



what works centre for
local economic growth

Toolkit

Transport

Real Time Information
Systems

What are they and what do they aim to do?

Real-time information systems provide passengers with estimated arrival times for different public transport modes across a range of different platforms. The information is driven by location-based systems, for example, GPS tracking devices on vehicles, increasingly utilised by bus operators. The information can be delivered in various different forms, including via information screens at stops or stations, transport operators' websites, text message alert services or third-party apps. Recently, the widespread availability of this data has enabled users to rapidly adapt their behaviours 'on the go' to react to new information about service performance.

This toolkit considers what the evaluation evidence tells us about the impact of real-time information systems on local economic growth. As none of the available studies examine local economic growth effects directly, we focus on ridership effects. Increased ridership may reduce congestion, which acts as a barrier to growth. Some of the additional journeys, e.g. if they are work-related, may also directly generate economic benefits. Furthermore, whilst user benefits are not the focus of our toolkit, increased ridership may be a sign of improved service experience for public transport passengers.

The toolkit does not attempt a full assessment of the overall costs and benefits of real-time information systems. Instead, it is intended to inform discussions about potential wider economic benefits that may be used to justify investment.

How effective are they at increasing ridership?

The available evaluations suggest that the provision of real-time information for bus routes may only lead to modest increases in ridership. Effects are small, but positive in two out of four studies (the other two studies find no effect).

One study suggests that there are larger ridership effects when real-time information systems are implemented on longer and more frequent routes (though it is important to note that increases on smaller routes may be more difficult to identify).

One study finds that transport networks which primarily serve captive markets (i.e. smaller urban areas which largely cater for commuter flows) do not benefit from ridership increases following implementation of real-time information systems – although there could be user benefits to existing commuters.

The effectiveness of real-time information systems may be associated with the level of technological adoption. One study found larger effects when systems were implemented in later years, attributing this to greater familiarity with technology and improvements in the technology (e.g. smartphone apps). Another study which found a positive effect on ridership also reported high levels of tech use among their sample respondents.

How secure is the evidence?

This toolkit summarises the available ex-post (i.e. after introduction) evaluations of the effect of real-time information on ridership. We focus on evaluations that identify effects which can be attributed, with some degree of certainty, to the introduction of real-time information. More details and discussion of our inclusion criteria are covered in the annex.

The evaluations provide some guidance on possible impacts on ridership. But given that results are likely to be scheme specific additional sources of evidence (e.g. bespoke surveys, ex-ante modelling, etc.) should play an important role in making decisions around real-time information data in any specific context.

Generally, the evidence base on the wider economic benefits of real-time information is quite weak and focussed only on ridership, meaning that the conclusions are based on a limited number of studies. We found no evaluations which directly explore the effects of real-time information on wider economic factors such as employment or growth. More rigorous studies, which look at a wider range of economic benefits, are required. We found no systematic reviews and no meta-analysis.

We found four studies that examined the effectiveness of real-time information on ridership. All four studies use panel data methods to compare changes in ridership for lines that receive real-time information to change in ridership on lines that did not (yet) receive the system.

The evaluations do not distinguish between different types of real-time information, or how this information has been accessed (e.g. effectiveness of text message services versus smartphone apps).

All of these studies come from the United States. For a full list of studies and summaries of their findings, please see the Annex.

Is real-time information cost-effective?

None of the four studies provide a detailed analysis of the wider economic benefits of real-time information (e.g. in terms of congestion, employment or productivity) so we cannot assess these benefits relative to costs.

A number of the studies attempted to identify the impact of real-time information systems on operators' revenues. But it is important to note that cost-effectiveness in terms of operator revenues and costs was not the focus of our review. A much wider evidence base is available that could inform assessments of possible effects on operator revenues and costs.

Things to consider

- **Should real-time information systems be implemented universally?** Given the evidence suggests that effects on ridership might depend on the type of transport network and route, it may be best to implement the systems selectively.
- **What sort of technology should be used for real-time information systems?** The limited evidence suggests there may be an association between technology adoption and ridership effects. However, there is a lack of evidence of what is the best technology to use for systems in terms of increasing ridership.
- **In what ways should the system be promoted?** One of the successful schemes covered in this toolkit was accompanied by a coordinated marketing campaign to promote the new service.
- **How will transport operators be persuaded to adopt real-time information systems?** Given the modest uplifts in ridership reported, and the substantial costs associated with real time information systems, operators may need to be incentivised to introduce systems.
- **What kind of evidence will be used to inform decision making?** Results are likely to be scheme specific. The existing evaluation evidence provides some guidance, but additional sources of evidence (e.g. bespoke surveys, ex-ante modelling, etc.) should play an important role in making decisions around real-time information in any specific context.
- **Could evaluation help inform final decisions on real-time information systems?** Evaluation could assess the impact of schemes through use of pilot schemes or incremental roll out over time. Better evaluations could focus on providing missing evidence such as on wider economic benefits (e.g. employment), cost-effectiveness and effectiveness across types of technology.

Annex: Evidence on real-time information for public transport

What kind of evidence do we consider?

The aim of our toolkits is to summarise the available ex-post (i.e. after introduction) evaluation evidence on particular aspects of policy design – in this case real-time information. We consider a wider range of evaluations than for our evidence reviews. But we continue to focus on finding and summarising evaluations that identify effects which can be attributed, with some degree of certainty, to the introduction of real-time information.

Our objective is to assess the quality of, and summarise the lessons from, the available evaluation evidence in a way that can help inform local decisions. Ex-post evaluation of the impacts of these different interventions can be challenging. Some benefits accrue only indirectly to passengers, for example, where operators and transport authorities use this information to improve network planning and remove infrastructure bottlenecks. In the longer term, these effects would lead to better quality services, lower fares and hence higher patronage but this is unlikely to be picked up in evaluation studies that focus on short term effects.

In addition, the technology for implementation of real-time information has evolved significantly in recent years and older technologies are now a lot cheaper or even redundant (e.g. much lower demand for at-stop displays with the rise of smartphones, and many operators now installing GPS/mobile phone communications by default). We focus on summarising the findings from available evaluations, while recognising that additional sources of evidence (e.g. bespoke surveys, ex-ante modelling, evaluation of pilot schemes, etc.) may play an important role in making good decisions around real-time information in any specific context.

We looked for studies that provide ex-post (i.e. after introduction) evaluation of the impacts of introducing real-time information systems for public transport services. We initially looked for evidence that investigates the impact on local economic growth. We found no studies that do this and that also meet our criteria for inclusion. Instead we focus on studies which evaluate the impact on: a) ridership levels; and b) operator revenue. We only found suitably robust evidence on the former of these.

We focused on evaluation evidence from the OECD, in English. We considered any study that provided before and after evidence; or cross-sectional studies that compared across different systems. We also included more robust studies that compared changes to participants with a control group. That is, we included evidence that scored 2 or higher on the [Maryland Scale](#). Using these criteria, we found four studies that looked at the effect of real-time information.

The evidence

Provision of real-time information for bus routes may lead to modest increases in ridership.

All four studies (TT2, TT3, TT4, TT7) considered whether the introduction of real-time information services increased ridership. Two studies find modest positive effects (TT3 and TT7), while two find no significant effect (TT2 and TT4).

Study TT7 (SMS 3) considered the impact of the Bus Time system in New York City on ridership levels on the Metropolitan Transport Authority (MTA) bus network. A GPS system is used to locate MTA Buses, allowing data such as estimated arrival times of services to be ‘mined’. The gradual borough-by-borough roll out of Bus Time allows for a comparison of routes with the system to those that have not yet received the system. The real-time information was launched both online, via the MTA website, and as ‘open data’ to allow development of 3rd-party apps. The evaluation suggests a small weekday average ridership increase of 118 daily trips per route (1.7% median increase) can be attributed to Bus Time.

Study TT3 (SMS 2) considered the ridership effects of a similar system, Bus Tracker, on the Chicago Transit Authority (CTA) network. This is the third largest network in the US based on average weekday ridership. Aside from one earlier pilot route, Bus Tracker was introduced incrementally across different depots between April 2008 and May 2009. When first launched, ‘live’ bus arrival information was only available through the CTA website, but subsequently a text message service was launched, followed later by a series of 3rd-party apps for smartphones and other mobile devices. As with New York’s Bus Time, the findings indicate that Bus Tracker had a positive, albeit modest link to ridership, equivalent to 126 additional passengers per day or a 1.8%-2.2% increase in route level average weekday ridership.

Study TT2 (SMS 3) evaluated the effects of the ShuttleTrac information service introduced by the University of Maryland for its extensive campus shuttle services, which serve the College Park campus and commuters from nearby communities. During the summer of 2006, the University’s Department of Transportation Services (DOTs) started to implement a GPS based real-time passenger information system named ShuttleTrac. The system consists of five components – 30 touch-enabled BusFinder terminals at select stops, a large display screen at an activity centre, an Interactive Voice Response (IVR) system for telephone inquiries, a website for Internet inquiries, and a website for WAP-enabled handheld inquiries. Using individual level data for staff and students at the university, the study compared changes in ridership for people who actually used the ShuttleTrac services vs ridership changes for people who never used the services. Results indicate that the implementation of the system did not have any statistically significant effect on ridership, suggesting that travellers did not increase their shuttle trips in response to the provision of real-time bus arrival information.

Study TT4 (SMS 2) examined the effects on bus ridership across a panel of 27 ‘medium’ sized US transport agencies which began utilising real-time information technology prior to 2011 (excluding cities with largely multi-modal systems in order to focus on buses). Results indicate that the implementation of the system did not have any statistically significant effect on ridership in terms of number of trips or overall miles travelled.

One study suggests that there are larger ridership effects when real-time information systems are implemented on longer and more frequent routes (though it is important to note that increases on smaller routes may be more difficult to identify).

For New York’s Bus Time study TT7 finds larger effects on larger routes (those with over 1,900 revenue miles of service on an average weekday). For these routes, average ridership increased by 340 trips per weekday or a 2.3% median increase (compared with 118 trips, or 1.7% for the average route). The study speculates this may be because higher frequency routes benefit more from real-time information as they attract more ‘choice’ trips. They acknowledge, however, that the difference could be attributed to the fact that lower ridership on smaller routes means that increases may be more difficult to identify.

One study finds that transport networks which primarily serve captive markets (i.e. smaller urban areas which largely cater for commuter flows) do not benefit from ridership increases following implementation of real-time information systems

As discussed above, study TT4 finds no significant effects on ridership after the implementation of real-time information systems across 27 US networks. The authors suggest that in networks which largely cater to captive markets (i.e. where other modal choices are either not available or affordable) real-time information may be ineffective at increasing ridership.

The effectiveness of real-time information systems may be associated with the level of technological adoption.

One study (TT3) found larger effects when system was implemented in later years, attributing this to greater familiarity with technology and to improvements in the technology (e.g. smartphone apps). Another study (TT7) that found positive effects on ridership also found their sample respondents had good access to technology and devices. Furthermore, this system was accompanied by a coordinated marketing campaign to promote the new service – which is another potential way to improve product familiarity.

Cost effectiveness

While some of the studies attempted to identify the impact of real-time information systems on operators' revenue from fares, none of the studies undertook detailed analysis of the wider economic benefits of real time information (e.g. in increasing ridership).

As discussed in the text, it is important to note that cost-effectiveness in terms of operator revenues and costs was not the focus of our review. A much wider evidence base is available that could inform assessments of possible effects on operator revenues and costs.

References

TT2 – Zhang, F., Shen, Q., Clifton, K. (2008), 'An examination of traveller responses to real-time bus arrival information using panel data', TRB 2008 Annual Meeting

TT3 – Tang, L., Thakuriah, P. (2012), 'Ridership effects of real-time bus information system: A case study in the City of Chicago', Transportation Research Part C 22 (2012) 146–161

TT4 – Vonderschmitt, K. (2014), 'Riding in Real-Time: Estimating Ridership Effects of the Adoption of Mobile Real-Time Transit Tracking Applications', Masters thesis, LSE, 2014

TT7 – Brakewood, C., Macfarlane, G., Watkins, K. (2015), 'The impact of real-time information on bus ridership in New York City', Transportation Research Part C 53 (2015) 59–75

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