

PhD Candidate full name: Armando Teles Dauer

Dissertation Title: Mobility in low-density areas: a framework for designing Demand Responsive Transport Systems

Date: 2026-07-27 09:30:00

Location: University of Porto | Faculdade de Engenharia | Departamento de Engenharia e Gestão Industrial | Sala de atos

Higher Education Institution: University of Porto

Abstract or Public Summary: Demand Responsive Transport (DRT) offers a flexible alternative to traditional public transport, dynamically adapting routes, schedules, and fleets to real-time demand. Traditional fixed-route, fixed-schedule public transport requires predictable demand to operate effectively. While it can function efficiently in urban areas, it struggles in less dense regions such as rural and peri-urban areas, where demand is often dispersed and heterogeneous.

Despite over 60 years of proven effectiveness in pilots and real operation, large-scale adoption of DRTs remains limited by configuration complexity, operational uncertainty, and insufficient policy support. Policymakers and planners also often lack the knowledge and tools to identify optimal DRT configurations for specific contexts. The objective of this work is to assist in the design of these systems through a structured, evidence-based framework that supports strategic-level DRT design, with a special focus on low-density areas.

The proposed framework, named APOLO, integrates empirical data, a simulation model, and stakeholder inputs to help decision-makers identify suitable DRT system configurations. Developed through a comprehensive literature review and the analysis of 52 real-world DRT systems, it identifies key configuration variables grouped into three categories — Guiding, Operation, and Service — according to their strategic role. APOLO is organized into three modules: MUSE that assesses the suitability of operational variables for given scenarios; ARTEMIS used to simulate configurations and to generate performance indicators; and DELOS that performs cost-benefit analyses of service variables.

Implemented as a web-based platform, APOLO was presented to authorities and industry representatives, and exploratory case studies were conducted to refine the framework and derive practical insights for future research. The APOLO framework provides a structured, data-driven approach to the strategic design of DRT systems in low-density areas. By integrating empirical evidence, simulation, and stakeholder input, it enables decision-makers to configure flexible, efficient, and context-sensitive transport solutions, supporting the adoption of DRTs in diverse scenarios.

Doctoral Programme: Doctoral Program in Transport Systems

Research Centre: SYSTEM

Principal Supervisor at INESC TEC: Teresa Galvão Dias

Additional Supervisor: Jorge Pinho de Sousa (INESC TEC); Bruno Prata (UFC)

Scientific Domain: Transport

Keywords: Flexible transport; DRT; Demand responsive transport; Transport service planning