TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM

Project Summary Report 0-1790-S
Project 0-1790: ITS Benefits

Authors: William R. Stockton and C. Michael Walton

PROJECT SUMMARY REPORT

Estimating the Benefits of ITS Projects

This report summarizes the benefits associated with the deployment of intelligent transportation systems, or ITS. ITS apply computers, electronics, and communications systems to maximize the effectiveness and efficiency of transportation systems.

These systems are a small capital and operational investment that can have significant impact on the utility of the transportation network. Because ITS projects do not exist apart from the transportation system, they are "deployed" as a complement or augmentation.

What We Did ...

During this project, researchers:

- Assembled, reviewed, and regularly updated dozens of sources demonstrating results of deployed ITS projects.
- Reviewed and tested decision-support tools for use by the Texas Department of Transportation (TxDOT) and local entities in evaluating the potential effectiveness of ITS deployments.
- Critically analyzed ITS evaluations conducted and evaluation methodologies developed in Texas and throughout the United States.
- Prepared briefings and presentations for TxDOT senior personnel and senior elected and appointed officials regarding the role and benefits of ITS as a part of the Texas transportation system.
- Developed and implemented a comprehensive web site to provide TxDOT staff with up-to-date results, tools, information, and nationwide experience in the deployment and evaluation of ITS projects. For information, go to tti.tamu.edu/austin/its.

What We Found ...

Benefits of ITS are both quantitative in traditional transportation measures and, significantly, qualitative in customer service and satisfaction.

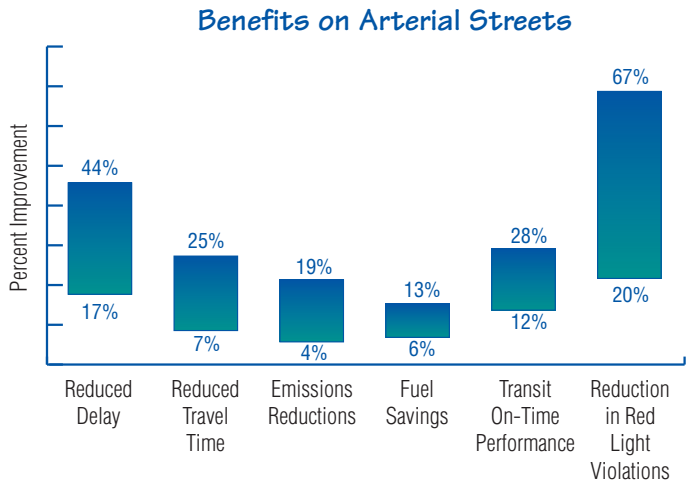
Figures in this report show typical benefits associated with ITS deployments. As with all highway and traffic improvements, the effectiveness of ITS in a specific situation depends on local conditions and the applicability of the deployment to those conditions.

Benefits to Travelers

ITS deployments have a substantial impact on safety that is not achievable by other means. Crash reductions of 5 to 50 percent resulted from ramp metering in Seattle, Denver, Portland, Detroit, and Minneapolis. ITS incident management has reduced total crashes by 35 percent in San Antonio and is projected to impact typical metropolitan areas by 11 to 15 percent nationwide due to reduced times of incident detection and response. Deployments at railroad-highway grade crossings reduced high-risk violations by 26 to 92 percent. Traffic signal coordination reduced vehicle stops (that often lead to crashes) by 28 to 43 percent.

Delays on freeways and arterial streets can be significantly reduced through selected ITS projects. Traffic signal coordination reduced travel times by 8 to 25 percent nationally and reduced delays on arterial streets by 15 to 50 percent. Incident management systems nationwide have typically reduced incident-related delay 50 to 60 percent as a result of rapid detection of and response to crashes and stalls. Ramp metering systems reduce travel time by 10 to 27 percent. On-time performance of bus systems with automated vehicle location systems has improved 12 to 28 percent. Queues at toll plazas have decreased dramatically with the use of electronic toll collection (ETC).

The traveling public strongly supports better information and more reliable travel times made possible by ITS deployments, expressing very high levels of favorable response to a wide range of technologies. Incident locations, travel times, rerouting information, weather warnings, and Amber Alerts are possible because of ITS infrastructure, roadside signs, and highway



Typical ranges of benefits measured or estimated from arterial street ITS deployments nationwide.

advisory radios (HAR). In Orlando, 58 to 67 percent of users believe roadside dynamic message signs (DMS) are accurate and timely. In Indiana, more than 75 percent of participants favored DMS installations. Automated warning signs have even higher levels of approval—69 to 85 percent. Ramp metering was favored by 80 percent of survey respondents in Minneapolis—*after* ramp metering had been discontinued for a lengthy period.

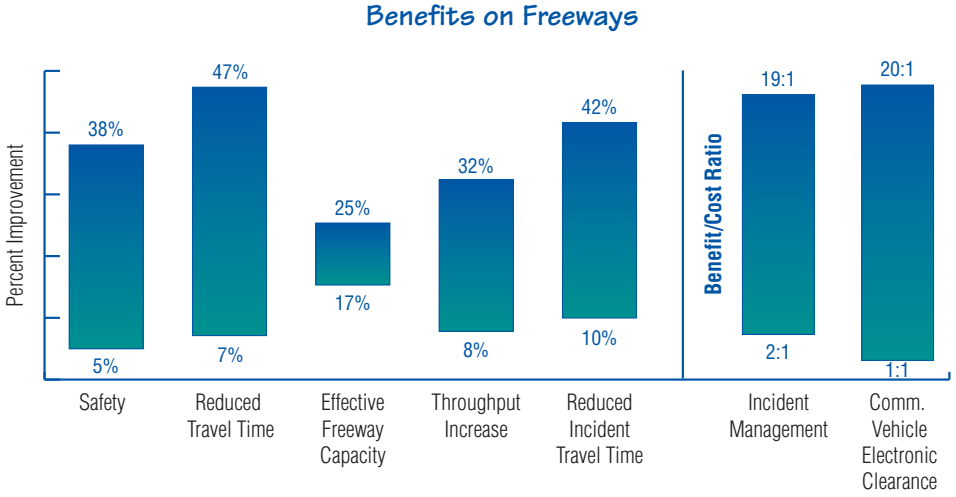
Internet access has radically changed customer expectations, especially regarding information; meaningful real-time information is contingent upon a good ITS network. Web sites with local traffic information have seen dramatic increases in usage, especially as they expand the nature of information available and provide timely and reliable information.

Critical services to assure truck safety and efficiency can be provided only through key ITS deployments. A midwest project increased the identification and removal of unsafe drivers and vehicles by 50 percent. Colorado has experienced a 13 percent drop in truck crashes resulting from a downhill speed sensor/monitor that reports excessive speed. Electronic credentials projects have reduced processing time from six weeks or more to less than an hour. Numerous truck rollover projects have been implemented, most commonly at freeway-to-freeway connector ramps. Roadside electronic screening and weigh-in-motion (WIM) are central to Texas' long-term strategy for minimizing weigh station staffing requirements and maximizing safety screening.

Benefits to Society

Numerous ITS projects have lowered fuel consumption well in excess of the cost of the deployment. Signal coordination reduced fuel consumption by 5 to 15 percent over a range of traffic and local conditions. Fuel savings from ramp metering ranged from 135,000 gallons annually in Portland to 5.5 million gallons annually in a much larger program in Minneapolis/St. Paul. Fuel savings of 2600 gallons *per incident* are an estimated impact for the San Antonio TransGuide center. Based on the study of 297 areas, minimum savings of 6 percent are estimated with basic metropolitan ITS infrastructure.

A wide range of ITS technologies have had measurable impacts on emissions. Reductions of hydrocarbons (HC) and carbon monoxide (CO) ranged from 4 to 19 percent for traffic signal coordination projects, with most projects producing double-digit reductions. Estimates of the impact of the traffic management center in Detroit are annual reductions of: 1400 tons of HC; 122,000 tons of CO; and 1200 tons of NOx. The metropolitan ITS infrastructure is conservatively estimated to save a base of 6 percent in corridor emissions.



Typical ranges of benefits measured or estimated from freeway ITS deployments nationwide.

Benefits to Transportation Agencies

Increased throughput on freeway and tollway lanes substantially improves the effectiveness of the facility. Such improvements may postpone the need to widen freeways, or at least lessen impacts until capacity improvements can be implemented. Nationwide the improvements range from 8 to 22 percent, effecting a temporary increase in capacity simply by making more efficient use of existing facilities.

Because technologies can significantly speed up manual tasks, the available transportation agency staffs can be much more effective and have a much greater reach and impact.

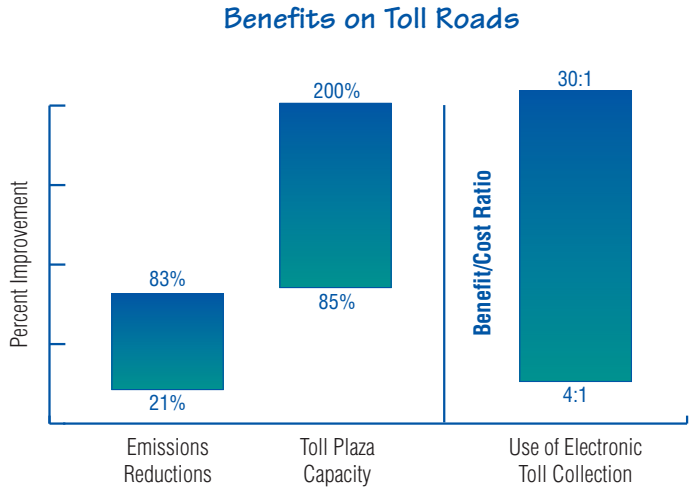
Because ITS technologies can be deployed and operated remotely, traveler information and warnings, roadway safety, and traffic operations can be monitored and adjusted, and responses effected in ways never before possible.

Substantial savings in transportation agency operations and traveling public time and expense have resulted from a wide range of ITS deployments.

Because most ITS deployments either directly or indirectly involve multiple agencies, ITS have an integrating effect that is not readily quantifiable but is evident during major events, such as storms.

Deployment Considerations

ITS benefits, like the benefits of roadway construction, are highly site- and context-specific and do not lend themselves to reliable prediction using rules-of-thumb or simple prediction equations. However, there are several computer tools or models (e.g., SCRITS, IDAS) that can provide planning-level estimates given base or forecast traffic and roadway inventory information. These tools should be integrated into the transportation planning process.



Typical ranges of benefits measured or estimated from toll road ITS deployments nationwide.

Evaluation methodologies have been so varied in their approaches and measures of effectiveness that they are not combinable into a data bank of knowledge. However, the Federal Highway Administration (FHWA) has provided some basic guidelines that furnish an overall framework for conducting ITS evaluations, and numerous ITS evaluation reports are available on FHWA's Electronic Document Library.

ITS infrastructure (detectors, communication system, cameras, etc.) is the critical backbone of the system but does not provide service or benefits directly. This enabling infrastructure is analogous to highway right-of-way, which has no service value itself but is essential.

Most of the data required to perform effective and efficient evaluation are readily and inexpensively obtained through monitoring existing ITS installations.

The Researchers Recommend ...

The establishment of deliberate, clear goals reflecting the intent of implementing agencies, combined with objectives that measure progress toward the goals, is essential for meaningful success of ITS projects.

Aggressive deployment of ITS infrastructure to support information gathering and dissemination, integration of multi-agency activities, and provision of current and future ITS services should be considered as a part of all urban and metropolitan construction projects.

Ongoing automated data gathering, archiving, and analysis will allow TxDOT districts to monitor the service provided to the public and make adjustments as needed. It will also allow the traffic operations staff in TxDOT to accumulate a database for improved forecasting of ITS benefits and applications.

TxDOT and local agencies in Texas would be well served to follow the evaluation guidelines contained in Report 1790-5. These guidelines are based on a sound evaluation framework that is consistent with a goals-driven approach to planning and deployment and are used for extensive analysis of a wide variety of ITS projects nationwide.

For More Details . . .

The research is documented in the following reports:

Research Report 1790-1, *ITS Benefits: Review of Evaluation Methods and Reported Benefits*
Research Report 1790-2, *A Proposed ITS Evaluation Framework for Texas*
Research Report 1790-3, *Intelligent Transportation Systems (ITS) in Texas: Deployment Summary and Case Study of Deployment Methodologies*
Web Site: http://tti.tamu.edu/austin/its

Research Supervisors:

William R. Stockton, P.E., Research Supervisor, 979-845-9947, bill.stockton@tamu.edu
C. Michael Walton, PhD, P.E., Co-Research Supervisor, 512-471-1414, cmwalton@mail.utexas.edu

Researchers:

Ginger Daniels Goodin, P.E., 512-467-0946, g-goodin@tamu.edu
Tina Collier, 512-467-0946, t-collier@tamu.edu
Michael Martello, 512-467-0946, m-martello@tamu.edu
Shawn Turner, P.E., 979-845-8829, shawn-turner@tamu.edu
Poonam Wiles, P.E., 817-462-0524, p-wiles@tamu.edu
Darren McDaniel, TxDOT Project Director, 512-416-3331, dmcdanie@dot.state.tx.us

To obtain copies of the reports, contact Dolores Hott, Texas Transportation Institute, TTI Communications, (979) 845-4853, or e-mail d-hott@tamu.edu. See our on-line catalog at http://tti.tamu.edu.

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This research examined the benefits of deploying intelligent transportation systems (ITS) into conventional transportation systems. ITS have been deployed extensively for all modes of transportation worldwide. In Texas, ITS have been emphasized in urban locations and have recently been introduced in rural locations. Implementation of ITS in Texas has reaped benefits and will continue to do so through reduced congestion and increased levels of service.

For more information, contact Mr. Wade Odell, P.E., RTI Research Engineer, at (512) 302-2363 or e-mail wodell@dot.state.tx.us.

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