

ROADWAY SAFETY DATA GOVERNANCE IN ILLINOIS

ROADWAY SAFETY DATA AND ANALYSIS

CASE STUDY FHWA-SA-16-108

Federal Highway Administration Office of Safety

Roadway Safety Data Program http://safety.fhwa.dot.gov/rsdp/



December 8, 2016





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16. Abstract The Illinois Department of Transportation (IDOT) has implemented an enterprise data governance approach for managing data collection, storage, distribution, and use throughout the organization. The Illinois Traffic Records Coordinating Committee (ITRCC) works to advance IDOT safety analysis activities, which includes identifying severe crash locations and segments, prioritizing locations for treatment, and performing systemic safety analyses. The ITRCC also ensures availability of complete, accurate, and timely motor vehicle crash data for transportation safety decision-making. IDOT offers safety analysis tools, training, and technical assistance to local agencies. Through these various data governance and management activities, IDOT integrates a wide variety of safety-related data for decision making in comprehensive transportation program development.				
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*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

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ACRONYMS

BSPE	IDOT Bureau of Safety Programs and Engineering
CIS	IDOT Crash Information System

- EMS Emergency Medical Services
- FHWA Federal Highway Administration
- GIS Geographic information system
- HSIP Highway Safety Improvement Program
- HSP Highway Safety Plan
- IDOT Illinois Department of Transportation
- IRIS Illinois Roadway Inventory System
- ITRCC Illinois Traffic Records Coordinating Committee
- LRS Linear Referencing System
- MPO Metropolitan Planning Organization
- OPP IDOT Office of Planning and Programming
- SHSP Strategic Highway Safety Program

EXECUTIVE SUMMARY

The Illinois Department of Transportation (IDOT) has implemented an enterprise data governance approach for managing the collection, storage, distribution, and usage of data across the organization. IDOT has also established a spatially-enabled data warehouse to integrate crash, roadway, and traffic data. The Illinois Traffic Records Coordinating Committee (ITRCC) serves as IDOT's formal safety data governance group, which include the Engineering Subcommittee and the Data Quality Subcommittee. The Engineering Subcommittee is developing a comprehensive safety data system to enable safety analyses, which includes identifying severe crash locations and segments, prioritizing locations for treatment, and performing systemic safety analyses. The Data Quality Subcommittee ensures availability of complete, accurate, and timely motor vehicle crash data for transportation safety decision-making. IDOT also offers safety analysis tools, provides safety data. Through these various data governance and management activities, IDOT integrates a wide variety of safety-related data for decision making in comprehensive transportation program development.

INTRODUCTION

The Illinois Department of Transportation (IDOT) has implemented an enterprise data governance approach for managing the collection, storage, distribution, and usage of data across the organization. IDOT also established a spatially-enabled enterprise data warehouse that integrates crash, roadway, and traffic data. As a major benefit, IDOT integrates a wide variety of safety-related data for decision making in comprehensive transportation program development.

For transportation agencies, the development and implementation of the annual and multi-year transportation program is a complex undertaking involving coordination with multiple stakeholders. This effort requires access to a wide variety of information for project selection and evaluation. Illinois has addressed these needs through institutionalized data governance practices that make transfer of information practical and efficient. This case study demonstrates the deployment, and resulting benefits, of enterprise data systems for safety-related decision making.

BACKGROUND

IDOT's Office of Planning and Programming (OPP) manages the transportation system plan development. Nine IDOT District offices and multiple local agencies—including 102 counties and 16 Metropolitan Planning Organizations (MPOs)—coordinate this effort. IDOT's Office of Program Development through the Bureau of Safety Programs and Engineering (BSPE), develops and manages a multi-faceted program to reduce traffic-related deaths and injuries. IDOT addresses traffic safety needs on both State-owned roads and roads owned by local agencies. One key component of improving safety on local roads is enhancing the safety data capabilities of local agencies and the District offices. IDOT offers safety analysis tools, provides safety data training and technical assistance, and promotes local access to crash and roadway data.

To implement Illinois' Strategic Highway Safety Program (SHSP), Highway Safety Plan (HSP) and the Highway Safety Improvement Program (HSIP), IDOT and its partner agencies require the assembly, review, and use of data describing the safety performance of the highway system. IDOT compiles and links data from various sources to identify high severity crash locations and corridors of interest. IDOT then develops projects that are funded by the HSIP and included in the Annual Highway Improvement Program.

I

AUDIENCE

This case study applies to the following audiences:

- State Departments of Transportation: Roadway Data System Managers, Program Developers, Safety Engineers, GIS specialists, and IT project managers.
- Local Agencies: Regional Planning Commissions, MPOs, cities, and counties, plus Local Technical Assistance Programs (LTAPs).
- Tribal Agencies: including Tribal governments, public agencies responsible for transportation safety data in Tribal areas, and Tribal Technical Assistance Programs (TTAPs).
- Consultants and private businesses involved with safety data analysis and GIS.

ENTERPRISE SOLUTIONS

ENTERPRISE SPATIAL DATA WAREHOUSE

IDOT has implemented an enterprise Geographic Information System (GIS). This system enables safety data integration including crashes, roadway inventory, and traffic characteristics along with program development data files. IDOT spatially locates crashes for all of the State roadway network and a majority of the local network. IDOT receives 55 percent of crashes electronically from law enforcement agencies. This percentage is growing as IDOT works to improve local data reporting.

IDOT has a functioning Linear Referencing System (LRS) for all public roadways (approximately 146,000 miles), which links the following information:

- Roadway, structure, and rail/highway crossing inventories.
- Traffic volume and truck classification information.
- Operations and maintenance activities.
- Annual and multi-year planning and programming information.
- Individual and high crash location identification.
- Video inventory and condition assessment (State system and National Highway System).
- Construction projects (State system only).

IDOT's spatial information systems infrastructure directly links the LRS with roadway-related databases using a variety of system identifiers. This linkage enables the complex integration of safety and roadway asset-related data files across the enterprise and also provides access to historical information. The system readily accommodates changes to the route referencing systems without loss of integrative capabilities. The spatial information system can also accommodate for newly available internal and external spatial information layers when referenced to IDOT's linear referencing system or to State plane coordinates. Outputs include a variety of user-developed safety analysis products such as Heat Maps, which display areas experiencing high levels of a specific safety problem.

An important feature of data warehouse functionality is access to historical data through the creation of year-end archives for the roadway inventory files. IDOT personnel access these archived files to acquire prior information such as crash, traffic levels, and roadway condition/rehabilitation histories for pavement network analysis and research. Thus, IDOT staff can also make comparisons over the same section of roadway by using the LRS, even if the route name or milepost convention has changed.

ENTERPRISE DATA GOVERNANCE

IDOT employs formal data governance principles in the development and oversight of architectures, policies, and procedures to manage the spatial data resource. The data governance process addresses data collection, storage, security, inventory, quality control, and distribution. IDOT maintains a complete data dictionary for all enterprise database resources. The data dictionary identifies data linkage variables (such as location codes).

IDOT continuously collects, maintains and distributes crash data compiled from crash reports. The Crash Information System (CIS) houses the crash data. OPP maintains the Illinois Roadway Inventory System (IRIS) database, which provides detailed roadway information on all roadway segments, spot locations, and highway-railway crossings. Roadway information includes travel lane, pavement, and shoulder types and characteristics, and also traffic count data with truck classifications. The CIS and IRIS databases provide the primary information used to identify projects for the HSP and the HSIP. IDOT integrates CIS and IRIS information through a Safety Data Portal to provide users with preformatted reports and the ability to perform ad-hoc analysis. OPP maintains an inventory of highway-railroad crossings that help identify high risk highway-railway crossing locations.

The external availability of the Safety Data Portal has improved crash data accessibility and allows users to produce a variety of reports as well as map-based output from the IDOT's GIS. The Safety Data Portal provides an interactive query tool allowing users to generate their own statistics and maps using a series of drop-down menu selections.

DATA GOVERNANCE EFFORTS

ILLINOIS TRAFFIC RECORDS COORDINATING COMMITTEE

The Illinois Traffic Records Coordinating Committee (ITRCC) serves as IDOT's formal safety data governance group. The vision of the ITRCC is to "enable the discovery of life-saving strategies by ensuring that complete and timely traffic safety data is available for in-depth relational analysis." With executive oversight, the ITRCC consists of knowledgeable managers

and data users who regularly meet to provide overall direction and leadership for ITRCC activities. Appendix A displays the areas represented within the ITRCC.

The Engineering Subcommittee of the ITRCC plays a major role in safety data governance activities. The Engineering Subcommittee is developing a comprehensive safety data system to perform safety analysis, problem identification, and countermeasure selection for all public roadways. These analyses include identifying severe crash locations and segments and prioritizing locations for treatment. The Engineering Subcommittee helps ensure relevant data is integrated and accessible for IDOT to perform systemic safety analyses, which consist of identifying contributing factors, evaluating the effectiveness of safety improvements, and establishing performance measures and targets.

IDOT integrates this information to develop specific GIS safety asset management products such as:

- HSIP top five percent locations.
- Spatial products for annual and multi-year safety and capital program development, by District offices.
- Systemic network analysis (e.g., identification of rumble strip and cable median locations).
- Network screening and project identification for HSIP projects.

For more information about ITRCC, please visit <u>http://www.idot.illinois.gov/transportation-</u> system/safety/illinois-traffic-records-coordinating-committee.

ITRCC's data integration efforts extend beyond the core safety data sources of crash, roadway, and traffic volume. They are working to deploy an automated, statewide citation/conviction system for use by law enforcement and courts. ITRCC is also working to integrate crash and injury surveillance data including the National Emergency Medical Services Information System (NEMSIS).

DATA QUALITY

The Data Quality Subcommittee of the ITRCC ensures availability of complete, accurate, and timely motor vehicle crash data for transportation safety decision-making. The Subcommittee works with data owners and the ITRCC to develop a set of data quality measurements of system performance.

Illinois, with the support of FHWA and NHTSA, implemented data quality performance measures to address timeliness and accuracy of the statewide crash data (based on data quality issues recommended by NHTSA's Crash Data Improvement Program and Traffic Records Assessment teams).

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Electronic crash reporting is a high priority for IDOT. Currently, IDOT receives 55 percent of State and local crashes electronically through law enforcement agencies using a variety of off-the-shelf solutions. IDOT has also developed an automated process to provide electronic large truck-related crash file for FMCSA's SAFETYNET system and another upload file to support FARS data reporting. The Illinois Secretary of State uses CIS file extracts to post crash involvement into the driver history file and to send notices of suspension for failure to provide proof of financial responsibility. Additional data initiatives include vehicle identification, driver status, and property damage reports with the Illinois Secretary of State. Future efforts include the integration of forensic lab findings from the Illinois State Police and access to prehospital/trauma data and death certificate information.

Illinois has revised its Emergency Medical Services (EMS) data collection system to one that is NEMSIS-compliant and that will allow agencies to submit data electronically. This revision enables the Illinois Department of Public Health (IDPH) to begin receiving data from all agencies across the State, which improves the timeliness, completeness, accuracy, and uniformity of the State's EMS data. Through an online query system, IDPH makes mortality, hospital discharge, crash, and trauma registry data available for safety analysis. The query capabilities are constrained and only limited data are available; however, these tools suffice to give easy access to summary data and reduce the burden on IDPH and IDOT analytic staff.

PROGRAM APPLICATION

THE ILLINOIS TRANSPORTATION PROGRAM DEVELOPMENT PROCESS

In developing the multi-year and annual programs, IDOT District offices frequently refer to crash history and roadway condition data. Illinois' State Transportation Plan covers a six-year period. It reviews a full range of transportation and mobility options and assesses the current infrastructure. IDOT then prioritizes improvements based on system performance metrics (including safety) and, within available revenue sources, integrates them into the overall IDOT transportation strategy.

Each year, IDOT develops the Annual Highway Improvement Program. This presents a more detailed account of the fiscal year's highway program element. The annual program provides a current listing of all projects to inform the general public and to aid local transportation stakeholders and business partners in specific planning activities.

THE ILLINOIS HIGHWAY SAFETY IMPROVEMENT PROGRAM

In order to achieve the goals of the SHSP, IDOT endeavors to reduce fatalities and serious injuries resulting from crashes through various steps in the program planning process.

Developing an effective statewide program is a collaborative and integrated effort. The BSPE develops, implements, and maintains the SHSP, and integrates the efforts of the SHSP into the HSIP. At both the State and local levels, the BSPE encourages the engineering communities to work with their law enforcement partners to identify locations and contributing factors of severe crashes.

The BSPE assists the IDOT Districts in identifying problem areas and in developing costeffective strategies to address problem area locations. The BSPE develops and distributes the top five percent HSIP location maps and the fatal and serious injury maps/data. They also provide lists and summaries of effective engineering countermeasures and methods for evaluating the cost-effectiveness of countermeasures. Districts develop a list of recommended projects eligible for HSIP funding according to these guidelines. The BSPE also identifies systemwide safety improvements for certain SHSP emphasis areas for implementation by Districts for State highways.

IDOT assembles the HSIP through a planning process conducted by each of the District offices and in cooperation with local agencies. Each District has a District Safety Committee comprising the following District positions or equivalent persons: Programming Engineer, Studies and Plans Engineer, Geometrics Engineer, Operations Design Engineer, and Traffic Engineer. The District Safety Committee also coordinates with the law enforcement community (State and local) on a regular basis to identify severe crash locations and behavioral and engineering related contributing factors to provide integrated solutions to address the severe crash location.

LOCAL AGENCIES

Because local public roads constitute approximately 125,000 of the 146,000 centerline roadway miles in Illinois, improving local road safety is a major priority for IDOT. One key component of improving safety is the safety data capabilities of local agencies and IDOT District Offices. IDOT offers safety analysis tools, provide safety data training and technical assistance, and promote local access to crash and roadway data.

For HSIP, local governments use a process similar to that used by the Districts. The BSPE provides maps and roadway data for use by local governments. IDOT provides data element definitions, descriptions, and characteristics through database manuals, such as IRIS, and through data dictionaries. The IRIS file includes all local roadways and associated data. Local agencies can utilize IDOT-supplied maps and reports directly or incorporate the information into their process. The local agencies are responsible for supplementing IDOT's information with their own data or field studies to produce the data needed to perform safety analyses. Local agencies use the Safety Data Portal to obtain and update their data.

RESULTS

Advanced project and system safety analysis functions requires access to timely, complete, and accurate data integrated from a variety of sources. Through the ITRCC, IDOT's safety data governance activities help to ensure that appropriate data is available to safety analysts and highway program developers for effective safety-related decision-making. However, given the complexity of relevant data sources, the breadth of potential users, and the advancement in data collection and distribution technologies, management of the data governance process is challenging.

CHALLENGES

IDOT faces continuous challenges in managing safety data resources and coordinating safety activities across multiple State and local agency stakeholders. IDOT continues to work on improving data governance processes and integration for vehicle, driver, citation, and injury surveillance data. IDOT is also working to improve electronic submission of crash reports and to improve accessibility of safety information. The ITRCC is an important leader in these efforts since they bring together State and local stakeholders from the multiple traffic records custodial agencies.

LESSONS LEARNED

- Enterprise focus: To provide value, data must be a shared organizational resource to meet the needs of decision makers internal and external to the organization. IDOT has met this need through spatial integration of a wide variety of safety-related State and local agency data.
- Data Governance: To ensure comprehensive and consistent use, IDOT's data governance process addresses data inventory, storage, archiving, quality control, and distribution. IDOT also maintains a complete data dictionary for all enterprise data resources.
- Communication and Coordination: IDOT actively coordinates a wide variety of safetyrelated activities and strategically plans improvements through its program development process and through the ITRCC.

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APPENDIX A—ITRCC MEMBERSHIP

Traffic Records Coordinating Committee Members Adams County Highway Department Administrative Office of the Illinois Courts CH2M Hill Chicago Department of Transportation Chicago Police Department Cook County Sheriff's Police Department DuPage County Circuit Clerk's Office Illinois Association of Court Clerks Illinois Commerce Commission Illinois Department of Public Health, Office of Policy, Planning and Statistics Illinois Department of Public Health, Office of Preparedness and Response Illinois Department of Transportation, Bureau of Information Processing Illinois Department of Transportation, Bureau of Safety Engineering Illinois Department of Transportation, Division of Transportation Safety Illinois Department of Transportation, Office of Communications Illinois Department of Transportation, Office of Finance and Administration Illinois Department of Transportation, Office of Planning and Programming Illinois Secretary of State, Department of Driver Services Illinois Secretary of State, Department of Information Technology Illinois Secretary of State, Department of Programs and Policies Illinois Secretary of State, Information Support Services Illinois State Police • Illinois State Police, Chief Information Service Bureau Illinois State Police, Traffic Crash Reconstruction Unit Illinois Toll Highway Authority Lake County Division of Transportation Loyola University Medical Center Menard County Highway Department National Highway Traffic Safety Administration Office of Preparedness of Public Health Traffic Management Authority United States Department of Transportation, Federal Highway Administration United States Department of Transportation, Federal Motor Carrier Safety Administration

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