

# **Barriers in Modal Integration: The Case of Rail and Bus Transportation in Sri Lanka**

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## **Abstract**

For the existence of competitive markets, transportation is an essential economic activity needed to fulfill the activities of daily needs by providing a mode for the mobility of people and freight. A selection of specific planning method of transportation, convincing the passenger to use public transportation over private transport modes is a vital element in the current transport policies. Efficient operation of transport services depends on how effectively transport planning is undertaken considering technical, economic, market, social and environmental requirements under which services are provided. Nowadays every country in the world is trying to establish its own national transport system, not in isolation but as a part of the international system of transportation. When a transport mode is incorporated into a model, it can be used to build a better transportation system by using split development, model share and model integration. However, the passenger flow would not take place as predicted by transport models due to the influence of personal transport modes. As a result, developed infrastructure and transport services are often underutilized or one attractive mode of transport services are highly demanded to lead to overcrowding. This leads to the development of modal share issue with public transport share tends to decline while private motorized transport share is on the rise. As a remedy, model integration is considered as one seamless entity which has made by the involving of the travel modes for the benefit of the fare paying customer. There are many integrated transportation systems can be seen in well-developed cities all around the world established to reduce car dependency (Buehler, Pucher, Gerike & Götschi, 2017). Transport modal integration (Intermodality) provide the advantages by keeping space through the traffic congestion and controlling and resultant time saving and vehicle operational costs savings to users, minimizing carbon footprint and other negative externalities and eventually reducing the country dependence on fuel. However, intermodality is not always successful due to certain barriers. This paper aims at identifying the barriers that affect to efficient model integration process between bus and railway service around selected bus and rail corridor.

The methodology followed in this research is a questionnaire-based data analysis using Principle Component Analysis (PCA). The relevant data were collected through a field study

conducted in a selected public transport corridor that is served by rail and bus transport. The data collection was carried out using an online survey form but carried out as face to face. At all location 100 randomly selected passengers were surveyed. Data from each location were collected to cover all the time frames as possible and covering different users of the transportation service.

Main factors acting as barriers to modal integration were derived as operational factors, comfortability, infrastructure design, competition, information flow and ethical behavior from the PCA analysis. Fourteen barriers identified, which includes security and safety concern of train, lack of information of bus and railway operating times, the capacity of current bus and train service and operating conditions of bus and railway stations, have been perceived as the main issues to be solved that make passengers participate in modal integration between bus and railway services. Further, poor sanitary facilities, having uncomfortable fare collection methods and health and fitness issues of passengers have also been barriers. Further, considering the travel complexity of passengers in the sample, 28 travel patterns have been identified which includes traveling modes of the bus, foot, train, three-wheelers, taxi cabs and personal vehicles such as cars, bikes, and vans. Most of those 28 patterns have similar areas of destinations even they have different origins indicating hub and spoke transport behavioral pattern. Variable origins, less planned travel facilities, not having proper integration method, have been main reasons for the travel complexity.

**Keywords:** Public transportation, Modal share, Modal split development, Modal integration, Exploratory factor analysis

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