Chapter 5
Railway Demand Forecasting

Miloš Milenković
Zaragoza Logistic Center, Spain & University of Belgrade, Serbia

Nebojša Bojović
University of Belgrade, Serbia

ABSTRACT
Forecasting represents an indispensable activity in railway transportation planning. Forecasting of demand levels is vital to the railway company as a whole as it provides the basic input for the planning and control of all functional areas including railway transport operations planning, marketing and finance. Demand levels and the timing of their appearance (on a day, week, month or seasonal basis) greatly affect capacity levels, financial needs and general structure of the business. Forecasting employs historical data and uses various forecasting methods to make accurate estimates of future demands. Forecasting approaches can be generally divided into two categories: econometric or causal and time series techniques. In this chapter a comprehensive review of methods belonging to these two broad classes will be made. Special emphasis will be given to the application of these techniques to railway demand modeling.

1. THE NATURE AND USES OF FORECASTS IN RAILWAY FIELD
Forecasting represents a process of predicting or estimating the future. It provides information about the potential future events and their consequences for an organization. It may not reduce the complications and uncertainty of the future but it increases the confidence of the management to make important decisions.

Railway companies use forecasting methods in order to anticipate potential issues and results for the business in the upcoming months and years. The essence of railway transportation planning and management is to match transport supply with railway demand. A thorough understanding of existing pattern of railway customers is the key for identifying and analyzing existing railway traffic related problems. Detailed data on current pattern and railway traffic volumes are needed also for developing demand forecasting/prediction models. The prediction of future demand is an essential task of the long-range railway transportation planning process for determining strategies for accommodating future needs. These strategies may include land use policies, pricing programs, and expansion of transportation supply – high speed railway lines and express services.

DOI: 10.4018/978-1-5225-0084-1.ch005
The demand model is a base of railway transport forecasts. Via this model a possible causal relationship can be found between the subject of forecasting process (number of passenger trains on a railway line) and the factors influencing on it (GDP, quality of service, travel times, prices, etc.). After determining the causalities and checking for statistical and logical validity, model can be used for forecast of railway demand in future.

Railway transport demand may be divided into passenger and freight demand. Passenger demand consists of intercity demand and commuting demand. Intercity demand is based on business activities or leisure. The same holds for commuting, but all components of commuting demand has similar characteristics and for this reason there is no difference between business and leisure. Freight demand is almost always part of the industrial process. It is under the great influence of type of goods, geographical and socio-economic parameters, pricing policy, seasonality, etc. (Profillidis, 2006).

Forecasting methods used for railway demand modeling can include both quantitative data and qualitative observations. The chief advantage of qualitative methods is that the main source of data derives from the experiences of qualified executives and employees. On the other hand, projections of quantitative forecasting methods rely on the strength of past data.

However, any demand forecasting has one primary disadvantage as that of any other method of predicting the future – there is no absolute certainty about the future. Any unforeseen factors may influence on forecast usability, regardless of the quality of its data.

This chapter is organized as follows. In Section 2, a classification of forecasting methods is presented. In Section 3, qualitative forecasting techniques are described, and a review of their application in the field of railway demand forecasting is given. Section 4, contain a review of quantitative forecasting techniques and their applications in the domain of railway demand forecasting. A survey of other forecasting methods with railway related applications is presented in Section 5.

2. METHODS OF FORECASTING

Considering railway demand forecasting, one classification of forecasting methods concerns the time in the future they cover. Long-term forecasts look ahead 5 to 10 years. Medium-term forecasts extend from 2 to 5 years into the future and short-term forecasts involve predictive intervals within 6 to 18 months.

Short and medium-term forecasts are required for activities that range from operations management to budgeting and selecting new research and development projects in railway transport. Long term forecasts impact issues such as strategic planning in the domain of railway infrastructure and mobile capacities.

The time horizon affects the choice of forecasting method because of the availability and relevance of historical data, time available to make the forecast, cost involved, seriousness of errors, effort considered worthwhile (Waters, 2008).

Despite the wide range of problem situations that arise in the field of railway transportation (railway operations management, marketing, finance and risk management) there are only two types of forecasting techniques – qualitative and quantitative methods.

Qualitative forecasting techniques are often subjective in nature and require judgment on the part of experts. These techniques are often used in situations where there is little or no historical data (Figure 1).

Quantitative methods for forecasting the future railway demand are used in case a company has records of past sales and knows the factors that affect them. Quantitative methods may be classified into two broad categories (Figure 2).
Related Content

Feedforward
[www.igi-global.com/chapter/feedforward/82877?camid=4v1a](www.igi-global.com/chapter/feedforward/82877?camid=4v1a)

Agent Based Modelling of Smart Structures: The Challenges of a New Research Domain
[www.igi-global.com/chapter/agent-based-modelling-of-smart-structures/162915?camid=4v1a](www.igi-global.com/chapter/agent-based-modelling-of-smart-structures/162915?camid=4v1a)

Risk Analysis of Structural Engineering Systems Using Bayesian Inference
[www.igi-global.com/chapter/risk-analysis-of-structural-engineering-systems-using-bayesian-inference/162927?camid=4v1a](www.igi-global.com/chapter/risk-analysis-of-structural-engineering-systems-using-bayesian-inference/162927?camid=4v1a)

The Impact of Forms of Buildings on the Air Exchange in Their Environment: Based on the Example of Urban Development in Warsaw
[www.igi-global.com/chapter/the-impact-of-forms-of-buildings-on-the-air-exchange-in-their-environment/199597?camid=4v1a](www.igi-global.com/chapter/the-impact-of-forms-of-buildings-on-the-air-exchange-in-their-environment/199597?camid=4v1a)