Investment choices and stakeholder interactions on the European railway network

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Introduction

Under the impetus of the European Commission, the European railway system has undergone a thorough overhaul. It was characterized until 1990 by a monopolistic and national organization with a vertically integration. There was only one actor by network for each state in Europe. Sweden has been the first State to engage a liberalization process on its network. Its first action has been to separate in 1988 the network manager, for maintenance and network development, from operator, for transportation service. The purpose was to reduce the cost of railway system and to improve its efficiency by new competition between operators (Alexandersson and Hulten, 2008). The Guideline 91/440 from European Commission extended this model in European Union to improve the competition and create a single market for railway. This process has drawn the importance of understanding the new chain of stakeholders and their role in decision making.

Both in the literature and the political sphere, the current debate focuses on how the rail sector should be organized, based on the hypothesis that a good organization will guarantee its efficiency in terms of socioeconomic effects (Crozet, 2012; Nash, 2012). On the one hand, there is the model, advocated by the European Commission, in which there is complete separation between the infrastructure manager and train operation. It is assumed that the improvement in the efficiency of the system will compensate for the potential increase in the transaction costs (Merkert et al., 2012). On the other hand, there is the model in which the separation of the two is overseen by a joint holding company as in Germany. In this case it is assumed that regulation can compensate for any reduction in the system's efficiency by lowering the transaction costs (Merkert et al., 2012).

In this paper, the efficiency of the system is defined as its ability to supply the best quality of service in terms of regularity of traffic and timetables for the users. By this way, it is proposed to test the link between stakeholder interactions and ability for the system to solve problem of capacity in condition of congestion or saturation of infrastructure. The hypothesis is that the capacity of a piece of infrastructure involves not only the technical aspects (physical constraints) but also the strategic aspects in terms of the decisions made by different stakeholders. The infrastructure is analysed by considering it as a technical and strategic entity whose mode of governance may have an impact on investment choices. This study sets out to reveal the stakeholders in the railway sector and to evaluate the impact of each on the

capacity of the rail system. A model of saturation for railway infrastructure is used to evaluate their impact on capacity.

The first section defines the railway capacity. The second section describes the chain of stakeholders. Then the model of saturation is presented to evaluate the capacity of a piece of infrastructure. This model is then applied to evaluate the impact of each stakeholder on capacity. Lastly, the theoretical findings will be illustrated by means of a case study with reference to the investment strategy of the stakeholders.

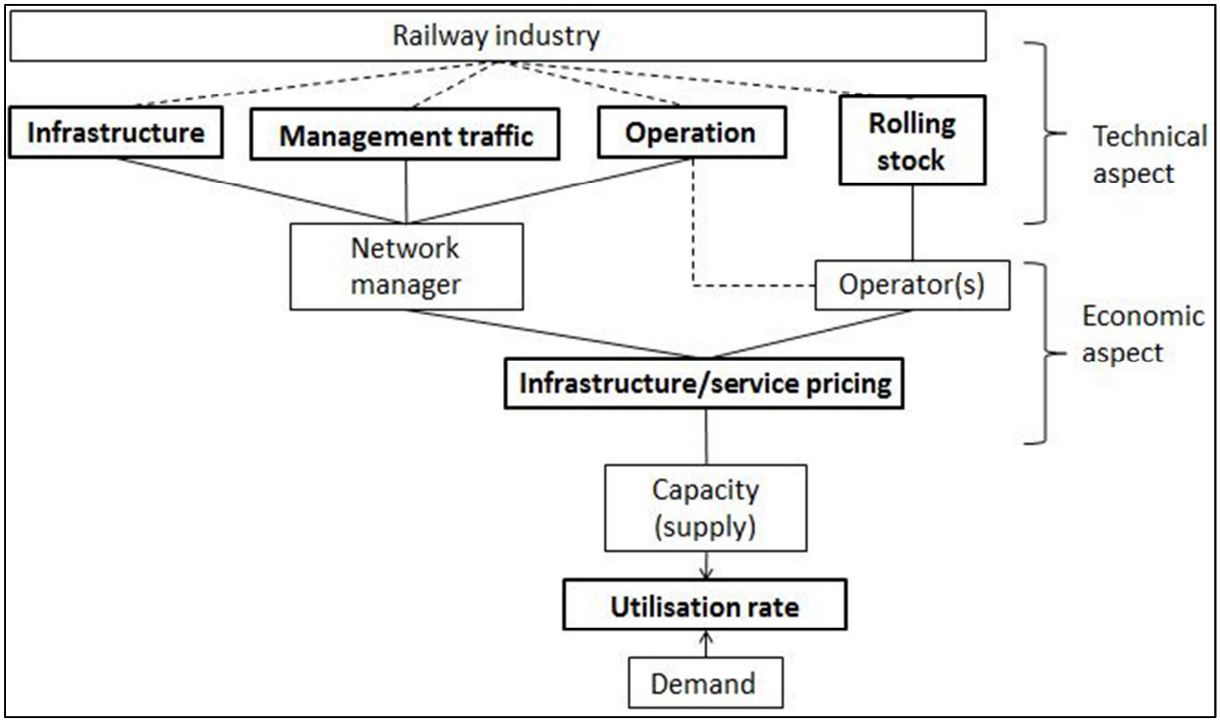
1. A definition for the concept Capacity

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Characterization of capacity

The modelling of infrastructure capacity uses five principal factors in two categories: technical factors (engineering side) and economic factors (results from stakeholders choice and strategy). These factors constrain supply and also constitute adjustment variables according to the level of demand.

Figure 1: Factors of railway capacity and stakeholders



Source: The author

The infrastructure is defined on the basis of the types of rail services it is intended to serve/carry. This characteristic is not unimportant, particularly in France where the development of High Speed Lines (HSLs) makes some traditional services impossible. Three types of infrastructure are identified. HSLs that only carry long distance high speed passenger trains (TGVs). Conventional lines that carry both long distance passenger or freight trains and short distance passenger trains. Last, freight lines that mostly consist of old conventional lines that have been reclassified for freight and short distance passenger trains after an HSL has been built alongside them. The existence of these diverse types of lines, which is specific to France, means that capacity can vary enormously from one line to another. The architecture of an HSL permits higher speeds than a conventional line, but does not necessarily increase

capacity because of the constraints associated with speed (Landex and Kaas, 2005; Harrod, 2009). In this situation, capacity depends on the composition of traffic, HSLs having perfect train type homogeneity (a single type of train service) and the conventional line having the greatest heterogeneity and hence the lowest capacity.

The second principal factor, operation, is an essential factor of the capacity of a piece of infrastructure. It is this which determines its maximal capacity (Burdett and Kozan, 2006; Sétra, 2009). The model considers that capacity is determined by the operating system used on a line (the control-command system). It is, therefore, equal to the maximum number of slots on the line permitted by the operating system and the characteristics of the infrastructure.

The third principal factor, management, brings together several dimensions that are typical of the decisions made by infrastructure managers. It expresses the need to carry out maintenance works which may remove some capacity. In addition, it represents the available capacity that the manager keeps in reserve for use in the event of incidents such as disruptions. Lastly, it expresses the resilience of the network, i.e. its ability to return to normal operation after a disruption. This factor involves both technical aspects and more qualitative parameters such as the speed with which information travels within and between stakeholders, their level of dialogue, experience and trust, etc.

The fourth principal factor relates to the rolling stock and its capacity. Marlot (2012) has shown that there are two different types of capacity as far as passengers are concerned: the total passenger capacity of the line and the capacity of individual trains. The hypothesis is that the technical characteristics of the rolling stock are covered under operation and infrastructure (braking time, speed, mass, etc.). Defining the capacity of the rolling stock as a variable provides a way of representing the decisions made by operators and measuring their impact on transport services in general. Thus the operator makes similar trade-offs with the infrastructure manager, namely choosing between the passenger load factor of a train set and the quality of service.

The five and last principal factor relates to the stakeholders choice and strategy. According to the technical constraints and opportunities, each stakeholder defines its strategy. The network manager gives a price to the infrastructure use (marginal cost, full cost) and the operator gives a price for its service. In general, it depends on demand according to constrain capacity. The consideration of pricing strategy in the model allows to considering the choice made by stakeholders between a maximisation of user’s surplus and a pricing to the marginal cost for a maximisation of demand and social utility of infrastructure and service.

The model is based on these five principal factors which it considers determine capacity and utilization rate.