RESEARCH PAYS OFF

Computerized School Bus Routes Save Time and Money

Pupils are being transported more efficiently in North Carolina because of several key transportation initiatives, including the installation of a statewide transportation information management system (TIMS). TIMS is a computer-assisted program of optimized school bus routing and scheduling provided to each local education agency (LEA) in the state. Funding for the project has come largely from the Energy Division of the North Carolina Department of Commerce (NCDOC) and the North Carolina Department of Public Instruction (NCDPI). Installation, training, and data base preparation services are provided by the University of North Carolina Institute for Transportation Research and Education (ITRE).

Problem

The process of routing and scheduling school buses had been tedious and time-consuming, and bus routes tended to reflect what had been done the previous year; few attempts were made to look at transportation globally. Only within the past decade have computer systems been developed that can effectively help school transportation personnel route buses.

Solution

The use of computer techniques to address pupil transportation focuses on two primary issues: maintaining and updating large quantities of data and solving complex optimization problems. During 1982-1985, ITRE analyzed and developed algorithms and computer programs for routing and scheduling school buses. Pilot projects were conducted at more than a dozen LEAs. In 1985 ITRE began working with NCDPI to build on this foundation and develop the statewide TIMS. A commercial vendor (Education Logistics, Missoula, Montana) was selected to provide the software and train the staff at ITRE to implement the system.

TIMS was designed as a truly comprehensive pupil transportation system. School district personnel can not only maintain extensive routing and scheduling information, but also update the street map data base and the locations of all students in the district whether they are transported or not. By September 1992, fewer than six years after the first two districts in the state began the TIMS data gathering process, all 129 school districts in North Carolina were using TIMS to manage their school bus routes and schedules.

Application

Because of a statewide license with the vendor, TIMS software is provided free to districts, as are the initial digitizing and data preparation services from ITRE. Documentation and continual training are also free. A statewide microcomputer-based student information management system ensures that all districts have a student data base from which to develop their transportation plans. LEAs are responsible only for costs associated with hardware and local personnel.

From 1984 through 1993, the total cost for the installation of this system has been approximately $4.25 million, excluding the local costs for hardware (about $1.7 million) and personnel (about $5.3 million). Of the system installation costs, $3.58 million

School bus crossing the Perquimans River in eastern North Carolina.

TIMS operator Laura Flye of North Carolina's Nash County schools.

came from grants from the Energy Division of NCDOC.

Benefits

The data maintenance requirements for such a system are significant, but the savings have been significant too. School districts have reported reductions in route times of up to 20 percent. Mileage reductions have been identified by the simple rerouting of less efficient routes, which has often eliminated vehicles as well. More significant fleet reductions also occurred when districts altered school opening and closing times.

TIMS has benefited from other NCDPI initiatives that have contributed to statewide savings. Under a new funding formula, the percentage of a district's budget to be paid for by the state (up to 100 percent) is now based on an efficiency rating calculated from the total cost, number of students transported, and number of buses operated.

Another event related to efficiency occurred during the Persian Gulf war: when the price of gas escalated, each district was asked to cut back on fuel consumption. Many such cutbacks remained in effect even when the price of fuel returned to normal levels.

Statewide data collected as of 1992 indicate a total savings of nearly 500 buses, 2.5 million miles, and 1.3 million gallons of fuel. For LEAs, improved efficiency has enabled more students to be transported on existing buses. Thus, LEAs have been spared the costly task of enlarging their fleets, at nearly $30,000 per bus.

TIMS data can also provide a valuable human element to the system. In November 1990 a school bus carrying children to school in rural eastern North Carolina was rear-ended. No serious injuries occurred, but many of the children were treated at a local hospital. While the bus was en route to the hospital, school administrators were able to access information about the bus's normal route and print a list of the parents' phone numbers. Hospital workers were also able to use a computer-generated passenger list kept on the bus to call parents. As a result, the community responded positively to the way in which the emergency situation was handled.

In recognition of its contribution to the state, TIMS in July 1993 received the Exemplary Systems in Government Award of Excellence from the Urban and Regional Information Systems Association.

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Suggestions for "Research Pays Off" topics are welcome. Contact Crawford F. Jencks, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 (telephone 202-334-2379).