Studies on Some Operational Challenges in Indian Railways

Abstract

The study of coaching operation of Indian Railways (IR) reveals that there are many areas where capacity (seats and track capacity) have been underutilised whereas there are many activities where possibility of saving exists. Empty berths and over consumption of fuels has widened the financial gap between revenue earning and working expenses. An increase of mere few percentages in the average occupancy ratio might generate millions of rupees of revenue which not only would reduce cross subsidies but also improve profitability. In this thesis, using efficiency and productivity indicators like Break Even Analysis (BEA), a macroscopic break-even train length (in terms of the number of coaches) has been estimated and presented. This determines how many units of coaches (with fully sold berths) per train must be operated to reach a pre-defined profit level. But, the class-wise occupancy figure tells that trains run with vacant berths causing revenue loss. To overcome such revenue losses a novel concept of route oriented Global Waiting List (GWL) passenger management system has been proposed and analysed. Analysis shows that such a proposal can increase revenue of IR.

Many routes of IR are increasingly suffering from problems of shortage of capacity, congestion and punctuality losses. This thesis analyses heterogeneity which is considered as one important reason for route congestion and delay. Heterogeneity is introduced when train services with different speeds operate on the same line. In present study, for some routes of IR speed heterogeneity has been measured and its effect on secondary delay propagation has been analysed. Finally, on the basis of tests conducted on IR's Diesel crews (sample size 146) a quantitative analysis on the possibility of fuel saving is presented and a trade-off between fuel-consumed versus journey time has been established. This thesis thus focuses on analysis of real time data related to some pressing problems of Indian Railway and provides some simple but insightful analysis and implementable solutions that could lead to increase in profitability of IR.

Keywords: Indian Railways, Break Even Analysis, Operating Ratio, Occupancy Ratio, Heterogeneity, Secondary Delay, Fuel Consumption, Eco-Driving, Coasting.