Real-time Transit Information Systems

What is it?
Real-time transit information systems provide transit riders with up-to-the-minute information on bus arrivals via the internet, phone, and display boards at key bus stops. The information is based on real-time bus locations using global positioning systems (GPS) rather than a set schedule of arrival and departure times. Access to real-time travel information reduces actual and perceived wait times and increases the reliability of transit, which can encourage a mode shift.

What are the benefits?

- **Mobility**: Reduces actual and perceived out-of-vehicle travel time for transit riders, thereby encouraging a mode shift to transit and reducing congestion and vehicle miles traveled (VMT).
- **Funding the System**: Increases ridership, which boosts operation revenues.
- **Environmental**: Reduces the emission of criteria air pollutants and greenhouse gases that are harmful to the environment and human health.
- **Safety and Security**: Allows travelers to reduce time spent waiting at transit stops in conditions that may seem less secure (at night, in unlit areas, etc.).

Where is it being used?
Real-time transit information systems are in use as part of systems across North America and around the world. Examples in the Pacific Northwest include: ¹

- **Portland Streetcar**, Portland, Oregon
- **C-TRAN**, Clark County, Washington
- **TransLink**, Vancouver, British Columbia
- **OneBusAway**, multiple jurisdictions, Washington

How effective is it?
On average, research has shown that real-time transit information systems are effective in reducing both perceived and actual wait times at transit stops. This is critical—as travelers tend to view out-of-vehicle wait time as twice as costly as on-board travel time. ² Other research shows that these systems

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¹ In this summary, the best available data on program effectiveness is used. Whenever possible information is provided for the referenced examples; however, this is not always available.
have positive impacts on ridership. A summary of findings from the literature is provided below.

**Impacts on Perceived and Actual Wait Times**

- In Seattle, researchers found that the addition of real-time information decreased perceived wait times by 0.7 minutes (13%). A critical finding was that mobile real-time information reduced not only perceived wait time, but also actual wait time for customers. Real-time information users in the study waited almost 2 minutes less than those using traditional schedule information.\(^3\)

- In London, shorter wait times were reported by 65% of those surveyed at stops equipped with real-time transit information systems. Average perceived wait times declined from 11.9 minutes before the trial to 8.6 minutes with the real-time transit information system (28%). This is notable because, in actuality, bus frequencies were the same and service reliability actually decreased slightly during the trial. The majority (89%) of survey respondents agreed that real-time information made waiting time more acceptable. Respondents also expressed a slight willingness to pay more in fares for the system. No changes in ridership could be estimated on the basis of the trial.\(^4\)

**Impacts on Ridership**

- In a study of real-time arrivals in Chicago, average route-level weekday bus ridership increased approximately 2% during the year after the tracking system was implemented when compared with the previous year. Additionally, weekday ridership on Chicago Transit Authority bus routes with real-time information increased by an average of 126 daily rides compared with routes without such information, when controlling for factors such as monthly variations in ridership.\(^5\)

- Another study in Seattle showed that real-time arrival information can make transit a more viable option for all trips, in particular, non-commute trips, which typically occur during off-peak hours when frequencies are lower. Providing real-time information increased the average number of transit trips by at least one additional trip per week for nearly 35% of survey respondents (for non-commute trips) and 15% of survey respondents (for commute trips). It also increased overall satisfaction with public transit for 92% of respondents, 48% of whom reported being “much more...”

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\(^2\) Transportation Research Board 91st Annual Meeting Compendium of Papers DVD. 2012.


\(^4\) Photo courtesy of CH2M HILL.


satisfied” since using real-time systems.9

How much does it cost to implement?

The total cost to implement a real-time information system typically includes capital costs (installing automatic vehicle locator (AVL) systems such as GPS in transit vehicles, electronic sign monitors, and prediction model software) and annual operation and maintenance costs (running the system, maintaining equipment, and, potentially, more staff). These are some examples of capital and operating costs:

- In Portland, Oregon, operating and capital costs for TriMet’s Transit Tracker system in 2006 included a capital cost of $1,075,000 (for hardware, servers, and software) and annual operating and maintenance costs of $94,000.10

- In Salem, Oregon, it was estimated that a real-time transit information system would cost the Salem-Keizer Transit Agency $363,000 in start-up costs and $74,000 in annual operating and maintenance costs (2010 dollars).11

- A survey of participating domestic and international transit systems revealed the following ranges of capital and operating costs for real-time information systems:12
  - Capital Costs:
    - AVL system installation: $100 to $7,000 per vehicle (2002 dollars)
    - Additional capital costs: $98,000 (for a small 156-bus system) to $46.5 million (for a large system with 5,700 buses)
  - Annual Operating and Maintenance (O&M) Costs:
    - AVL systems: $50 to $1,550 per vehicle
    - Total annual O&M cost: $22,000 to $200,000

In terms of cost effectiveness, a 2006 U.S. Department of Transportation return on investment study of TriMet’s Transit Tracker system concluded that the system “most likely achieves positive net social benefits.” The study conservatively assumed that the system reduces the costs of out-of-vehicle transit time by 30 to 45 seconds and that uncertainty with the next vehicle’s arrival time was reduced by 5%.13 In London, implementing real-time arrivals on the London Underground system was deemed to provide a first-year return on investment of 83% in social benefits (due to the monetary value of reducing wait time overestimation), as well 16% in financial benefits (due to ridership and revenue increases).14

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11 http://www.salemrivercrossing.org/alternate-modes-study/.
Implementation resources

The following resources are available for jurisdictions considering the implementation of real-time information system programs:

- Developing Traveler Information Systems Using the National ITS Architecture, U.S. Department of Transportation, 1998