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RESEARCH PROJECT TITLE

Development of an Analytical Tool for Work Zone Performance

SPONSORS

Smart Work Zone Deployment Initiative
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SWZDI

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The Smart Work Zone Deployment Initiative (SWZDI) is a transportation pooled fund that supports research investigations into better ways to improve the safety and efficiency of traffic operations and highway work in work zones. The primary objective is to promote and support research and outreach activities that focus on innovative policies, processes, tools, and products that enhance the implementation, safety, and mobility impacts of work zones. The fund is administered by Iowa State University's Institute for Transportation, and the lead agency is the Iowa Department of Transportation.

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Development of an Analytical Tool for Work Zone Performance

tech transfer summary

The Work Zone Performance Metrics Analytical Tool uses readily available data to significantly simplify and streamline the process of calculating work zone performance metrics.

Objectives and/or Goal

The main goal of this project was to enhance transportation agencies' ability to monitor and evaluate work zone performance by developing an easy-to-use analytical tool—the Work Zone Performance Metrics Analytical Tool (WZPERFOMAT)—that calculates work zone performance metrics using readily available data sources.

Background

Work zones are essential to maintaining and upgrading transportation infrastructure, but they often result in disruptions to traffic flow, impacting both efficiency and safety. Recent advances in detection technologies and data collection have enabled agencies to gather extensive work zone data more easily, but translating these data into meaningful performance metrics, especially at scale, remains a challenge.

In addition, the Federal Highway Administration (FHWA) has introduced new requirements for work zone performance as part of each state's programmatic review. To meet these federal requirements, agencies are expected to develop policies that incorporate these measures, conduct annual monitoring, and complete a comprehensive review every five years.

Problem Statement

Although work zone performance data have become easier to gather, working with these data can still be difficult for users who do not possess advanced data analysis skills.



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Work zone with closed lanes

Research Description or Research Methodology

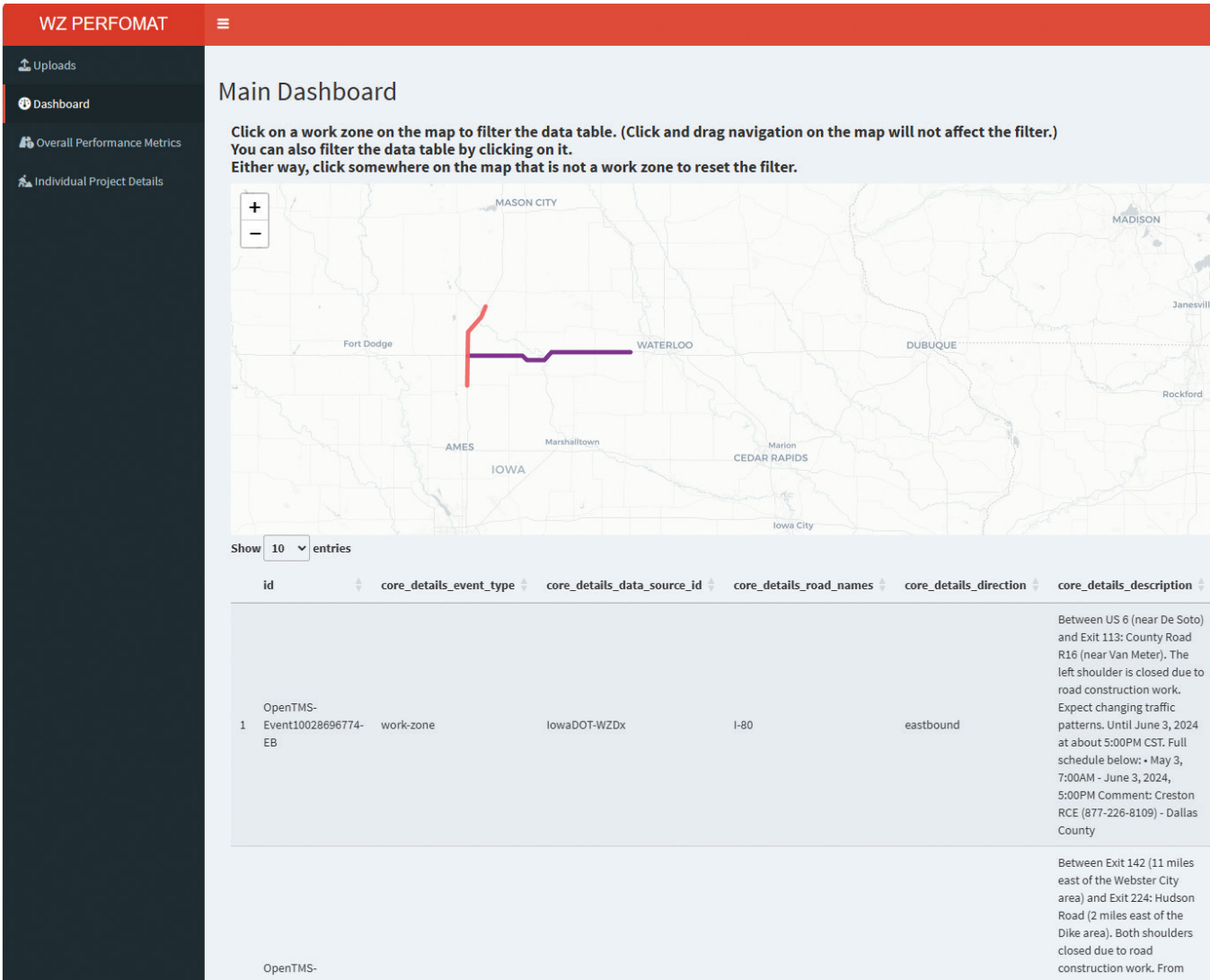
The researchers thoroughly reviewed existing literature, state-level initiatives, and analytical tools to identify data sources and performance metrics that work zone practitioners use. Based on this review, the researchers selected the data inputs and formats required to operate WZPERFOMAT, as well as the performance metrics to be generated as outputs.

The researchers then developed WZPERFOMAT as a web-based tool built on a Shiny dashboard in R. Data from Iowa and Missouri were used in the initial development.

Key Findings

- The key outcome of this project is WZPERFOMAT, a web-based application that allows users to upload work zone data in standardized formats and automatically generate key performance metrics.

- WZPERFOMAT accepts the following data inputs:
 - Work zone locations in Work Zone Data Exchange (WZDx) format
 - Crash data in Fatality Analysis Reporting System (FARS) or Crash Reporting Sampling System (CRSS) format
 - Speed and location data from INRIX or HERE probe data
 - Connected vehicle data
- The only mandatory input for the tool is work zone location data, while the crash data, probe data, and connected vehicle data are optional. If these datasets are not provided, the tool simply does not display the corresponding performance metrics.
- WZPERFOMAT produces downloadable reports that support the effective communication and documentation of work zone performance. These reports enable quick identification of issues and a deeper understanding of their impacts.



Main dashboard of WZPERFOMAT

Implementation Readiness and Benefits

WZPERFOMAT is currently available to users at <https://reactor-shiny.intrans.iastate.edu/wzperformat/> and can be implemented immediately. The accompanying R scripts can be easily executed locally or hosted on a private server for customized use.

The tool supports standard and readily available data formats and can be adapted to accommodate work zone data from states beyond those used in the initial development. While future development can be undertaken to improve processing speeds and further

incorporate connected vehicle data, the current version of the tool offers the following benefits:

- Improved decision-making
- Standardization
- Minimal need for technical expertise
- Downloadable and shareable outputs
- Transparency and reproducibility
- Free availability and accessibility