ISSN: 2513-2520
R4TLI Conference Proceedings 2016
Paper Reference: *R4TLI-A13*

Developing a Fare Index for Para Transit: The Case of Urban Three-wheeler Taxi service in Sri Lanka

Pasan K. Kevitiyagala
University of Moratuwa, Sri Lanka

Yapa M. Bandara
University of Moratuwa, Sri Lanka

1. Introduction

Para Transit is a popular informal public transportation service in Sri Lanka where three-wheeler plays the dominating role. There have been many studies carried out on para-transits known as informal public transport modes. In developing countries, most para-transit services are not regulated, and they function as a self-regulated manner. Many cities in developing countries have their own, often highly distinctive, forms of informal transportation.

Research has revealed several factors which contribute to the emergence of an informal public transport service. Initially, these modes have developed suddenly to fill gaps in conventional transport of urban areas [1]. The need to have integrated transportation connectivity is ever-increasing in transport systems in many parts of the world. The three-wheeler fleet in Sri Lanka comprises of around 1,000,000 vehicles accounting for around 17% of the active motor vehicle fleet [2]. These three-wheeler operations demonstrate a lack of regulatory control, and cartelised service provision featuring oligopolistic market behaviour. 74% of three-wheeler operators are registered at a particular three-wheel park having an informal unionised operation, while the rest park their vehicles at different locations and are not among the unionised three-wheelers [3]. Three-wheelers complement and most of the time substitute public transport services by transporting passengers along routes on which bus service is not available. Nevertheless, users have to pay much higher fares than the public bus fare. The existing fare systems are of three types and include fares decided through negotiation, fixed fares and meter based fares.

As a solution to fare charge conflicts, this paper presents fare index developed based on the vehicle operational cost. The paper is based on a survey of the operators who provide their services in Colombo Municipal Council area.

2. Scope and the objectives of the study

This paper aims at identifying methodology to calculate fare index for three-wheeler taxis, based on vehicle operating costs. To derive a fare index, there must be a logically determined basis of computing the operating cost of three-wheelers. The cost of three-wheeler operations are made in to costs on inputs such as value of fuel, tires and spares. Fare index will be presented as a distance-based function which includes the fare per kilometre. A cost index must be sensitive to the variations in the operating cost of the three-wheeler taxi service due to differences in the cost components, so that it can be used as regulatory indicator to revise fares whenever it is needed. The index is therefore a weighted average of all individual cost inputs. Consequently, a cost index is a composite index of all the components of costs under both operating types. This research sets out to derive the cost index as an iterative process.

3. Methodology

A questionnaire was developed based on the survey form developed by Kumarage, Bandara, & Munasinghe [3]. The structured questionnaire consists of 21 questions with sub questions to gather more profound data on owning the vehicle (license &registration costs, insurance costs), fuel cost, tire wear cost, vehicle repair and maintenance cost. The sample consists of randomly selected 30 three-wheeler drivers operating in Colombo city. Therefore, two types of three wheeler operator groups were used as the sample for this research. After finding values for the above cost categories, a cost index is developed with the fixed costs and variable costs. Since there should be only a single-fare structure implemented for all types of operators, it is necessary to arrive at a single index to calculate a weighted common operating cost. The result will be then presented using a formula as follows:

$$VOC = (O_c + D_c) + d(T_c + M_c + F_c)$$

Where;

VOC - Vehicle Operational Cost per journey
d - Distance travelled per journey
D_c - Vehicle depreciation cost
O_c - Costs of owning the vehicle
T_c - Tire wear cost
M_c - Vehicle repair and maintenance cost
F_c - Fuel cost

Vehicle operational cost itself does not provide any information which is requested by the user. Therefore a distance based fare structure is needed to convey the

information more comprehensible manner. Following formula is adopted to construct the distance based fare structure,

$$F_i = f_0 + f_i\,(d_i - d_0)$$

where f_0 is the initial charge and d_0 is the distance covered by f_0; f_i is the charge rate for next km travelled [4]. Assuming that d_0 is equal to one kilometre, the above formula is modified as follows;

$$F = f_0 + f_i(d_i - 1)$$

For the calculation to get a value for f_0 which is the initial charge (minimum fare) for a three wheeler ride, all cost components are considered. However to calculate f_i which is the charge for next kilometre travelled, only the fuel cost, tire wear cost and maintenance cost are considered as they are the costs that will increased when distance increases.

Based on the vehicle operational cost estimates derived by analysing survey data, a distance based fare equation was estimated as below.

$$F = 30.68 \text{ LKR} + 7.49 \text{ LKR}(d_i - 1)$$

where; F = Minimum fare for a journey of d_i km

d_i = Total distance

4. Conclusion and Implications

Pricing and costing transport services is important for ensuring the profitability even though the three wheeler taxi sector is deregulated. If costs are too high, then demand will be less and even though transport capacity may exist, it will not benefit the passenger or the operator. On the other hand if costing is too low, the supplier may ultimately run out of the business even though the user will benefit. In this research fare index is presented which was derived with the value of vehicle operational cost in which fixed charged (Rs.31) is related to the all costs and variable charge based on distance is based on the operational costs. Further to this research, in order to improve the fare index presented, value of time (waiting time, traffic congestion) can be considered for future research. Further research also needs to consider user expectations and the demand.

References

1. Hilling, D. (1996). Intermediate public transport in transport and developing countries. New York: Routledge.
2. CBSL (2015). Economic and Social Statistics of Sri Lanka. CBSL.

3. Kumarage, A. S., Bandara, M., & Munasinghe, D. (2010). Analysis of the economic and social parameters of the Three-Wheeler Taxi service. Elsevier, 395-400.
4. Smith, J. M., & Cruz, F. (2012). State dependent travel time models, properties, & kerners three-phase traffic theory.

Keywords: *Para Transit, Informal Public Transport, Three wheeler, Vehicle operational cost, Fare Index*