DECISION SUPPORT FOR BRIDGE PROGRAMMING AND BUDGETING

PROBLEM STATEMENT

The Florida Department of Transportation (FDOT) has implemented the AASHTO Pontis Bridge Management System to support network-level and project-level decision making in its central and district offices. Pontis is an integral part of a Department-wide effort to improve the quality of asset management information provided to decision makers. The credibility and usefulness of this information is also essential for satisfying the requirements of the Government Accounting Standards Board Statement 34 (GASB 34) regarding the reporting of capital assets. Previous Department research developed state-of-the-art models for determining user costs and agency costs. A spreadsheet-based Project-Level Analysis Tool (PLAT) was also developed to process and present Pontis analytical results in a form useful for bridge-level decision-making.

FDOT and other state DOTs have expressed interest in having an objective network-level analysis of tradeoffs between performance and funding. GASB 34 specifically requires this capability in its modified approach, which FDOT is planning to adopt. PLAT provides all the necessary inputs for individual bridges, so what is needed now is a tool to compile and summarize all this information.

OBJECTIVES

The objective of this research is to extend the capabilities of PLAT by developing a digital dashboard for network-level bridge decision-making. This new tool will enable FDOT bridge managers to optimize bridge improvement and preservation programs at the network level.

Specific goals of the research include the following:

1. Gather relevant data to identify performance measures related to FDOT's bridge decision making
2. Formulate a multi-objective optimization framework for bridge decision-making at both the project and network levels
3. Develop a computer program and implement the framework of the multi-objective optimization

FINDINGS AND CONCLUSIONS

The researchers developed a bridge decision support tool for network-level analysis of tradeoffs between performance and funding, using a multi-objective benefit/cost analysis capable of predicting (1) systemwide performance at any given budget level and (2) the funding requirement for any target performance level.

Researchers developed performance measures that are compatible with the prior models inside the FDOT Pontis bridge management system, particularly the Project Level Analysis Tool (PLAT), and the use of the FDOT's Deficient Bridges List (DBL). They then formulated and developed an optimization model framework using the incremental-benefit algorithm, with the performance measures serving as constraints and objectives. The model, dubbed the Network Analysis Tool (NAT), was developed as a Microsoft Excel spreadsheet to supplement the functionality of AASHTOWare® Pontis®. The primary purpose of the NAT is to determine the maximum level of inventory performance achievable at any given level of funding over a 10-year planning horizon. The budget constraint can be easily manipulated by the user to analyze sensitivity to funding uncertainty.

Finally, the researchers conducted a preliminary evaluation of the FHWA's NBI translator and formulated a new methodology for using the NBI translator to convert Pontis' element condition data into the NBI condition ratings format.

BENEFITS

The new tool developed in this study will enhance the ability of the FDOT bridge managers to better plan bridge improvement and preservation programs at the network level, with the capabilities of predicting network-wide performance and funding based on budgetary constraints and network performance targets. The product is extendable to other types of transportation assets such as pavements and rest areas, and is therefore a useful tool for the FDOT's GASB 34 implementation. The tool is also beneficial to the FDOT Work Program Office and the Office of Financial Management, which are involved in the long-range work programs and the development of finance plans, especially, as required by Florida statutes, the 5-year Work Program that lists preservation, improvement, and new construction work that must be performed over the next five years in order for the Department to meet its long-term objectives

This research project was conducted by John O. Sobanjo, Ph.D., at Florida State University. For more information, contact Richard Kerr at (850) 410-5808, richard.kerr@dot.state.fl.us.