

## DYNAMICS OF RAILWAY MARKET OPENING – CHOICE OF A POLICY

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**Abstract:** Opening of the railway market has no alternative for all European countries. Before the very opening of the market, it is necessary to take a number of independent and difficult decisions, namely, to find solutions with unpredictable results as far as dynamics and final models of realization of these solutions are concerned. The duration of the period preceding the beginning of activities on the opening of the market depends on interest and possibility to create a climate for opening of the market. The opening of the market can also be realized in phases until a completely free market can be established. In different phases, access to the market can be restricted (for example, only for national and regional railway undertakings). In order to achieve effectiveness and avoid unnecessary costs, all the activities shall be synchronized. This requires a clear state policy regarding the dynamics of the market opening process. It is possible to define several different policies, taking into account the existing characteristics of the railway sector in a certain country. The paper presents different possible policies of the railway market opening in Serbia and use of the ANP approach for the choice of the most appropriate policy.

**Keywords:** Policy, Railway market opening, Analytic Network Process, Serbia.

### 1. Introduction

The member states of the precursors to the European Union (EU) opted for an open and free transport market in the whole area, for all transport modes and in all segments of the market, by the Treaty of Rome in 1957. Railway reforms, which have been lasting for more than two decades, enable gradual opening of the railway market which has always been monopolistically organized. Although the opening of the railway market in the EU is generally being realized as a gradual process, in certain countries there are several alternatives regarding the dynamics of its realization. The process of the market opening can be realized more or less slowly or rapidly. Perception of dynamics of this process depends on the moment of decision making and realization. Thus, perception of dynamics of the market opening was not the same in the 90s as today.

Before the very opening of the market, it is necessary to make a number of independent and difficult decisions as a precondition of its liberalization. Many of the activities in this process take a lot of time and require more resources. Therefore, all the solutions, as well as decisions themselves, have a high proportion of uncertainty regarding their results, dynamics and final models. The most important decisions concern restructuring of the incumbent railway company, development of railway market institutions, subsidies and investment policy, railway infrastructure access charges, public service obligation, etc. Realization of each activity requires a certain time. Some of the activities are interdependent and, thus, they shall be coordinated. Therefore, target date and dynamics of the opening of the railway market shall be defined at the very beginning. Desired and realistic time limit for the opening of the market is essential for fixing time limits for all the necessary activities in this process.

Besides the dilemma regarding "faster" or "slower" opening of the market, there is also a doubt whether it would be useful to introduce different phases with restricted access to the market. For example, according to the draft "Agreement on Establishment of a Transport Community in the Western Balkans" (Treaty, EU 2010), railway market of the Western Balkans countries (Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Macedonia and Albania) shall be opened through three phases until a completely free market can be established: the first concerns opening of the internal market (only for railway undertakings of the concerned country), then, opening of the market at the regional level (only for railway undertakings from the region) and, finally, complete opening of the market according to the EU legislation. Time limits for the different phases have not been fixed. Each country shall define its own time limits. Complete liberalization of the market of a candidate country shall be realized, at the latest, on the day of the accession to the EU.

What dynamics of market opening shall be adopted for a country in certain circumstances? Circumstances mean all important factors, such as economy requirements regarding quality of services and market, accounts and characteristics of railway infrastructure and railway undertaking, present and expected dynamics of restructuring process of the incumbent railway company, development of railway market institutions, subsidy and investment policy, dynamics of the EU integration process, projects of the other countries in the region for the future, etc.

On the other hand, in most railway markets there is still a "non ideal competition" and railways are still considered as a social transport mode. Such point of view slows down restructuring process and opening of the market. This affects the level of charges, subsidies, type of competition, structure of the market, specificities of demand, compliance with the EU strategy for development of transport, etc.

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Taking into account different circumstances, objectives to be achieved, competition on the market, etc, different variants of the railway market opening policy represent different ways of achieving balance among market development policy, policy of development of the railway sector and financing policy. It is a specific and difficult decision requiring research and modern decision making methods. In this paper, the ANP approach was applied as a support to the choice of the most appropriate policy for the opening of the railway market in Serbia.

## 2. Railway market opening in Serbia and surroundings

The main stakeholders on Serbian railway market are Ministry for Transport, Serbian Railways, Directorate for Railways, national operators (Kombinovani prevoz, ZGOP Novi Sad and TENT railway transport which are still not active on public railway lines) and railway industry.

Railway transport market in Serbia has not been opened yet. A part of the Serbian railway network belongs to the Corridor X having an important transit freight transport. It is surrounded by the networks of Hungary, Bulgaria, Romania, having an open market, and Croatia, Bosnia and Herzegovina, Macedonia and Montenegro, which do not have an open market. Serbia is in the process of accession to the EU (candidate status without the date of the beginning of negotiations).

On one hand, Serbian Railways are under constant pressure related to the opening of the market (both from the inside and from the outside) and, on the other hand, the railway system is extremely unproductive, namely, there is a small level of capacity utilization with high costs. The condition of existing system requires more intensive investments, both in order to maintain the network at the existing level and to improve the quality of services. What makes the situation even more difficult is the fact that a appropriate strategy of economy development has not been defined yet, that is, it is still not known which economy fields will be developed as a comparative advantage of Serbia. There is also a constant budget deficit.

Serbia belongs to the Southeastern Europe (Western Balkans + Romania, Bulgaria and Greece), in which, development of the railway market is in the initial phase and real opening of the market and introduction of competition is yet to come.

## 3. Railway market opening variants

Complexity and dynamics of the railway system in all the different aspects (technical, socioeconomic and environmental) and necessity of making connections between vertical and horizontal policy (different administration levels and interdependence with other systems), but also different intentions and interests (often confronted) of different stakeholders, has created the need for a strategic planning. In other words, it is necessary to carry out an analysis and define the elements of transport policy in order to cover different questions and create a policy to be followed through the years.

The process of strategic planning defines the content and form of strategy elements. Strategic planning of the railway system shall result in the appropriate policy of the market opening. Policy is here considered to be a methodical influence of the state and includes all governmental activities influencing economy and society. It represents directions of strategic *action* (in order to regulate the concerned field) adopted and monitored by the Government. It has *regulatory or management* functions.

Based on the previously defined concept of policy, as well as on discussions on the policy of market opening in the Introduction and situation in the railway sector in Serbia, the following 4 policy variants related to the opening of the railway market in Serbia have been defined:

- *Variant 1 – slow opening of the market (SOT)*. According to this variant, the market will remain closed for a longer period of time, with the same market participants, while financial instruments (for example grants, debt cancelling, investments, PSO, charges, etc) will depend on the budget and needs of the monopolist. The aim of this policy is to protect the existing railway undertaking (there is no competition). It has been estimated that a longer period of time will be necessary to prepare the incumbent for competition and that, at the moment, the Government and competent authorities do not have enough capacity to restructure the railway sector.
- *Variant 2 – gradual opening of the market (POT)*. This variant requires appropriate financial instruments in order to support opening of the market and enable market participants to be competitive where the incumbent railway undertaking is still dominant. The aim of this policy is to harmonize restructuring of the monopolistic national company with the opening of the market by improving the efficiency of the railway system. In other words, competition shall be introduced gradually which means that the existing national company will remain dominant railway undertaking but its efficiency will be gradually improved.

- *Variant 3 – rapid opening of the market (BOT)*. This variant of the policy is based on the priority objective of Serbia, which is quick accession to the EU, and, in order to achieve this objective, the necessary requirements shall be fulfilled as soon as possible. This implies rapid opening of the market and providing efficient transport enabling a competitive economy. Making the existing RU competitive is less important than opening of the market, which means that the priority of this policy is to join the EU railway market.
- *Variant 4 – selling of the market (PT)*. This implies selling the only freight railway undertaking which, in the situation where the market is monopolistic, means selling the whole market. Freight transport is the only one which is “interesting“ at the private capital market, namely, this is the only activity of a railway company which can find a buyer. This policy is based on the opinion that there are no resources (financial, human, etc) which could recover the company from crisis and, therefore, it is necessary to find a strategic partner by selling profitable activities and solving most of the problems. Policy which consists of selling the market does not mean rapid opening of the market. That will depend on the situation in the freight company and possibility to sell the company to a strategic partner and thus make the sale successful.

#### 4. Analytic Network Process and its implementation

Analytical Network Process (ANP), which is both a quantitative and qualitative approach, is a decision support system that evaluates different alternatives for a purpose by comparing them. This approach, which was developed by Saaty (1996), was successfully applied to many cases that required complex decision analyses.

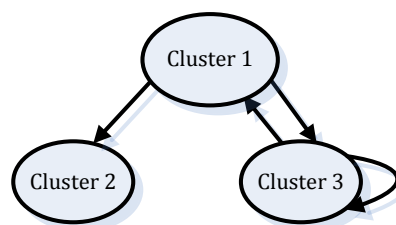
The application of ANP in problem of strategy selection can be followed in papers of Maede and Sarkis (1998) for selecting a strategy for managing logistical chains, Ulutas (2005) for selection of the appropriate energy policy in Turkey and for selecting a knowledge management strategies (Wu and Lee, 2007; Sercuk, 2010). ANP was preferred because it disaggregates the problem to its parts; it examines the problem by considering the opinions of every different stockholder that gives different weights to different criteria and it is easy to use. Another advantage of the Analytical Network Process is that there is no need to openly establish a function (Zoffer et al., 2008).

ANP starts with disaggregation of a complex multi-purpose problem into a network which comprises specific clusters. In order to establish such a network structure, all of the elements of the system and the relationships between these should be observed.

##### 4.1. Basic steps

The most important issue in the ANP is creation the network structure which describes dependency among /within sets of elements (clusters); because with this model, the main purpose is to measure the effect of the relative priority of the tangible and intangible elements. After the network model is established, the next stage is to determine the attributed weights to the elements within and among clusters. Pair-wise comparisons matrices are prepared. So the ANP prioritizes not only elements but also their groups or clusters as is often the case in the real world.

A network model example is seen in Fig. 1 and pair-wise comparison is given in Fig. 2. The importance of clusters C1–C3 is scaled with a value from 1 to 9, according to its effect on cluster C2. For example, in the matrix in Fig. 2, if C1 and C3 are equally important,  $X_{c1c3} = 1$ ; if C1 is certainly more important than C3,  $X_{c1c3} = 9$ . In this situation, it is apparent that  $X_{ii} = 1$  and  $X_{ij} = 1/X_{ji}$ . After the pair-wise comparison matrix is established, the eigen vectors of this matrix are founded by using the computer software name SuperDecision. These eigen vectors are used for determining the priority orders.



**Fig. 1.**  
Network model example  
Source: owner

	C1	C2	C3	
C1			$X_{c1c3}$	$X_{c1}$
C2	$X_{c2c1}$			$X_{c2}$
C3	$X_{c3c1}$		$X_{c3c3}$	$X_{c3}$

**Fig. 2.**

*Pair-wise comparison matrix example*

*Source: owner*

By utilizing the pair-wise comparison matrices that come back from the experts, supermatrix is founded. The priorities derived from the pair-wise comparisons are entered into the appropriate position in this supermatrix. This supermatrix has to be normalized using clusters weights. The SuperDecision software is used for this purpose and the priorities of the elements in the model are calculated. Thus, the importance or weights of the alternatives according to the target are found. These weights are then summed up separately for each alternative and the general weights of the alternatives are obtained. Then overall inconsistency indexes are calculated. If any inconsistency exists, the expert opinions should be reviewed and the inconsistencies should be cleared up.

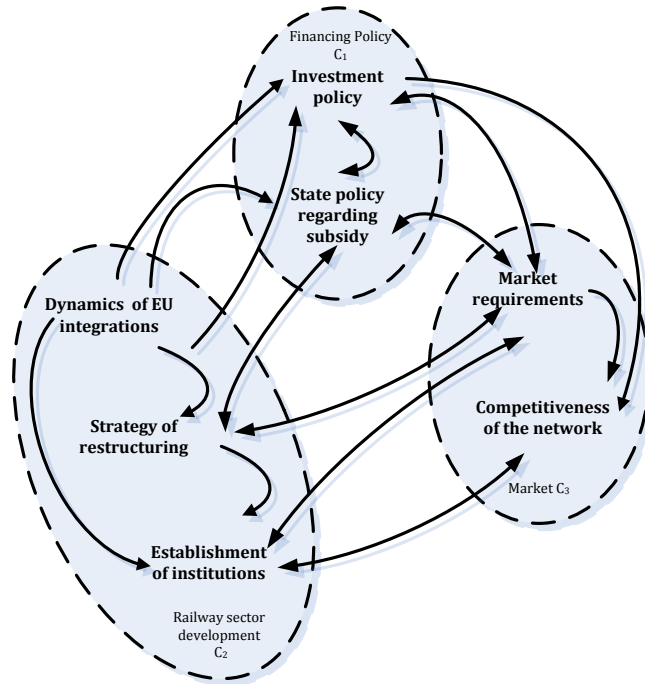
#### 4.2. Defining criteria

For this purpose, survey and in-depth interviews were used. Initially, interviews were conducted with a total of 20 experts on transportation, representatives of Ministry of Transport, Railway Directorate, Serbian Railways and transport planning in the universities. Their points of view about the most important factors to be taken into consideration were gathered. The final result is 7 criteria clustered under three different titles: market, financing policy and development of railway sector.

The selected criteria are as follows:

1. *Strategy of restructuring of the incumbent* – Policy variants related to the opening of the market shall correspond to the process of restructuring of the incumbent. This means that it is necessary analyze the convenience of the different implementation alternatives for the chosen strategy of restructuring of the incumbent or evaluate the possible dynamics of restructuring of the incumbent according to the above mentioned dynamics of the market opening.
2. *State policy regarding subsidies in the railway sector with the accent on the incumbent.* For rapid opening of the market, it is necessary to improve capacities of the RU in freight and passenger transport as soon as possible in order to ensure its competitiveness on the transport market, as well as to enable the infrastructure manager (IM) for doing business in a commercial way. First of all, this requires financial consolidation of the incumbent and paying its long and short term debts. Can the budget of the Government support quick and overall financial consolidation or does such an attempt require a longer period of time?
3. *Investment policy.* Technical improvement of the state owned railway undertaking up to the level of competitiveness in the open market, as well as improvement of the infrastructure performance which enables providing of competitive services.
4. *Dynamics of EU integrations.* In most cases, this was a crucial criterion for the last 12 countries which have entered the EU. Why? Because the expected and defined period of time necessary for the EU integrations, together with the existing situation, defines the variant of the market opening policy.
5. *Market requirements.* Growing economy requires railway undertakings providing quality services at low prices. In other words, it is necessary to have a strong transport market and competitive railway undertakings. Therefore, economic requirements can be of great importance for the dynamics of restructuring and opening of the market.
6. *Competitiveness of the network.* This criterion points out the influence of competitiveness of other networks and lines which may speed up opening of the market on the concerned network. In case of Serbia, opening of the bridge Vidin – Kalafat between Bulgaria and Romania on the corridor IV is reducing transit traffic through Serbia and thus requires rapid opening of the Serbian railway market. This criterion requires good knowledge of the railway network, infrastructure and railway undertakings in the region.
7. *Establishment of railway sector institutions required by the opening of the market.* The necessary capacities of railway regulatory bodies depend on the degree of openness of the market. Institutions can sometimes obstruct opening of the market. In other words, it is necessary to define the capacities of those institutions taking into account the degree of openness of the market and restructuring phases of the incumbent. Establishment of these institutions and development of all their functions require a certain time.

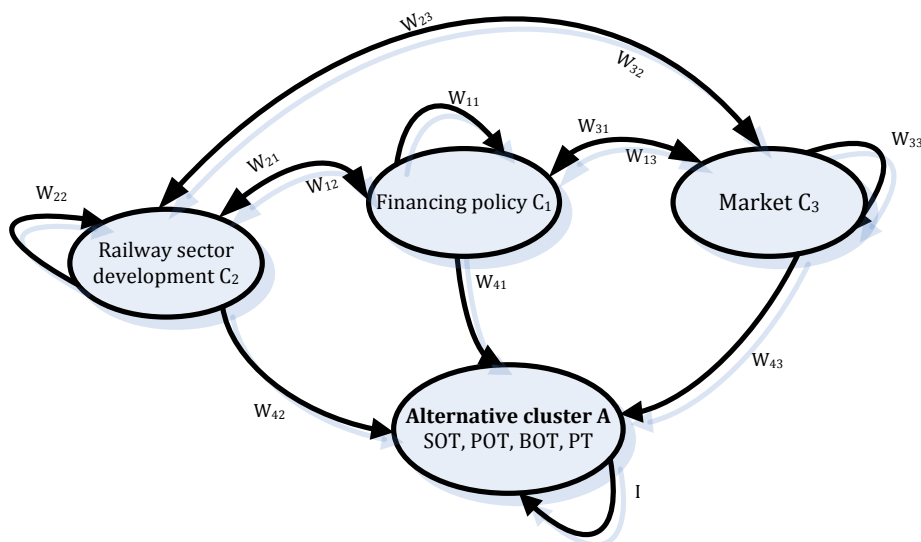
These 7 criteria were put on network structure as elements of clusters and following relationship was obtained (Fig. 3)



**Fig. 3.**  
Criteria relationship in the clusters  
Source: owner

**4.3 Network structure**

The alternatives are the cluster A and criteria perform clusters  $C_1$ ,  $C_2$  and  $C_3$  that are related to the each other by casual relations (Fig. 4). Once the network model has been constructed, the elements in one cluster are evaluated according to their relative importance with respect to one element in the other clusters. The evaluations are made on a 1–9 scale (Saaty scale). The matrices are then evaluated using SuperDecision software and the global importance of the alternatives are calculated.



**Fig. 4.**  
Railway opening market choosing  
Source: owner

## 5. Results and discussion

After the evaluation of preferences among the different elements and once the priorities have been defined, limit supermatrix is calculated. The first column in the limit supermatrix (Table 1) represents final priority vector for all elements of the defined structure. The obtained priorities of policy variants related to the opening of the market are shown in the Table 2.

**Table 1**

*Limit supermatrix*

Limit supermatrix		Development of			Financing		Market	
		Development of new institution	Dinamic of EU integration	Strategy of restructuring	Investment policy	Subsidy strategy	Market requirement	Network competition
Alternatives	BOT	0.094	0.094	0.094	0.094	0.094	0.094	0.094
	POT	0.111	0.111	0.111	0.111	0.111	0.111	0.111
	PT	0.074	0.074	0.074	0.074	0.074	0.074	0.074
	SOT	0.071	0.071	0.071	0.071	0.071	0.071	0.071
Development of railway sector	Development of new institution	0.082	0.082	0.082	0.082	0.082	0.082	0.082
	Dinamic of EU integration	0.123	0.123	0.123	0.123	0.123	0.123	0.123
	Strategy of restructuring	0.125	0.125	0.125	0.125	0.125	0.125	0.125
Financing policy	Investment policy	0.093	0.093	0.093	0.093	0.093	0.093	0.093
	Subsidy strategy	0.089	0.089	0.089	0.089	0.089	0.089	0.089
Market	Market requirement	0.050	0.050	0.050	0.050	0.050	0.050	0.050
	Network competition	0.088	0.088	0.088	0.088	0.088	0.088	0.088

**Table 2**

*Priority of the market opening policy variants*

Name of alternative	Graphic	Results		
		(1)	(2)	(3)
BOT		0.845	0.269	0.094
POT		1.000	0.318	0.111
PT		0.664	0.211	0.074
SOT		0.637	0.202	0.071

The ANP evaluation shows that with respect to the market, financing policy and development of railway sector, the highest relative importance is for the POT policy.

Priorities regarding criteria and analysis of individual influence of criteria show the following:

- ✓ Decision makers and experts consider in this moment criteria related to restructuring strategies of the incumbent and dynamics of Serbian accession to the EU as key elements (criteria) defining the dynamics of the opening of the Serbian railway market. A more detailed analysis of those two elements shows that, in case of Serbia, both processes are late. If we take into account that the objective is to choose a market opening policy, it is logical that those two criteria are the most important and that relations between those criteria are defined by the experts.
- ✓ If the railway sector and its participants are not competitive enough and the final date of the accession to the EU is close, then variants BOT or PT are more convenient than the variant POT. But, if the accession to the EU has not been planned in close future or if it is very uncertain, which is the case of Serbia, then the criterion related to the dynamics of the EU integrations does not change ranking of the alternatives, namely, the variant POT has the highest preference.

- ✓ If the neighboring railway markets have been opened or will be opened before the opening of the concerned market, and, if other parameters are more convenient (market institutions exist, improved performances and quality of infrastructure services, subsidies are still being allocated to IM and RU, etc), then the variant BOT has the highest preference.

## 5. Conclusion

Opening of the railway market has no alternative for all European countries. Before the very opening of the market, it is necessary to take a number of independent and difficult decisions, namely, to find solutions with unpredictable results as far as dynamics and final models of realization of these solutions are concerned.

It is imperative for decision-makers to devise, identify and recognize railway market opening criteria prior to define opening policy. In order to design a more effective decision making process, this study applies ANP approach for choosing the variant of railway market opening.

The model have shown that restructuring strategy of the incumbent is the most important criteria for opening the market. It is understandable that Serbian railway, where IM and RU are together, cannot be part of the competitive open market and be efficient too. Moreover, experts who participated in the work are highly valued dynamic of EU integration which is capture by investment policy and policy for subsidy. The third concern is network competition. The lowest two criteria are development of new institution and market requirements.

As a result of the evaluations made to the elements listed under the clusters, it was observed that the gradual opening of the market (POT) is the most weighted as a variant for the opening of railway market in Serbia in this moment. In this paper, the interdependence among the criteria was analyzed by the author first, and was confirmed by the experts after a few rounds of revisions. Other method such as decision making trial and evaluation laboratory (DEMATEL) or interpretive structural modeling (ISM) may be used to facilitate the process. This can be our future research direction, and a more comprehensive model can be constructed.

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