

RAILWAY TRANSPORT PROCESS OPTIMIZATION, A REQUIREMENT FOR A QUALITATIVE ACTIVITY

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REZUMAT. Lucrarea evidențiază importanța transportului feroviar și necesitatea alinierii la standardele europene. Acest fapt implică dezvoltarea unui învățământ de specialitate de cea mai mare calitate.

Cuvinte cheie: optim, optimizare, transport feroviar, factori de influență.

ABSTRACT. This work points out how to choose the optimum coordination for the railway transport. This is done based on the analysis of the factors that influence the organization and quality of the railway transport.

Keywords: Keywords: railway transport, optimum, optimization, influence factors.

1. GENERAL ASPECTS

In every aspect of our lives there is room for better and therefore the actions that we do are directed towards adding extra quality. In other words, we always tend to optimize those particular aspects that increase the quality.

We can thus define the following notions:

- *optimum* – the solution found for a given problem;
- *optimization* - sequence of processes or methods which allow to determine the optimal solution;

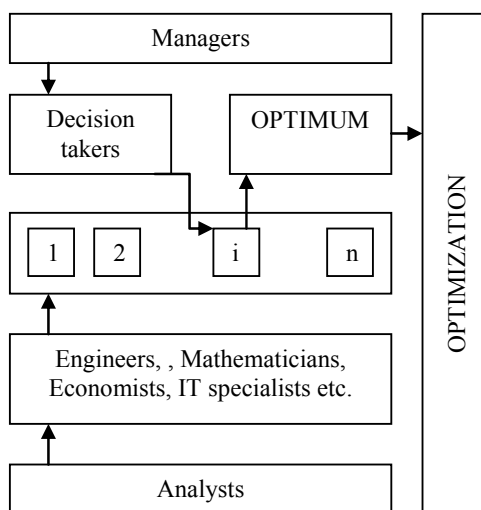


Fig. 1. Representation of the general algorithm to achieve optimum.

The trend for obtaining optimum is beyond human will and consists in finding the solution that, according

to a purpose and based on a clearly defined criterion, is the best of all possible solutions.

Optimization is a study and analysis of a problem at the end of which is obtained a such a result that, compared with other outcomes, is the most appropriate, most suitable and based on which a technical and economic decision can be taken.

An optimal result is the best result that is achieved after studying and solving a problem. This result is obtained within the scientific and technical limits that are specific to the moment the study is being done. Decisions in any area of economic activity can be taken based on an optimum result.

Such an approach, applied on the management and coordination activity, includes the decision factors and analysis of the phenomenon items (fig. 1).

Analysts identify, scientifically, a sum of good solutions and managers choose the optimum.

In the case of railway transport, it is necessary to conduct the analysis both for cargo and passengers transport, in three directions:

- requirements analysis:
 - for the primary geographical framework (location of the objectives);
 - for the current and future economic situation (industry, agriculture, tourism, education, culture, etc.)
 - for the social situation.
- restrictions analysis:
 - for the secondary geographical framework (environment status);
 - legal and politic framework;
 - manpower and labour means;

- *artificial environment status* (civil and industrial constructions).
- performance analysis:
 - *quality indicators* (fig.2 and fig.3);
 - *quantity indicators*;
 - *safety*;
 - *comfort, cost* etc.



Fig. 2. Passenger railway transport quality.



Fig. 3. Cargo railway transport quality.

Achieving the optimum outcome depends on:

- knowledge level;
- the existing data regarding the problem to be solved;
 - ratio between the specific model and the specific problem to be solved.

The technic and economic activities whose optimization is achieved through mathematical modeling are:

- stock management
- dynamic programming;
- the waiting wires theory etc.

Optimization involves a research activity that is objectified in both theoretical and applicative side.

The theoretical activities involve:

- the scientific, technic, economic and mathematic substantiation of:
 - the principles;
 - the processes;
 - the methods.
- comparing alternative approaches;
- choosing the optimum solution;

and the *applicative* ones involve:

- the ensuring of all the conditions necessary to achieve the optimum;
- the development and enhancement of those elements that maintain or maximize the optimum.

2. MATHEMATICAL FORMULATION OF THE OPTIMUM

In the theoretical research of optimum, choosing the way in which problems are formulated in accordance with their specific, is done in one of these ways:

- achieving the maximum target levels, using available resources – *the result maximization principle*;
- achieving a certain level, using the minimum resources – *the resource consumption minimization principle*;
- combining the two principles;

Formulation of the optimization problems was first done by Euclid and then developed in the XVII and XVIII centuries.

The number of variants found and provided the results to be positive solutions, requires the consideration of a number of additional conditions, that also include the restrictions imposed to the followed system. The combinations of possible variants is reflected in *the objective function* and in *the purpose function*, which need to be minimized or maximized.

Therefore:

$$\min(\max) \{f_i(x_i) | g_j(x_i) = 0; x_i \geq 0\} \quad (1)$$

where: $f(x_i)$ is the *objective function*;

$g_j(x_i)$ – the *restrictive function*;

$i = 1, 2, \dots, n; j = 1, 2, \dots, m; n \geq m$.

In general, the f_i and g_j functions can be random. In the square optimization $f(x_i)$ is a depending on two function, and in the linear optimization, both $f(x_i)$ and $g(x_i)$ are linear functions.

To optimize the activities of the railway transport, depending on the purpose, it is necessary to consider one of the following:

- simultaneous use of multiple optimization criteria;
- criteria used for various possible partial optimals;
- single criteria optimization for management and administration problems;

This is necessary to eliminate the neglect of important issues in report to others that might generate sources of errors and contradictions.

The construction, solving and achievement of an optimization model outcome is not sufficient and does not mean that once the solution is set, the optimum will be achieved by itself. Without the existence of the whole administrative system that a manager leads, a

system that puts in motion all of the mechanisms existing in a transport enterprise, the optimum will not be concretely achieved.

3. RAILWAY TRANSPORT OPTIMIZATION ASPECTS

In the transport activity in general, but especially in railway transport, the problem of optimal organization of work is extremely complex due to the technic and economic factors that influence (in different ways):

- the volume;
- the rithm;
- the quality;
- the economic efficyeny of the transport process.

Therefore, knowing the technical and economic factors of influence and the interdependence between them, can lead to a scientific approach to various phenomena within the railway transport activity.

One of the phenomena characteristic to the railway transport is in the way of existence and action of the

transport needs of customers, expressed in tons cargo or number of passengers, in a known space time system. So, to analyze the needs of transport means to analyze the traffic of passengers or goods.

4. CONCLUSION

Optimizing the management of railway transport, providing better conditions for travel and traveling information for the public, along with the necessary conditions for cargo transport, is a priority of any profile unit. How to achieve these goals depends on the quality the beneficiary is provided and benefits received by the company providing the service.

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