ABSTRACT

Everett, Stephanie R. M.S.C.E., Purdue University, May 2012. Measurement and Monitoring of the Performance of Highway Investment. Major Professors: Kumares C. Sinha and Jon D. Fricker.

In response to the federal SAFETEA-LU requirements, nearly all state departments of transportation (DOTs) have started to use performance measurement at some point in the planning and/or programming process. Although these performance measures are routinely monitored, they are generally completed during the project development process on a project-by-project basis for anticipated future conditions. No state has a fully developed post-implementation tool to monitor and evaluate capital investment programs at a system (statewide) level. The primary objective of this study is to establish a systematic, comprehensive, and robust tool for the Indiana DOT (INDOT) to routinely perform an ex-post facto appraisal of its investment program at the system level. Using historical highway expenditure and performance data, the link between investment and performance is characterized in four asset areas—pavements, bridges, safety, and mobility. Obligated contract amounts between 1994 and 2009 were collected from INDOT's Scheduling Project Management Database (SPMS) and designated using the four asset areas. Roadway performance data were measured using the International Roughness Index (IRI) for years 2000-2009. Bridge performance data from the National Bridge Inventory (NBI) were grouped by structural evaluation, from 0 to 9, into categories of Excellent (8 or 9), Good (7), Satisfactory (6), Fair (5), and poor (4 or below) for years 1992-2009. Mobility performance was measured using the volume to service flow ratio (VSF). VSF ratios for years 2000-2009 were acquired from Highway Performance Monitoring System (HPMS) data submitted by INDOT to the Federal Highway Administration. Non-fatal injury and fatality crash rates between 2003 and 2009 were used to measure safety performance. Linear regression models are used to evaluate the effects of expenditures in each of the four asset areas on performance in each area. The links between expenditure and performance of bridge and roadway assets represent the physical return on investments. The links between expenditure and performance of mobility and safety assets represent the operational return on investment. The physical and operational relationships defined by this study can be used as the inputs to

determine the value added to Indiana's economy from highway investment. Although the time and scope of future surface transportation reauthorization legislation is uncertain, there are many indications that effectiveness of past expenditures will be one basis for receiving future federal transportation funds. The tool developed during this study provides a monitoring methodology that can be used to demonstrate the effectiveness of INDOT's investment of surface transportation funds and the improvement program to legislative bodies responsible for funding decisions. It also provides a mechanism to present the return on investment in transportation projects to the general public.