United States Department of Transportation
Federal Highway Administration
Federal Transit Administration

Technology in Rural Transportation "Simple Solution" #9

E N T E R@P R I S E

Transportation Operations Optimization

Introduction

This application was identified as a promising rural Intelligent Transportation Systems (ITS) solution under a project sponsored by the Federal Highway Administration (FHWA) and the ENTERPRISE program. This summary describes the solution as well as opportunities for expansion into the broader context of rural ITS.

Technology Overview

The various operations and maintenance activities, involving the dispatching of resources, that are provided by local and state governments were largely designed many years ago using manual processes. With new technologies becoming available, and the ever evolving combination of resources and needs, these operations may often be re-engineered with new optimization technologies and techniques.

Real World Example - **Snow Route Design Optimization Software**

Overall goal: To re-design snow routes in order to optimize the plowing process.

Technical approach: A Computer Aided System for Planning Efficient Routes (CASPER) has been completed for the use of maintenance engineers. This software was designed to assist in the design or re-design of network service routes -- snow plow routes in the first instance. Each district within a state performs its own optimization.

Current status: The system was piloted in two districts in Indiana, now all districts have access to the program to re-design their routes. It is estimated that by the winter of 1996- 1997, new routes will have been designed for approximately 80 percent of the state's service area.

Location / geographic scope: All districts in Indiana.

Agencies involved: Purdue University, Indiana DOT.

Cost information: Precise costs for software development are currently not available.

Key contact: Dan Shamo, Indiana DOT. (317) 232-5523

Have goals been achieved? Yes. The developers have documented a reduction of approximately 8 to 10 percent in the total number of routes needed to service the road network in addition to improved service levels for the remaining routes. Developers claim total cost savings of $11 to $14 million in reduced equipment and operating costs for winter maintenance activities.

Solution timeline: All districts now have access to the system. The system developers are considering enhancing the system to provide more functionality, such as pavement marking maintenance planning, etc.

Further Description of Application

Additional technologies may include:

This particular system was created to optimize existing snow plow routes designed in previous years, and so is a means of rationalizing and improving upon existing practices and techniques. Other computerized database systems could be designed to offer the same functionality, and it is likely that all such computerized systems would offer more convenience and efficiency over any manual techniques.

Potential additional uses for this technology may include:

As outlined above, there are many other services besides snow plowing that could benefit from this solution. The state agency is investigating enhancing the system to incorporate maintenance management schedules for other highway-related activities such as re-painting pavement markings and replacing road signs. In theory, the system could be expanded to form a master system enabling the planning, management, and scheduling of all road maintenance activities.

Benefits of Application

	Benefits to travelers / the community	Benefits to business / industry	Benefits to the public sector
Direct benefits	Roads will be cleared more effectively in winter conditions, resulting in safer travel	Roads will be cleared more effectively in winter conditions, resulting in safer travel	Cost savings for snow removal and maintenance activities
Indirect benefits	Taxpayer's money can be optimized		Improved public perceptions of the levels of service provided

Probable Implementation Process

Step One: Agencies should consider their winter maintenance budget, in terms of operator salaries and overtime payments, and equipment investments and depreciation. In addition, the local road network, in terms of the number of miles, density, network structure, etc., should be analyzed. Projected cost savings from implementing the optimization system should then be calculated based on these findings.

Step Two: Once it has been determined with reasonable confidence that savings could be gained though implementing the system, resources must be identified and allocated to either develop custom software or to purchase software from the original developers.

Step Three: Once the snow route optimization software is available, the system can be distributed for the use of local agencies as appropriate.

Potential Implementation Issues

Due to the development costs of such a system, it is likely that a state agency would build and maintain a system such as this, which would then be provided to districts, counties, or cities at low or no cost for them to perform their own optimization of routes.

If designing a system, agencies may wish to ensure that any additional functionality that they may require in the future can be easily added to the initial system.

Solution's Contribution to Broader Rural ITS Developments

This solution will contribute to the rural ITS development as follows:

Roadway Management - Improved services delivery will enhance the management of roadway systems.

The Technology in Rural Transportation: "Simple Solutions" Project

This project was performed within the ENTERPRISE pooled-fund study program, and aimed to identify and describe proven, cost-effective, "low-tech" solutions for rural transportation-related problems or needs. "Simple solutions" studied within the project focussed on practical applications of technologies, which could serve as precursors to future applications of more advanced systems, or intelligent transportation systems (ITS).

More than fifty solutions were initially identified and documented. Of these, fourteen solutions were documented and analyzed in detail. The transportation technology applications were also categorized according to the seven Critical Program Areas (CPAs) defined within the U.S. Department of Transportation's Advanced Rural Transportation Systems Program. It is hoped to utilize the information gathered within this study to perform outreach to local level transportation professionals to introduce them to ITS and its potential benefits.

For More Information: A full report on this study is available from the FHWA R&T Report Center, telephone no. 301-577-0818. **Title:** Technology in Rural Transportation: "Simple Solutions." **Publication No.:** FHWA- RD-97-108. This research was conducted by Castle Rock Consultants, Eagan, Minnesota. For more information, contact Paul Pisano of FHWA, HSR-30, 703-285-2498. For more information about ENTERPRISE, contact Bill Legg, Washington State DOT, 206-543-3332.

Publication No. FHWA-RD-97-121