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Evaluation of Bus All-Door Boarding: Analysis of Dwell Time Performance



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Issue

Los Angeles County Metropolitan Transportation Authority (LA Metro), which provides most transit services in the county, has studied various improvements to bus services, such as signal prioritization and improved frequencies, to boost service quality and increase ridership.

One method to improve bus service reliability is to allow for all-door boarding on bus services. Traditionally, transit services in the United States have passengers board through the front of the bus, to facilitate fare payment, while having passengers alight, or exit, through the rear doors. This process can lead to significant delays at stops, depending on the number of boarding passengers. Transit agencies have long struggled to balance the need for faster boarding periods with maintaining fare compliance. Boarding and alighting make up a majority of vehicle dwell time or the length of time a transit vehicle is stationary at a scheduled stop. Dwell time reliability is important for transit service quality. Inconsistent dwell times make it harder for transit vehicles to meet scheduled arrival times and can result in bus bunching, when one transit vehicle catches up with another operating along the same route. In response, LA Metro has begun piloting an all-door boarding policy, with fare card validators at each door. This research examined the impact of all-door boarding on dwell time on three pilot bus lines: Lines 720, 754 and J.

Research Findings

All-door boarding in LA Metro's network results in a 6.5-second-per-stop reduction in dwell time. Routes that use articulated buses, which have an extra door, see a 7.5-second reduction in dwell time per stop. These reduced waiting periods result in large cumulative time savings for transit agencies, as routes with all-door boarding made more than 310,000 weekday stops per month. A bus operating Line 720 service would save approximately 4 minutes, 45 seconds per run if the bus made all stops along the route. On average, Metro buses spend about 20 seconds waiting for passengers to board.

All-door boarding on Lines 720 and 754 resulted in a 16% reduction in dwell time per passenger boarding when comparing data before and after the policy was implemented, and when comparing dwell time data from routes without the all-door boarding policy. All other bus routes in Metro's network saw slight dwell time increases during this time period. Dwell time reductions from all-door boarding can boost on-time performance, improve the customer experience, and reduce operating expenses.

Boarding Activity and Dwell Time

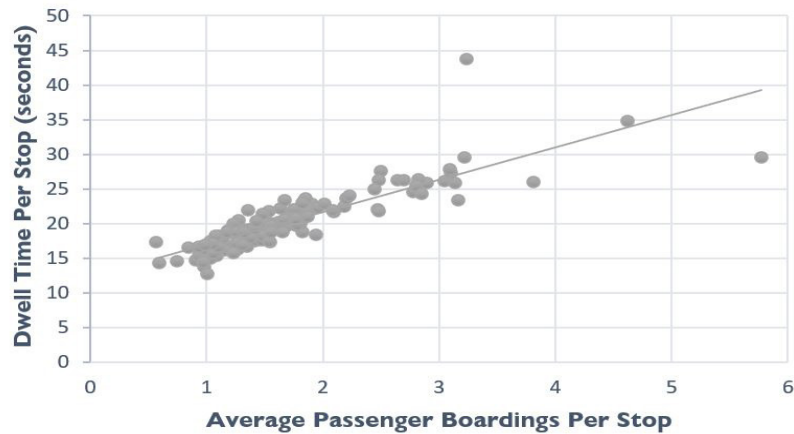


Figure 1: Boarding activity and dwell time: Bus routes with higher stop activity have longer boarding periods. Metro is considering service enhancements, such as stop consolidation, which may further increase waiting periods.

Study Approach

The researcher conducted a literature review examining the impacts of all-door boarding and case studies on three transit agencies across the country. He then analyzed dwell times at Metro using operational data. He used multiple linear regression to gauge the impact of the all-door boarding policy on Lines 720, 754 and J, controlling for differences in boardings per stop, wheelchair boardings per stop, and articulated bus use.

Conclusions

- Metro should examine an expansion of their all-door boarding program. The policy effectively reduces bus boarding times and can lead to cost savings due to this reduced waiting time.
- Metro should target bus routes with higher rates of stop activity. Lines with more passenger boardings per stop see longer waiting periods. Metro has previously targeted these routes in their all-door boarding program, and the agency should continue to do so with future expansions.
- Expanding the program to additional lines can provide operational flexibility. All-door boarding with on-board fare payment requires buses with fare validators at each door. This can complicate bus yard operations, as certain routes will need to use specific buses. Making a large percentage of the bus fleet all-door boarding capable can reduce this impact and will allow those buses to be used across multiple routes.
- All-door boarding should prioritize routes with three-door buses, since time savings from all-door boarding is particularly high on articulated bus routes. These routes will require the purchase of an additional fare card validator, due to the extra door.



Murray, A. (2021). Evaluation of bus all-door boarding: Analysis of dwell time performance (Master's capstone, UCLA). Retrieved from: <https://escholarship.org/uc/item/4jq618k5>

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