Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6912: Innovative Tools and Techniques in Identifying Highway Safety Improvement Projects

Background

The Highway Safety Improvement Program (HSIP) aims to achieve a reduction in the number and severity of fatalities and serious injury crashes on all public roads by implementing highway safety improvement projects. The Texas Department of Transportation (TxDOT) requests TxDOT districts propose HSIP projects through an annual statewide program solicitation. TxDOT's HSIP is based on a robust benefit-cost ratio analysis, yet there are several areas for improvement. As national safety assessment methods have evolved, legislation mandates that the use of safety performance methods be elevated. The increased use of advanced safety assessment methods and tools can help a state determine locations and safety improvements that have the greatest potential to reduce fatal and injury crashes while minimizing the influence of unstable crash trends over many years. This project addresses how TxDOT can:

- Allocate funds in the most cost-effective manner.
- Create a level playing field for all districts participating in the HSIP and promote district participation in the process.
- Minimize the amount of time and resources required to identify HSIP projects.

What the Researchers Did

Researchers completed the following activities:

- Reviewed the literature, state HSIP processes and practices, and HSIP tools used by various agencies.
- Evaluated the applicability of safety assessment methods and tools used by other states and local agencies for Texas facilities.
- Developed a general safety management framework that encompasses a series of modern safety assessment methods and tools. The project team tailored this cyclical framework to TxDOT's needs and focused on improving and streamlining four processes that were identified as critical elements in TxDOT's HSIP:
  - **Network screening.** The research team developed a series of ArcGIS models and Excel® tools to apply network screening for on-system mainlane segments. After performing network screening using 2014–2016 crash data, researchers developed and disseminated the results of the analysis to seven pilot districts. Since an intersection database is not currently available at TxDOT, researchers collected data for a sample of 264 intersections in San Antonio and conducted a pilot study to illustrate the network screening process for intersections.
  - **Diagnosis**. Researchers developed a Crash Analysis and Visualization (CAVS) process to create various informational products that are intended to improve and streamline the project selection process at TxDOT. The CAVS products include Google Earth® (GE) layers, geodatabases, shapefiles, and Excel files. These products support the visualization of crashes by severity and road part, and enable TxDOT officials to further review and process crash data by developing charts,

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Project Completed:
6-30-2017

graphs, summary tables, and other aggregate statistics. Researchers developed and disseminated the CAVS products to all 25 districts to support both the 2016 and 2017 HSIPs.

- **Countermeasure selection**. Researchers expanded the CAVS products by developing new GE layers that display which types of safety countermeasures could prevent each fatal and incapacitating injury crash that is considered in TxDOT's HSIP. Researchers also developed geodatabases and shapefiles that allow TxDOT officials to conduct additional geographical information system data processing, as needed.
- **Project prioritization**. Researchers developed a macro-enabled Excel spreadsheet that automatically conducts an incremental benefit cost ratio (IBCR) project prioritization analysis.

What They Found

The new processes and tools developed in this project enhance and streamline current project selection practices at TxDOT. Incorporating performance measures and data-driven systemic safety analyses into the program can minimize, to the extent possible, dependence on human discretion, regression-to-the-mean effects, and retrospective examination of historical crash data. Crash predictive methods will enable TxDOT to apply safety funds in places with the greatest potential to reduce fatal and serious injury crashes. The main benefits realized from using CAVS products by all TxDOT districts during the 2016 and 2017 HSIPs include the following:

- District officials reported that the amount of time and resources needed to complete project identification activities decreased on average by **20–50 percent** compared to previous years.
- The total number of projects (1,394) submitted by all districts to the 2016 HSIP increased by **31 percent** compared to the number of projects (1,067) identified in the 2013 HSIP, when districts used simple spreadsheets or their own visualization products to select safety improvement projects.
- The total number of projects (1,680) submitted by all districts to the 2017 HSIP increased by **57 percent** compared to those submitted in the 2013 HSIP.

What This Means

The network screening processes developed in this study for roadway segments and intersections can be expanded in the future to all TxDOT districts. By developing and providing all districts with the same tools and informational products, TxDOT can create a level playing field within the HSIP and increase district participation in the program. In addition, the IBCR tool developed in this study will allow TxDOT to easily rank HSIP projects based on their potential to improve traffic safety and invest funds in the most cost-effective manner. Recommendations to improve TxDOT's HSIP include the following:

- Conduct statewide implementation of network screening for segments.
- Incorporate the network screening process and CAVS products into HSIP and other safety-related business processes and practices.
- Incorporate the IBCR method into the current HSIP project prioritization process.
- Evaluate the safety and cost-effectiveness of HSIP projects.
- Incorporate the general framework into the HSIP.
- Develop an intersection inventory.
- Provide training on the use of the 0-6912 project deliverables.
- Develop new safety performance functions.

For More Information

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Keyword: Research