ANALYSIS OF ATTRIBUTES INFLUENCING A FUNCTIONAL PARK AND RIDE SYSTEM FOR COLOMBO

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Thesis submitted in partial fulfillment of the requirements for the degree
Master of Engineering in Highway & Traffic Engineering

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University of Moratuwa
Sri Lanka

May 2025

DECLARATION

I declare that this is my own work, and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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ACKNOWLEDGEMENT

I would like to extend my heartfelt gratitude to the University of Moratuwa and the Department of Civil Engineering for providing me with the opportunity to pursue this research and for their invaluable support, which was essential for the successful completion of my study.

I am deeply thankful to Dr. Dimantha De Silva for his unwavering guidance, insightful advice, and readiness to engage in discussions throughout the research process. His mentorship has been pivotal in shaping this work.

I sincerely appreciate the constructive feedback and technical suggestions provided by the panel of examiners during the progress reviews, which greatly contributed to the improvement of my study.

My gratitude also goes to the lecturers of the Transport Engineering Division for their guidance, encouragement, and support throughout the research period.

I would like to acknowledge the invaluable assistance and collaboration of my fellow research assistants, as well as the technical officers and non-academic staff of the Transport Division. Their support has been greatly appreciated and instrumental in completing this research.

ABSTRACT

Traffic congestion in Colombo, Sri Lanka's commercial capital, poses serious challenges to urban mobility, environmental sustainability, and economic productivity. Park and Ride (P&R) is identified as a solution worldwide for reducing congestion, lowering vehicular emissions, and encouraging greater use of public transportation. The research focuses on identifying the critical factors influencing the success of P&R systems and evaluating user perceptions to propose practical, context-specific solutions for Colombo's unique transportation needs.

The study begins with an extensive review of global P&R practices, highlighting key attributes related to parking facilities, station characteristics, transport modes, travel time, wait time, and other influencing factors. By analyzing international case studies, the research identifies the essential attributes needed to attract commuters to P&R systems.

Data collection was conducted in two phases: an initial survey of 405 respondents to identify and prioritize key attributes, followed by a Stated Preference (SP) survey with 205 participants to evaluate trade-offs among selected factors. The SP survey was administered digitally, utilizing randomized scenarios to systematically assess commuter preferences. Key attributes analyzed included parking cost, secured parking, travel time, wait time, seating availability, and transport mode availability.

Using discrete choice modeling with ALOGIT software, the analysis provided significant insights into commuter decision-making. Results show that waiting time is perceived as approximately 2.1 times more burdensome than travel time, while features like secured parking and seating availability significantly enhance mode attractiveness.

Segmentation based on travel distance and gender reveals that short-distance travelers prioritize travel time, while long-distance travelers emphasize parking security. Gender differences also emerge, with women more dislike to waiting times and men showing stronger preferences for seating availability. Additionally, current travel mode influences preferences—private vehicle users tend to avoid bus-only options, whereas public transport users value multimodal integration, particularly access to both bus and rail/LRT services.

Further, the findings indicate that low-income commuters are about 2.4 times more sensitive to parking costs than high-income users, while high-income commuters value secured parking nearly four times more. Accordingly, high-income users value secured parking as equivalent to a reduction of approximately Rs. 1,250, while low-income users associate it with a cost saving of around Rs. 130. Wait time sensitivity also varies significantly with trip length, as commuters with longer journeys perceive waiting as twice as inconvenient.

Comfort-related features, such as seating availability, emerge as critical factors influencing mode choice. High-income users equate seating to a Rs. 450 reduction in

parking cost, while low-income users value it at Rs. 190. Furthermore, seating is perceived as equivalent to a 43-minute reduction in travel time, underscoring its importance. The model also highlights the negative perception of bus-only systems and the positive impact of multimodal integration.

The final model, validated through T-stat checks, retains only statistically significant factors, ensuring a robust framework for optimizing Colombo's P&R system.

Keywords: Park and Ride (P&R) systems, public transportation, urban mobility, commuter preferences, discrete choice modeling, urban transport planning, transportation policy.

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P&R	Park and Ride
SP	Stated Preference
LRT	Light Rail Transit
PT	Public Transport
WTP	Willingness to Pay

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