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POLICY BRIEF

Influencing Travel Behavior via an Open-Source Platform Phase 2

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BACKGROUND AND OBJECTIVES

Urban centers worldwide are increasingly facing congestion and environmental sustainability challenges, which demand efficient public transport solutions. The increasing growth of urban areas add numerous logistical and environmental challenges, particularly in traffic management and pollution control. Public transport systems are critical to addressing these challenges by offering sustainable alternatives to private vehicles. However, the effectiveness of public transport is often undermined by outdated infrastructure, inefficient services, and poor user engagement, making the increasing integration of information technology into public transport management essential to meet the dynamic demands of modern urban centers.

The National Institute for Congestion Reduction (NICR) initiated the project "Influencing Traveler Behavior through an Open-Source Platform." The first phase of this initiative successfully implemented the OBA platform, facilitating access to real-time traffic updates. This advanced real-time transit information system aims to improve user engagement and transit data accuracy, thereby increasing public transport utilization. However, continued advances in user expectations and technology demanded further improvements. Therefore, the research team designed Phase 2 of the project to build on initial successes and address current issues such as improving data accuracy, enhancing system stability, and upgrading the user interface.

Phase 2 addresses these issues by improving the OneBusAway (OBA) app, which provides real-time transit information. The project focuses on refining the app's user interface and backend systems to improve service delivery and user experience. The purpose of this phase was to enhance the appeal and reliability of public transportation as a viable alternative to private vehicles, to decrease traffic congestion, and to advance environmental sustainability.

The goals for Phase 2 were diverse, focusing on enhancing implementation and gathering user feedback through an online survey and focus groups. This approach aimed to improve the accuracy and reliability of transit information, ultimately identifying strategies to encourage greater public use of transit services.

METHODOLOGY

The methodology adopted for Phase 2 comprised four distinct tasks. The first task involves collecting and analyzing data to characterize the Integrated Transportation System (TIM) in Mayagüez. This data collection effort includes two focus group sessions conducted with transit riders from the TIM transit system before survey development and deployment. Additionally, a survey was administered two months after implementing OneBusAway. The survey was conducted to gather insights from passengers and potential users about their demographics, travel preferences, motivations, perceptions of the transit system, and general decision-making processes, including origin-destination patterns. Tablets and specialized data collection software facilitated these data collection efforts.

The second task was to collect boarding data to determine ridership characteristics and distribution among the routes of the TIM system. The data for this study was sourced from the TIM operator and encompassed one year preceding the COVID-19 pandemic. Initially, an effort to conduct ridership studies was planned; however, given the restricted conditions of transit travel during the pandemic, those efforts were averted. Therefore, the ridership data was analyzed from the data collected by the operator for year 2019 as part of their everyday operations. In addition, as part of this task, the research team also undertook an updated analysis of activity systems initially conducted in Phase One to integrate any modifications in the spatial distribution of critical activities linked to transit services.

The third task focused on modeling and analysis of OBA data along with the data collected to understand the demand and the activity system. Econometric models were estimated using the data collected in previous tasks to study travel patterns, local public transportation habits, and their characteristics. The aim was to provide recommendations to decision-makers to improve the transit service, increase ridership, and reduce traffic congestion. The fourth and final task involved developing strategies to influence travelers' behavior.

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RESEARCH FINDINGS

After finalizing the second year of development, the OBA servers were actively running as a Docker container service. One Bus Away, as an open-source solution, was able to offer valuable information to users. The initial focus group revealed that a significant portion of transit users were older individuals who relied on the system due to their age, lack of a car, or absence of a driver's license. Several participants expressed that the lack of signage, protected stops, and knowledge about how the system works discouraged them from using it. Others stated that the location and lack of security at the stops made them uncomfortable taking the bus. The second focus group identified the need for more readily available information, such as signs and promotional materials, to encourage greater transit system use. The survey conducted from April to September 2022 provided valuable insights into the demographics and preferences of participants regarding public transportation in the city.

Regarding transportation modes, private vehicles were the primary mode of transportation across most routes. However, walking was a viable alternative on specific routes, particularly Route 348. Satisfaction with the Mayagüez Integrated Transportation System (TIM) varied among participants, with high satisfaction levels reported across all routes. Concerns about service reliability were minimal, with only occasional mentions of issues such as bus arrival times. Participants rated safety and cleanliness positively, affirming their confidence in using the system. The survey also indicated that real-time bus arrival predictions via smartphone applications would significantly influence travel behavior, potentially encouraging a shift from private vehicles to public transit. The total number of boardings in the TIM was 148,794 passengers in 2019. Related to the correlational analysis, the significant positive correlation between the number of boardings and multiple stops in an area (0.596***) suggests that areas with more bus stops tend to have more boardings. The negative correlation between the average number of vehicles per household and the number of boardings (-0.209) is not significant. However, it suggests that more vehicles available per household reduces the need to use buses.

The results of the analysis of the Boarding variable in the bus stop areas and the neighboring of each stop yield a coefficient of 0.1316. This result of Moran's I value indicates a weak positive spatial correlation, suggesting a slight tendency for high boarding values (stops with many boardings) to be near other high values and low values to be near other low values, which means that a high boarding at the neighboring bus stop is related to the boarding at the reference stop. Nevertheless, this clustering is weak, indicating that there is no spatial correlation, or the spatial correlation is due to other factors that were not considered, which could be found in a spatial regression analysis. Moran's I coefficient for the spatial regression analysis is 0.3043 with a p-value of 0.00317, which indicates a significant spatial autocorrelation in the residuals. The spatial regression analysis reveals that the number of stops in the area, vehicle ownership, and the presence of multiple stops positively influence public transport usage. On the other hand, higher average age and median household income negatively impact boardings.

POLICY AND PRACTICE RECOMMENDATIONS

The "Influencing Travel Behavior via an Open-Source Platform Phase 2" project highlights the potential of integrating advanced real-time information systems into public transportation planning and operations. Public transit can be made more efficient, reliable, and appealing by focusing on technological enhancements and user-centric strategies, thereby promoting increased ridership and supporting broader urban planning and sustainability goals. This approach provides practical strategies for cities aiming to use this technology to enhance their public transportation systems, addressing the needs of an expanding urban population and contributing to more livable, environmentally friendly urban environments.

A strategy to increase and improve transit ridership should include developing a user-centered transit network with dedicated right-of-way and high-frequency vehicles, considering the potentially attracted demand. Similarly, the type of vehicle and the coverage area for feeder systems should be considered. The strategies must ensure that each transit system component works at its best to reclaim passengers and attract new ones. These components include the roadways and stop infrastructure, the condition of the vehicles, favorable operating hours for users, committed drivers, and a service-oriented agency managing the system with precision and quality. The development of marketing campaigns for the transit system to attract new users and ensure that transit routes and services are well known to all the stakeholders involved in the transportation system must be carried out. Develop agreements to coordinate with Transportation Network Companies (TNCs) to expand the network's reach to neighborhoods located beyond the stops of the established fixed routes and that could operate as first/last mile operators. This coordination would also be convenient with payment systems for e-bikes or e-scooters that users can reserve before the trip. The transportation system agencies must obtain the financial resources required to implement the integrated strategy presented above. Elected officials should be on board and committed to reducing traffic congestion and using transit as a primary strategy to achieve that goal.

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