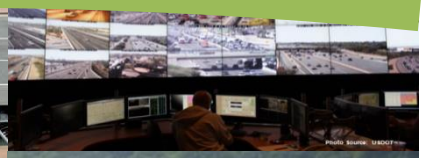
U.S. Department of Transportation

Executive Summary

ITS Benefits, Costs, and Lessons Learned: 2018 Update Report



Executive Summary

Intelligent transportation systems (ITS) provide a proven set of strategies for advancing transportation safety, mobility, and environmental sustainability by integrating communication and information technology applications into the management and operation of the transportation system across all modes. In the future, ITS technologies will transform surface transportation by offering a connected environment among vehicles, the infrastructure and passengers' wireless devices, allowing drivers to send and receive real-time information about potential hazards and road conditions.

The U.S. Department of Transportation's (U.S. DOT) ITS research program focuses on the overall advancement of ITS through investments in emerging ITS technologies, as well as supporting the evaluation of deployed ITS. This report presents information on the benefits, costs, and lessons learned regarding ITS planning, deployment, and operations obtained from almost twenty years of evaluation data.

The report is based upon three related Web-based databases, known collectively as the ITS Knowledge Resources (KRs). The Knowledge Resources were developed by the U.S. DOT's ITS Joint Program Office (JPO) evaluation program to support informed decision making regarding ITS investments by tracking the effectiveness of deployed ITS. The Knowledge Resources contain over nineteen years of summaries of the benefits, costs, and lessons learned of specific ITS implementations, drawn primarily from written sources such as ITS evaluation studies, research syntheses, handbooks, journal articles, and conference papers. They can be accessed online at www.itskrs.its.dot.gov.

The report has been developed as a collection of factsheets presenting information on the performance of deployed ITS, as well as information on the costs and lessons learned regarding ITS deployment and operations. The report has been designed to be flexible for the user. The purpose is to make the information readily available, whether by accessing it through the web, a mobile device or tablet, or by printing sections on one or more application areas.

Findings

As of February 24, 2018, there were a total of 2,141 summaries of ITS benefits, costs, and lessons learned in the ITS Knowledge Resources databases from the United States and around the world, as shown in Table 1. Of the 2,141 summaries, 205 summaries have been added since the publication of last year's report.

Table 1: Summaries in the Knowledge Resources Databases.

Summary Type	Number of Summaries
Benefits	1,112
Costs	368
Lessons Learned	661
Total	1,941

Table 2: Summaries by Taxonomy/Application Area.

Taxonomy/Application Area	Number of Benefit Summaries	Number of Cost Summaries	Number of Lesson Summaries
Arterial Management	219	75	82
Freeway Management	163	62	107
Roadway Operations & Maintenance	74	33	47
Crash Prevention & Safety	144	55	27
Road Weather Management	66	52	40
Transportation Management Centers	28	49	69
Alternative Fuels	7	3	4
Traffic Incident Management	88	44	66
Transit Management	152	57	92
Emergency Management	19	17	40
Traveler Information	101	44	84
Driver Assistance	161	38	31
Information Management	15	11	29
Commercial Vehicle Operations	69	24	20
Intermodal Freight	24	5	14
Electronic Payment & Pricing	108	42	81

An important recent addition to the Knowledge Resources is the inclusion of benefit, cost, and lessons learned summaries for the Connected Vehicle Program. These new entries are directly searchable buy a dedicated search button on the home page of the ITS Knowledge Resources.

ITS Evaluation Highlights

In the 21 years that the ITS JPO has been tracking the evaluation of ITS technologies, there has been steady growth in the number of studies documenting the benefits, costs and lessons learned of ITS. Looking back over the last year, the most recent additions to the ITS knowledge resources indicate the following evaluation highlights:

Crash Prevention and Safety

- The new wave of crash prevention and safety strategies includes the integration of vehicle and infrastructure safety systems and implementation of connected vehicle technologies for safety applications.
- Crash statistics show that lane departure warning systems have reduced all relevant crashes by 11 percent, and all relevant injury crashes by 21 percent, controlling for driver demographics.
- In a pilot test, bus drivers using in-vehicle collision avoidance warning systems were involved in 72 percent fewer near-miss events than a control group where the warning feature was turned off.

Accessible Transportation

- In May 2017, the Kansas City Area Transportation Authority (KCATA) rolled out its app-based public transit service, RideKC Freedom On-Demand. The one-year pilot project enabled riders to use a cellphone app to book taxi rides through private taxi companies at any time. After five months, KCATA recorded more than 15,500 trips on RideKC Freedom On-Demand. The new service cost $15.80 a trip compared to a traditional paratransit trip costing $27.13. In the five months since launch, RideKC On-Demand saved the Authority about $166,000.
- The USDOT ATTRI program has awarded six projects for application development in the four application areas: automation and robotics; safe intersection crossing; wayfinding and navigation; and pre-trip concierge and virtualization.

Mobility on Demand

- Since 2010, the Capital Bikeshare service has connected a network of over 450 stations via 4,000 bicycles across several jurisdictions in the Washington, DC area including Arlington County, VA. Arlington County reported on progress on the service's performance measures, which included a 24 percent growth in ridership between FY2013 and FY2014, saving Arlington members a combined estimated $2 million in transportation spending, and a total of 14,390,372 calories burned.
- Many carsharing programs have agreements with municipalities for free on-street parking as well as to provide dedicated parking spaces. Typically, the carsharing company pays the city a fee to cover these costs. Depending on the agreement the car company may also pay for other costs to operate that include insurance, pilot evaluation, car removal in cases of parking restriction violations. Annual payments per year per vehicle ranged between $1,303 in Portland, Oregon and $2,644 in Washington, DC.

Information Management

- The ITS JPO and its multimodal partners are dedicated to providing open access to archival and real-time publicly funded research data. Beginning in 2018, the ITS Public Data Hub became the USDOT's primary storage and access system for ITS data.
- The ITS Public Data Hub offers several visualization tools that users are encouraged to play around with. Six prototype visualization elements are available for viewing at https://www.its.dot.gov/data/visualizations/.
- A major accomplishment of the ITS Public Data Hub is the addition of the Connected Vehicle Pilot Deployment data from Wyoming occurring in near-real time.

Connected Vehicle – Safety

- V2P detection systems can be implemented in vehicles, infrastructure, or with pedestrians themselves to provide warnings to drivers, pedestrians, or both through in-vehicle systems and handheld devices. These include PED-SIG (Mobile Accessible Pedestrian Signal System), PED-X (Pedestrian and Signalized Crosswalk), Intelligent Pedestrian Traffic Signal (IPTS), and Intelligent Pedestrian Detectors (IPD).
- In one study, 23 percent of pedestrians reported that a crosswalk transit vehicle turn warning system help them avoid a collision with a bus.

CV Pilot Deployment

- USDOT selected the New York City Department of Transportation (NYCDOT), Wyoming Department of Transportation (WYDOT) and Tampa Hillsborough Expressway Authority (THEA) as recipients of a combined $42 million in federal funding to implement a suite of connected vehicle applications and technologies tailored to meet their region's unique transportation needs.
- CV Pilot Deployment sites have completed Phase 1, preparing a comprehensive deployment concept, and are currently in Phase 2. In Phase 2, the sites embark on a 20-month phase of activity to design, build and test deployment of integrated wireless in-vehicle, mobile device, and roadside technologies.
- Experiences from the New York site suggest that including technical, operations, and legal personnel in stakeholder meetings helps address the requirements of the CV deployment and ensure that participants' privacy is maintained.
- The Wyoming site focuses on the needs of commercial vehicle operators. To reduce the need for channel switching, a potential distraction, designing CV communications including dual radios is suggested.
- Experience at the Tampa site suggests installing additional vehicle detection equipment if it is determined that there is insufficient market penetration for CV traffic signal control applications to work at their full potential.

Automated Vehicles – Truck Platooning

- Truck platooning works by creating a close, constant coupling between platooning vehicles, providing fuel benefits for both the lead and following trucks. Operating as a unit, truck platoons can also smooth traffic flow to increase efficiency and roadway capacity.
- Class-8 trucks with standard-trailers net a fuel savings of between 5.2 and 7.8 percent in a three-truck CACC platoon. With aerodynamic-trailers, these savings grow to 14.2 percent at a minimum separation distance of 17.4 m (57.1 ft).
- A traffic microsimulation study of driver assistive truck platooning (DATP) found a travel time reduction benefit for each of the simulation cases featuring current traffic and two increased levels (115 percent and 130 percent) of traffic volumes on a five-mile section of I-85 in Alabama. Travel time savings during peak hour traffic conditions ranged from a two percent improvement (with 20 percent market penetration) to 69 percent improvement (with 100 percent market penetration).

Automated Vehicles – Driver Assistance

- Field testing and evaluation of GlidePath Cooperative Adaptive Cruise Control (CACC) systems installed on partially automated vehicles show these system can improve fuel economy by 17 to 22 percent and reduce travel time up to 64 percent.
- A survey of 21 volunteer participants in the Seattle area who drove DSRC equipped vehicles designed to collect speed and road weather data from other connected vehicles and infrastructure-based systems suggested that on-board applications such as queue warning, speed harmonization, and weather responsive traffic management (WRTM) messaging systems enabled drivers to take action in advance of congestion, reducing the need to slow down or stop suddenly.
- Observations of OEM driver assistance technology pricing over the last few years show these system can add from $300 to $10,800 to the purchase price of a new vehicle. Most systems are $4500 or less.

All data referenced is available through the ITS Knowledge Resources Database, which can be found at http://www.itsknowledgeresources.its.dot.gov/

U.S. Department of Transportation Intelligent Transportation Systems Joint Program Office

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