

JOINT TRANSPORTATION RESEARCH PROGRAM

Principal Investigator: Samuel Labi, Purdue University, labi@purdue.edu, 765.494.5926

Program Office: jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

Sponsor: Indiana Department of Transportation, 765.463.1521

SPR-3500

2012

Updating, Upgrading, Refining, Calibration and Implementation of Trade-Off Analysis Methodology Developed for INDOT

Introduction

To ensure optimal use of available funds while addressing the goals and perspectives of its stakeholders, the Indiana Department of Transportation (INDOT) continues to evaluate and prioritize alternative strategies for preservation and operations in each program area or management system. To combine all these systems to yield an overarching, integrated decision-support and evaluation mechanism, INDOT has started to develop an asset management system (AMS). As part of this effort, INDOT sponsored studies in 2004 and 2010 that culminated in the development of an overall framework for asset management, identification and description of the various trade-offs faced by the asset manager, and the mathematical constructs for quantifying these trade-offs.

As identified in the 2010 study, the network-level trade-off types include trade-off between two alternative individual projects; trade-off between two alternative groups of projects; trade-off between cost performance and levels of one non-cost performance measure; minimum budget level requirement analysis; shifting budget analysis; and trade-off between two non-cost performance measures.

As a follow-up to these studies, INDOT identified the need to update and implement the trade-off analysis methodology developed for INDOT in 2010. Thus, the present study commenced to carry out the upgrading and refinements, and also to calibrate and implement the framework by developing an analytical, flexible and interactive tool. The analytical tool, Trade-IN Version 1.0, was intended to be flexible so as to accommodate future changes in default input values to reflect future INDOT perspectives, or to yield new trade-off functions under circumstances different from those under which the present study was carried out.

Findings

This project demonstrates that it is feasible to develop and implement a framework and tool for analyzing trade-offs in asset management. The research products from the present study include this technical report, which shows how theoretical underpinnings of the methodology developed for INDOT in 2010 have been updated, upgraded, and refined. The report also includes a case study that shows how the trade-off analysis framework has been calibrated using available data. Supplemental to the report is a set of flexible and easy-to-use spreadsheets that implement the trade-off framework. With this framework and using data at the current time or in the future, INDOT's asset managers are placed in a better position to quantify and comprehend the relationships between budget levels and system-wide performance; the relationships between different pairs of conflicting or non-conflicting performance measures under a given budget limit; and the consequences, in terms of system-wide performance, of funding shifts across the management systems or program areas.

Implementation

The research product from this study can be used by INDOT's asset managers at the central office or the districts. After collecting the relevant data needed for the analysis, the asset manager can use the spreadsheets submitted with this report to carry out the trade-off analysis. Implementing the study product is expected to enhance decision making at INDOT as the agency continually seeks to make transparent and comprehensive evaluations to yield cost-effective and balanced investments. By providing methodologies to incorporate multiple performance criteria from different program areas for optimization of de-

cisions under constrained budgets, and for investigating performance and budgetary trade-offs across the program areas, this study product is poised to help address these issues.

A core group of persons at INDOT under the advisement of the Federal Highway Administration (FHWA) will further define and select implementation strategies relative to agency practices of trade-offs among asset programs. This steering group is represented by INDOT's central office and district planning divisions and its research office. Its principal mission is to advance and institutionalize the most practicable methods outlined in the research report.

Recommended Citation

Bai, Q., and S. Labi. *Updating, Upgrading, Refining, Calibration and Implementation of Trade-Off Analysis Methodology Developed for INDOT*. Publication FHWA/IN/JTRP-2012/32. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana, 2012. doi: 10.5703/1288284315036.

View the full text of this technical report here:
<http://dx.doi.org/10.5703/1288284315036>

Published reports of the Joint Transportation Research Program are available at: <http://docs.lib.purdue.edu/jtrp/>