Evaluation Framework for Work Zone Intelligent Transportation Systems

Primary Author: Praveen Edara, University of Missouri
Secondary Author: Carlos Sun, University of Missouri

In the last decade, Intelligent Transportation Systems (ITS) have increasingly been deployed in work zones by state departments of transportation. Also known as smart work zone systems they improve traffic operations and safety by providing real-time information to travelers, monitoring traffic conditions, and managing incidents. Although there have been numerous ITS deployments in work zones, a framework for evaluating the effectiveness of these deployments does not exist. To justify the continued development and implementation of smart work zone systems, this study developed a framework to determine ITS effectiveness for specific work zone projects. The framework recommends using one or more of five performance measures: diversion rate, delay time, queue length, crash frequency, and speed. The monetary benefits and costs of ITS deployment in a work zone can then be computed using the performance measure values. Such ITS computations include additional considerations that are typically not present in standard benefit-cost computations. The proposed framework will allow for consistency in performance measures across different ITS studies thus allowing for comparisons across studies or for meta analysis. In addition, guidance on the circumstances under which ITS deployment is recommended for a work zone is provided. The framework was illustrated using two case studies: one urban work zone on I-70 and one rural work zone on I-44, in Missouri. The goals of the two ITS deployments were different – the I-70 ITS deployment was targeted at improving mobility whereas the I-44 deployment was targeted at improving safety. For the I-70 site, only permanent ITS equipment that was already in place was used for the project and no temporary ITS equipment was deployed. The permanent DMS equipment serves multiple purposes, and it is arguable whether that cost should be attributed to the work zone project. The data collection effort for the I-70 site was very significant as portable surveillance captured the actual diversion flows to alternative routes. The benefit-cost ratio for the I-70 site was 2.1 to 1 if adjusted equipment costs were included and 6.9 to 1 without equipment costs. The safety-focused I-44 ITS deployment had an estimated benefit-cost ratio of 3.2 to 1.