The Role of Real-Time Information (RTI) Systems in the Demand for Urban Public Transport: A Case Study of Braga, Portugal

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Introduction and Research Objectives

The rapid growth of urban populations has intensified the need for efficient and reliable public transport systems to combat road congestion and promote sustainable mobility. In this context, Real-Time Information (RTI) systems have emerged as a critical innovation, providing passengers with live updates on vehicle arrivals, delays, and occupancy. While the technical benefits of RTI are well-documented, user adherence and the psychological impact on modal choice remain under-explored, particularly in medium-sized cities.

This research investigates how RTI systems influence public transport demand in Braga, Portugal. The primary objective is to establish the relationship between RTI characteristics, consumer satisfaction, and the actual usage of bus services. The study tests three main hypotheses:

- **H1:** Regular RTI users perform more public transport trips than non-users, suggesting a demand induction effect.
- **H2:** Access to RTI is associated with higher service satisfaction by reducing uncertainty and perceived wait times.
- **H3:** RTI serves as a relevant factor in modal choice, potentially encouraging a shift from private vehicles to public transport.

Methodology

The research adopts a quantitative approach focused on the city of Braga. This location is particularly relevant due to the high prevalence of individual transport (70.6% of residents) and a public transport usage rate (13.3%) that sits below the national average.

Primary data was collected through face-to-face surveys (N=199) conducted between January 20 and 30, 2026. A two-stage cluster/stratified sampling method was used to select survey locations, including primary interfaces, convergence hubs and peripheral parishes to ensure a representative mix of urban and suburban perspectives.

The second phase employs bivariate analysis, specifically T-tests for independent samples, to compare satisfaction and efficacy levels between RTI users and non-users to validate if technology leads to superior confidence in the system. Finally, the research utilizes multivariate econometric modeling to isolate the impact of technology. Model A employs an Ordinary Least Squares (OLS) regression to identify the determinants of weekly trip frequency ($N^{o}Viagens_i$), integrating variables such as RTI usage, car ownership, digital literacy, and perceived value:

$$N^{o}\,Viagens_{i} = UsaITR_i + Transbordos_i + TemCarro_i + Oferta_i + Satisfação\_ITR_i + Valorinfo_i + Lit.Dig_i + Feminino_i + e_i$$

For the full sample, Model B applies a Logit regression to estimate the probability of an individual being a public transport user, identifying the critical factors—such as car ownership and perceived informational utility that drive the decision-making process between competing modes.

Furthermore, the analysis is enriched by a series of complementary bivariate tests designed to explore secondary correlations and deepen the diagnostic of user behavior. These include examining the relationship between digital literacy and effective RTI adoption , as well as the correlation between economic valuation and modal alternatives, specifically comparing how car ownership influences the perceived utility of information , and exploring the impact of demographic variables, such as age and educational attainment, on service satisfaction and technological acceptance.

Key Findings and Preliminary Results

The demographic analysis reveals a predominantly young and female-dominated sample, with 67.6% of respondents under the age of 35 and 65.3% being female. This profile is characterized by high educational attainment (59.4% with higher education) and significant digital literacy, with 77.9% reporting high comfort with technology. A primary predictor of non-usage is car ownership; while 69.8% of the total sample possesses a vehicle , this figure rises to 80% among non-users, compared to 62% for users an 18 percentage point differential that underscores the challenge of modal competition.

Regarding service interaction, current users maintain a highly routine pendular pattern, averaging 5.29 weekly trips. Utilization of RTI is already integrated into the daily routines of 64.2% of users, yielding a high perceived effectiveness score with a mean of 3.83 on a 5-point scale. Economically, RTI is perceived as a structural component of the service rather than a luxury. Half of the surveyed individuals value RTI between 25% and 55% of the fare, and for regular users, this valuation reaches up to 64.5%, highlighting its role in mitigating the psychological burden of waiting.

Furthermore, an 'invisible barrier' was identified, as 13.6% of respondents are unaware of the service frequency near their residence. Among the segment of non-users (N=40), structural barriers like incompatible schedules (56.4%) and privacy preferences (46.2%) dominate, whereas price is a negligible factor (7.7%). Nevertheless, there is a clear opportunity for conversion: 75% of non-users indicated they would likely try the system if reliable RTI were available. These findings strongly suggest that RTI is not merely a secondary complement; it constitutes a fundamental and indispensable pillar for transforming public transport into an 'intelligent' and competitive alternative to the private car.

Conclusion

The preliminary results suggest that RTI systems in Braga play a vital role in redefining the competitiveness of public transport against individual motorized travel. While technology cannot entirely overcome structural deficits like low frequency, it significantly reduces the "invisibility" of the service and the uncertainty of the user experience. These findings indicate that informational transparency is a fundamental pillar of service quality, capable of inducing demand and improving the overall attractiveness of sustainable mobility in medium-sized urban contexts.