

Methodology to Identify the Optimum Network for an Integrated Urban Rail System

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Planning of railway network is very important in case of new railway systems such as urban Light Rail Transit (LRT) and Mass Rapid Transit (MRT). The general objectives of a railway network development are minimizing total cost that includes construction and operation costs, maximizing social welfare and profit and minimizing travel time and negative environmental impacts. The question in transport network design is to determine a network that has an optimal performance given a specific design objective.

According to the previous research studies, a methodology has been developed to identify the optimum railway network, by considering the factors related to the construction cost and the passenger demand. Although the network can be optimized by considering those two factors, it is not completed until the operational stage costs are considered. Therefore it is very much important to consider the operational costs in developing methodologies to identify the optimum railway network.

This paper is on finding an improved methodology to determine the optimum rail road network considering the fleet cost in addition to the construction cost. Optimum route network is generated so that optimizes the fleet because fleet is mainly depending on the route network.

Initially, ten locations from the Colombo Metropolitan Region are selected as station locations and two networks are identified based on two scenarios. First scenario is to generate a primary route network considering the demands between nodes. Routes are assigned for highest demands until all the nodes are connected at least by one route. In second scenario, all the demand values between nodes are assigned along their shortest paths and add them up to calculate the total demand for each link. Primary network is generated by linking the highest demand links until all the nodes are connected. Routes are assigned for the network considering the highest demand.

The two route networks are checked for fleet cost. Route networks are fine tuned using a set of algorithms for route merging, adding links and route sprouting. Fine tuned route networks are also checked for fleet cost and compared. Network with least fleet cost value and least changes for fleet cost with route network changes is selected as the best network. That means the best network should not be changed considerably in the later stages of operation due to demand variations apart from adding links or changing route network. The method to generate the best network is considered as the methodology to find the optimum network.