are designed, delivered and operated.

With the industry moving ahead quickly to implement CAV technologies and with an evolving policy environment, agencies can take a number of steps to prepare for change.

### Step 1: Ready your technology.

Technical considerations will include maturity and robustness of equipment, interoperability standards, application development, security and communications. To begin:

- Ensure your communications systems are robust enough to accommodate the "fire hose" of data connected and automated vehicles will generate, so that data can be leveraged from a

performance measurement and management perspective.

- Target areas where communication devices would be located (e.g. high-crash locations, heavily congested corridors).
- Build a bullpen of professionals: system integrators, network designers, network security specialists, data analysts and software/application experts.
- Inventory your back office to determine if it is adequately equipped to collect, store, analyze and disseminate the data, and, if not, identify the resources needed. Offering open data about real-time traffic conditions and transportation options will spur innovative ways to get information into the hands of travelers.
- Ensure your traffic signal infrastructure is up-to-date to support vehicle-to-infrastructure applications as connected vehicles are introduced.

### Step 2: Gear up institutionally.

Infrastructure deployment will lag without guidance on policy, business models and funding. The following steps will help agencies tackle those and other challenges:

- Tie ITS with agency goals. If freight movement is an agency priority, look at heavily traveled freight corridors and identify corresponding ITS solutions.
- Apply for federal grants. The FAST Act includes grant opportunities to support emerging mobility solutions. Plus, these solutions are eligible activities under most FAST Act programs.
- Collect information about the benefits, emphasizing safety and costs needed to help justify investment decisions.
- Seek partnerships with the industry. Viable business models to implement and operate transportation systems in the future will likely include such partnerships.
- Consider policy. Legislation authorizing automated vehicles to travel on your state's roadways has economic benefits, but it must be carefully conceived to encourage the industry to test their technologies in your state.
- Beyond testing, agencies should think about security and privacy issues associated with wireless communications and data networks, the potential for malicious activity, and insurance and liability issues.
- Get advice from industry associations and other DOTs that are exploring CAV adoption, such as Florida and Michigan.

### **Step 3: Educate internal and external stakeholders.**

Establish realistic expectations about CAV technology:

- Sign up for webinars and attend workshops to understand the implications of ITS and how you can leverage the technology.
- Meet with stakeholders to understand their needs and perspectives on this topic.
- List the resources your agency will need to execute an effective communication and public outreach program that will foster a greater understanding of the technology and its benefits.
- Piggyback projects. If you are widening a corridor, for example, as the New Jersey Turnpike Authority did in its Interchange 6 to 9 Widening Program, capitalize on the opportunity by also installing fiber optic cables. Ten years from now, when the Turnpike Authority needs that infrastructure to accommodate CAV solutions, it will be in place and at a much lower cost than installing it under a separate project.

### **Step 4: Consider operations, not just deployment.**

Agencies must look toward the future, not just from a deployment standpoint, but also how advances in ITS and CAV technologies will impact their operations.

- TSM&O is the way to go. While CAV technologies offer the promise of improved safety and mobility, the full benefits will not be realized until these technologies are deployed on a large scale. In the meantime, remain focused on transportation system management and operations to improve and sustain system performance.
- Seek ways to improve coordination among modes of travel. Intermodal coordination offers a more seamless travel experience, but can be difficult to achieve. Such coordination must include the integration of multimodal information to provide travel options, but should also support integrated payment platforms to encourage seamless transfers among modes.
- Train or retrain staff to more fully understand the technological changes that are at hand. This might include working with local universities or community colleges to develop a curriculum that considers CAV technologies and emerging mobility solutions.
- Data management and analysis will be one of the greatest operational challenges for public agencies in the future. New data management solutions are available to support these needs, but agencies must evaluate relative costs for third-party hosting versus in-house management of such data.

- Implement asset management systems to improve system availability. Asset management for your ITS devices and equipment can help with agency maintenance, replacement and retirement of aging equipment, but also with maximizing uptime of equipment, configuration control and upgrades to new technologies.
- Improve decision-support systems. New decision-support solutions offer an opportunity for agencies to improve the efficiency of their operations. A good place to start is the development of performance measures that are meaningful, measurable, and drive decisions of the agency.
- Embrace change. This sometimes requires agencies to give up current activities. Disruption creates opportunity, and agencies must be poised to take advantage of that opportunity. For example, mobile technologies have empowered travelers by offering transportation information in the palms of their hands or on their dashboards. It is possible that agencies may not need to provide traveler information systems or services in the not-too-distant future as the private sector finds ways to deliver this information faster and at lower cost. Seek opportunities to leverage private investment in such services to offset publicly financed activities.

### **A new era in transportation**

Expect change in the next few years and expect it to be significant and disruptive. The industry will need to adopt new methods for traffic signal timing, traffic analyses, information dissemination and roadway design criteria. We'll see significant changes in current engineering and operational concepts, algorithms, the transportation workforce and traffic control systems. Adoption will take time, especially with limited resources, but it will occur.

### **Additional resources**

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