

**PERFORMANCE EVALUATION FRAMEWORK FOR
SERVICE QUALITY IMPROVEMENTS IN PUBLIC BUS
TRANSPORT**

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Degree of Doctor of Philosophy

Department of Civil Engineering

University of Moratuwa

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Declaration of Candidate and Supervisor

I do hereby declare that this is my own work, and this thesis does not contain any material previously submitted for a Degree or Diploma in any other University or institute of higher education without being acknowledged. I do also here declare that it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content fully or partly in future works.

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Abstract

The aim of this thesis is to develop service quality measurement methods for bus transport considering two main components: passenger expectation and service performance. Existing measures of passenger expectations do not address the heterogenic characteristics of passengers. Existing measures on bus transport service performance lack consideration of possible dynamic elements of bus operations, such as thresholds for service quality factors, stop level, route level, service headway, bus size etc. There is a need for regulators to monitor the progress of achievement in sustainable transport through public transport service quality improvements. The thesis answers the questions about to what extent the levels of service quality are expected by the bus transport passengers and what is the existing level of service performance of the bus transport operation. Walking time, waiting time, travel time, in bus environment, and station environment are identified as important bus transport service quality factors for passengers. Conjoint analysis is used to measure the weight of passenger expectations on bus transport service quality factors using customer satisfaction surveys on service quality attribute levels. The normalization approach was introduced to address the heterogeneity of passenger behavior. The Threshold Enabled Earliness Index was developed to evaluate the reliability of buses (waiting time) at bus stops for both arrivals and departures using data on scheduled and actual arrival and departure times of the buses at stops. The Threshold Enabled Probability value is created using cross tabulation analysis to evaluate bus travel time reliability (travel time). Two Passenger Comfort Level Indexes STPCLI & SEPCLI to capture standing and seating passenger comfort levels are proposed that could be estimated using boarding and alighting counts. These two indexes are capable of capturing comfort levels for the entire route or a part of a route and not confined to a given location. In the absence of route level income information, methods have been developed to estimate bus revenue when individual passenger boarding and alighting data is available, or cumulative boarding and alighting data at the fare section level is available, or when only demand information or the history of demand distribution is available. A computer algorithm for estimating STPCLI, SEPCLI and to estimate fare revenue at route or part of route for different demand levels at different service headways for different bus sizes is developed. This algorithm could capture the number of passengers

who would miss a bus due to capacity limitations and is useful in situations where limitations on loading need to be imposed especially to maintain social distancing. The study helps identify the bus transport passenger expectations about the quality of the bus transport service and it also helps to evaluate the service performance of the bus transport system in fulfilling those expectations. These measures can be used to compare the level of service quality among different sections of a bus route, for the entire route, among different routes or for an area and among different areas. This study finally contributes to the ongoing debate on the critiques of the operationalization of service quality measurements.

Keywords: Service quality, bus transport, passenger expectation, service performance

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