



TECHSUMMARY December 2022

State Project No. DOTLT1000379 | LTRC Project No. 21-4SS

Develop and Evaluate Performance Measures for Intelligent Transportation Systems (ITS) in Louisiana

INTRODUCTION

This study developed performance measures for DOTD's current ITS programs, which were used to evaluate the ITS applications. The significance of this study is that it uses data and scientific methods to identify areas with the greatest need for improvement and to create performance-driven, outcome-based indicators for decision-making regarding the need for expansion or improvements of the ITS programs in Louisiana.

OBJECTIVE

The primary objective of this research was to develop a set of performance measures for each existing ITS program in Louisiana and evaluate benefits achieved through their implementation across transportation planning, traffic operation, safety, environmental quality, sustainability, and other areas that can be evaluated.

SCOPE

Insights were gathered through literature reviews, qualitative surveys, and inputs from stakeholders, which were used to develop performance measures for each of Louisiana's ITS applications. Available data were collected mainly for periods between 2016 and 2020 and used to evaluate the performance of sampled ITS applications.

METHODOLOGY

A literature review investigated how performance targets of ITS have been tracked, measured, and reported by DOTs. A survey and protocol were designed to obtain information on how existing performance measurements have been assimilated into ITS programs of respective agencies. An initial list of performance measures for each DOTD ITS program was developed from information gathered from the literature review and qualitative survey. Following stakeholder consultation, a final list of agreed performance measures for each DOTD ITS program was developed. An analysis of data availability for the agreed performance measures was conducted to identify where Louisiana lacked data for evaluating ITS performance. Where data existed, the analysis evaluated whether existing applications have been beneficial and reported aspects that need improvement. Due to data availability challenges and the limited time available to evaluate the performance of the programs using all performance measures, the performance measures shown in Table 1 were used to evaluate the selected programs to assess the research objective.

CONCLUSIONS

The following summarized conclusions were made under each key area of the research:

Literature Review

Responsible organizations like the FHWA and USDOT through ARC-IT have provided sufficient guidance and information to develop or incorporate performance measurement strategies into respective ITS programs.

Qualitative Survey

- ITS performance measurement has been fairly integrated into ITS programs by agencies with most organizations monitoring their ITS programs, considering it beneficial to operations and taxpayers.
- Reasons state DOTs generally do not benchmark or compare ITS performance with other agencies include lack of available data, lack of guidance or best practices on the subject, and incomparable data gathered across jurisdictions. Additionally, reasons that prevent agencies from measuring performance to greater detail and quality include lack of available data, complexity in the endeavor, fragmented and incomparable data, lack of data scientists, and difficulty assigning responsibilities when inter-agency collaboration is required.

Evaluation of ITS Performance

For each ITS program area, specific DOTD objectives were identified, and performance measures were developed to assess how the state had achieved its transportation goals. The conclusions that follow under each DOTD ITS program area were made using data mainly from 2016 and 2020 to evaluate the ITS program using the performance measures shown in Table 1.

LTRC Report 668

Read online summary or final report:
www.ltrc.lsu.edu/publications.html

PRINCIPAL INVESTIGATOR:

Raju Thapa, Ph.D., P.E. (TX)

LTRC CONTACT:

Elisabeta Mitran, Ph.D.
225-767-9129

FUNDING:

SPR: TT-Fed/TT-Reg - 5

Louisiana Transportation Research Center

4101 Gourrier Ave
Baton Rouge, LA 70808-4443

www.ltrc.lsu.edu

Arterial Management

- The current CCTV coverage on Louisiana's interstate highway system is only a small proportion, but segments with apparent crush clusters and unusually high crash frequencies without coverage identified by the study are determined to need immediate or immediate future coverage. For instance, interstate highways I-210 in Lake Charles and I-310 in New Orleans need immediate or immediate future coverage.
- Even though road users in Louisiana may be benefiting from installed CCTV cameras on roadways in other ways, the evidence available through this evaluation was not enough to claim that road users in Louisiana benefited from installed CCTV cameras in terms of reduced incident response times.

Emergency Management and Motorist Assist Patrol (MAP)

Notwithstanding the need to increase the sample sizes used in the evaluations in Alexandria, Baton Rouge, New Orleans, and Shreveport, the RCTs observed on roadways with MAP are lower than the RCTs on roadways without MAP. Even though in Lafayette, Lake Charles, and Northshore, where the RCTs on roadways with MAP are not significantly lower than RCTs on roadways without MAP, road users still benefit in terms of lower mean RCTs and upper bound of the confidence interval of the RCTs observed. In general, it can be concluded that road users in Louisiana benefit from reduced RCTs on roadways that have MAP.

Commercial Vehicle Operations

- Louisiana's interstate highway remained reliable over the studied period, with TTTR Index scores of less than 1.50; but there exist Traffic Message Channel (TMC) segments in Louisiana that experienced maximum TTTR scores of greater than 1.50, which are together 15.47% of the interstate highway system.
- The 15.47% of the interstate highway (with a maximum TTTR > 1.50) contributed, on average, 72.34% of the statewide annual user delay cost between 2016 and 2019. The proportion dropped to 62.49% in 2020, which is still extremely high, considering the full length of the interstate highway.
- The annual crash frequencies on the interstate highway system remained relatively constant between 2016 and 2019 but declined in 2020. Even though the annual frequency of crashes remained relatively constant, the ratio of commercial vehicles saw an increasing trend between 2016 and 2020.

Freeway Management

- The inventory of installed ITS equipment in Louisiana needs to be periodic and updated in required documents and portals for easy reference.
- The results from the safety assessment of active ramp meters in Louisiana using sampled sites in Baton Rouge were insufficient to claim the safety benefits of ramp meters to road users across Louisiana.

Electronic Payment and Congestion Pricing

- The results from the study did not support the hypothesis that tolling operation on the southbound lane of Causeway Boulevard across Lake Ponchartrain would improve travel time reliability in terms of the performance measures used. The finding, however, supports the notion that the tolls were for commercial purposes and not for operational improvements.
- There were variabilities in the assessed performance during the night, especially in speeds, which may be from unclear road delineations, lack of lighting, or the absence of shoulders on the stretch of Causeway Boulevard.

Traveler Information

The spikes in monthly 511 statistics seem to correlate with the months of major weather events in Louisiana, which suggests the benefits of Louisiana's traveler information program in the form of increased 511 services during bad weather events to users in and around Louisiana.

RECOMMENDATIONS

The study recommended the following for future research:

- It is recommended that a study in the future can identify or predict the factors that influence RCTs on the Louisiana interstate highway system.
- A comprehensive study to reevaluate the operation of ramp meters may reveal additional information on its effectiveness.
- Future studies can assess the coverage of installed ITS devices separately.
- There exists variability in the performance during the night on Causeway Boulevard, especially in speeds, which poses a safety concern that needs investigation.
- Regarding traveler information, the performance measures can be evaluated within a short time, preferably quarterly.

Program Area	#	Objectives	Performance Measures	Data	Data Sources	Extent of Study (2016-2020)
Arterial Management	1	Increase the percent of major and minor arterials equipped and operating with CCTV cameras	Percent of major and minor arterials equipped and operating with CCTV cameras per Z distance.	• Inventory and locations of installed CCTV cameras	LTRC	• Assess coverage of CCTV on significant highways in Louisiana.
	2	Reduce delay associated with incidents on arterials	Delay associated with incidents	• Travel time data	Crash database RITIS	• Evaluate change in incident response time on highway segments with CCTV coverage.
Emergency Management and Motorist Assistance Patrol (MAP)	1	Reduce mean incident clearance time per incident	• Roadway clearance duration (RCT)	• Incident notification time, On-scene arrival time, time full traffic operational status returns. • Travel time data	Crash database	• An assessment of incident clearance time on Louisiana's roadways with MAP coverage
Commercial Vehicle Operations	1	Decrease point-to-point travel times on selected freight-significant highways	Point-to-point travel times	• Travel time data	RITIS	• An assessment of travel time of commercial vehicles on freight significant highways in Louisiana
	2	Decrease hours of delay per 1,000 vehicle miles traveled on selected freight significant highway	Hours of delay per vehicle miles			
	3	Decrease the annual average travel time index for selected freight-significant highways	Travel time index			
	4	Reduce commercial vehicle crash rate.	Number of crashes involving large trucks and buses	Number of crashes involving large trucks and buses	Crash database	
Freeway Management and Traffic Management Centers	1	Increase the level of TMC field hardware	• Total number of TMC equipment	• Inventory of TMC field hardware	TMCs to assist	• Inventory of statewide TMC (ITS) resources and an evaluation of transportation systems monitored by TMC for real-time performance
	2	Increase the percent of regional transportation systems monitored by the TMC for real-time performance				
	3	Determine effects of Ramp Meters on traffic flow and safety at merge sections.	• Number of Crashes	• Number of Crashes	Crash database Localized data	
Electronic Payment and Congestion Pricing	1	Improve average travel time during peak periods	Average travel time during peak periods (minutes)	• Travel time data • Person travel along links	RITIS	• Evaluation of peak travel time on tolled Causeway Blvd
	2	Reduce hours of delay per capita	Hours of delay (person-hours)			
Traveler Information	1	Increase the number of traveler information portals	• Number of 511 calls per year. • Number of visitors to traveler information website per year. • Number of web (e.g., Twitter, Facebook) followers.	• Count of users of 511 channels • Count of traveler information website users • Count of web followers (e.g., Twitter, Facebook, etc.)	511 Program	• Evaluation of the current state of Louisiana's traveler information program area
	2	Increase the accuracy of traveler information posted				

Table 1. ITS program areas, performance measures, and scope of evaluations