



RESEARCH SERVICES SECTION

TECHNICAL SUMMARY

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PROJECT COST:

\$38,500



Researchers worked with Metro Transit to identify and analyze problematic bus routes.

Using Intelligent Transportation Systems Data to Improve Transit Performance and Management

What Was the Need?

Knowing detailed information about how buses are performing on their routes and how many passengers are making use of these routes can provide planners with the tools they need to optimize the transit system to rider needs. Although Metro Transit, the local transit authority in the Twin Cities region, had been collecting performance data for years, it lacked the funds and methodology to fully analyze the data it was archiving.

Metro Transit has been testing Intelligent Transportation Systems since 1999, and in 2005 equipped its entire fleet with automatic vehicle location systems and partially outfitted it with automatic passenger counters. Information collected by these systems had been used on a limited basis to identify early and delayed buses and to inform strategic decisions to address bus timeliness issues, but transit officials had been unable to meaningfully analyze the mass of data being archived.

At the same time, several bus routes in the Twin Cities have faced declines in ridership and reliability-related problems, highlighting the need for a more detailed analysis to better understand and more effectively resolve the causes of declining service reliability. Previous research has shown that increased service reliability is linked to increases in demand and that this reliability is more important than demographic and economic variables in predicting ridership.

What Was Our Goal?

Metro Transit aimed to understand the causes of performance and reliability issues on one of its problematic routes. Investigators also hoped to develop and test research methodologies that can help Metro Transit and other transit providers improve service reliability, schedule adherence and on-time performance.

What Did We Do?

First, investigators reviewed existing research on transit performance measures and running time modeling to understand how other transit agencies use the data collected by ITS.

Metro Transit assigned all buses outfitted with passenger counters to a route that was experiencing declining service reliability: Route 17, a cross-town route serving two western suburbs as well as southern, downtown and northeast sections of Minneapolis. Operating along one of the Twin Cities' most highly congested corridors, this route came with a set of challenges for conducting travel time and reliability analysis. Researchers looked at AVL and passenger counter data for this route from buses running between Sept. 20 and Dec. 1, 2006.

After removing some duplicate and irrelevant data, investigators were left with 150,635 observations covering 2,174 trips during peak and off-peak periods and 28 different trip patterns (defined as trips running at the same time, with the same start and end points, and the same number of stops). Researchers focused on two specific trip patterns, first performing analyses at the trip-pattern level to demonstrate a methodology for analyzing running time and scheduling issues, and then performing a more detailed statistical analysis by dividing each of the routes into numerous small time segments.

“The methodology developed in this project has the potential to allow transit agencies to use today’s data to improve tomorrow’s service. We hope this research can be applied to commercial software to give agencies more immediate feedback.”

–Sarah Brodt Lenz,
Program Administrator,
Mn/DOT Office of Transit

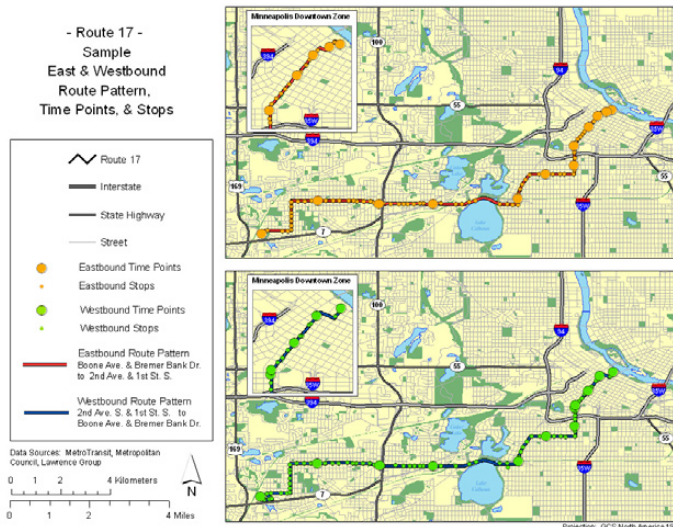
“The most important recommendation from this research is that Metro Transit needs more buses that are equipped with automatic passenger counters in order to have good enough data to do this type of analysis.”

–Ahmed El-Geneidy,
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The analysis focused on two peak-time Route 17 commute patterns between downtown Minneapolis and the western suburbs.

Researchers developed a series of variables impacting passenger activity, travel time and other characteristics. They then generated and tested a series of analytical models to predict running time, adherence to schedule and reliability of the transit route. Although these models were created for Route 17, they were created with the intent that this methodology could be replicated to analyze routes with similar performance issues.

What Did We Learn?

Investigators observed that Route 17 running times were, on average, 7 percent longer than the scheduled running times for peak trip patterns; the schedule generated by Metro Transit’s scheduling software does not sufficiently take into account traffic, stoplights and other factors affecting the route. Additionally, the scheduled amount of time between a bus’s last stop and the departure of the next trip, the layover/recovery time, should be increased. The analysis showed that only 50 percent of scheduled stops were used, indicating that Metro Transit should re-evaluate the number of scheduled stops and the spacing between stops. Driver experience also appeared to affect reliability.

What’s Next?

This study includes the recommendation that Metro Transit consider equipping the entire fleet with automatic passenger counter systems to enable similar research on additional routes.

This research may have implications for the development of scheduling software; the investigators have presented their findings to software developers who are interested in using AVL data to improve scheduling. Mn/DOT officials anticipate that the models created will be useful for analyzing other transit schedules and will result in more reliable service.

Investigators have submitted this research report to the *Journal of Advanced Transportation* to enable other states and agencies to learn from Metro Transit’s efforts.

This Technical Summary pertains to Report 2007-44, “Using Archived ITS Data to Improve Transit Performance and Management,” published October 2007. The full report can be accessed at <http://www.lrrb.org/PDF/200744.pdf>.