

Stages of Formation of Railway Economic Safety Schemes

Tetyana Tymofyeyeva¹, Natalia Gritsenko¹, Yujia Myroshychenko¹, Iryna Motsna¹

¹Ukrainian State University of Railway Transport, Economy and Management of Industrial and Commerce Business Department, Feuerbach sq. 7, 61050 Kharkiv, Ukraine

Abstract. It is found that the railway economic safety system shall be formed taking into consideration current social changes in the society. There is the comprehensive approach to the formation of railway economic safety schemes. It is found that railway economic safety enforcement shall be the continuous cyclic process to be regularly improved. There is the scheme of execution sequence of railway economic safety management. It is found that while determining railway economic safety, in whole or in part, of each element, quantitative and qualitative evaluation methods shall be used and combined. There is the calculation of railway economic safety based on the determination of aggregate criterion. It is found that the selection of figures upon certain functional elements shall be made based on any threats.

1 Introduction

Under current conditions the matter of railway economic safety enforcement takes the first place. The preliminary conditions of the occurrence of some problems in railway industry became various transformations in national economy that caused transformations in railway business and railway transport, generally. Up to this point, sectors of national economy had stability and forecasting of phenomena of external and internal nature over an extended time frame. Sectors of national economy were protected by state against influence of all negative factors. For railway sector, this fact was the main condition of performance efficiency – supply of the sufficient volume of works as those types of transport to be used in sectors of national economy for transportation of own products were defined irrespective of business demands. Herewith, railway transport was in priority.

Transformations in economy of Ukraine cause both external and internal factors having influence with railway performance both in negative and positive terms.

Under such conditions there is the necessity of timely forecasting and response to any changes both in external and internal environment. The objective necessity of improving the existing system and developing any scheme for its enforcement is the basis of railway economic safety enforcement.

Study of the problem of railway economic safety has been made by such scientists and economists as T. Tymofyeyeva, N. Gritsenko, Y. Myroshychenko [1], T.H.Vasylytsev [2], S.V.Dovbnia [3], S.V.Kavun [4], O.A.Kirichenko [5], V.M.Haiets [6], M.O.Kyzym [6], T.S.Klebanova [6], O.I.Cherniak [6], O.I.Sudakova [7], S.M.Shkarlet [8] and et.al. In their

¹ Corresponding author: timofeeva_ta@ukr.net

work papers the authors describe the problem of corporate economic safety management both in general and in certain elements. The sense of economic safety, its elements, necessity of comprehensive research of this phenomenon and evaluation approaches are of greatest focus.

Without underreport of strong contribution of scientists named, it should be noted that this problem is understudied, thus, the focus is on the study of theoretical principles of the problem that refers to the detection, evaluation and forecasting of railway status development by means of the most essential figures and indicators of its functioning in terms of economic safety enforcement affected by various negative events of external and internal nature.

2 Description of basis

The important figure of railway economic safety is the economic safety level.

The railway economic safety level is the evaluation of resource usage status upon criteria of the railway economic safety level. In order to achieve the highest level, the railway service shall ensure maximum safety of basic functional elements of work.

Thus, the main goal of railway economic safety enforcement shall be the prevention of threats, provision of industrial activity protection and achievement of goals through solving this task: detection of measures and ways to prevent threats, to facilitate or eliminate any sequences of actions.

Any total figures of railway economic safety evaluation shall not be considered as comprehensive and complete. The definition of economic safety is constantly increasing in terms of deeping the knowledge of economic laws and social demands in a certain stage of social development, thus, the system of railway economic safety evaluation is to be improved on the basis of economic science improvement.

Every form of economic threats concerning railway industry has various modifications. Thus, the selection of optimal problem-solving method shall have forecasting nature. And, therefore, it should be concluded that railway economic safety enforcement is the constant cyclic process to be regularly improved. This process is given in the figure 1.

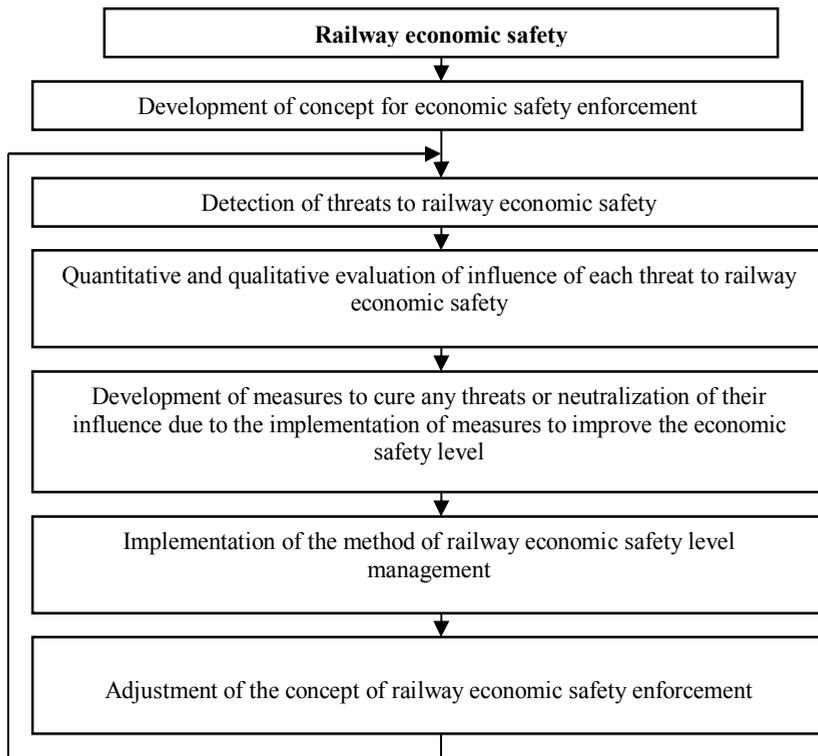


Fig. 1. Scheme of sequence of railway economic safety process management.

The first stage is the development of the concept for railway economic safety enforcement.

The second stage of enforcement is the detection of actual and potential threats to railway economic safety. As many existing threats took place [previously, they are unchanged and they are automatically referred to further periods. But some threats (those not being existed previously) may be detected by means of forecast.

Upon the detection of the list of threats, there is the third stage – consideration of factors that undermine the industrial stability and characteristics. Whereas threats may include several negative factors having influence with industrial operation, and the same factors may be repeated in some threats, it is required to determine all potential intercollerations between factors.

Based on the study actually made, the selection and development of optimal methods of economic safety enforcement is being carried out.

The optimal methods of railway economic safety enforcement are being a set of tools and the system of performance and monitoring that will enable to achieve the highest values of economic safety. It should be noted that the closer to completion the process of development and preparation is, the harder it is to make any significant changes.

Any economic process, object or event is being expressed in quantitative or qualitative form by means of figures. However, when it refers to the figures reflecting the level of railway economic safety, it should be noted that some of them are exposed to physical measurement and some are impossible to express in numerical value. Thus, in determination of railway economic safety, in general and separately upon each element, quantitative and qualitative evaluation methods shall be used and combined.

Quantitative figures shall mean such evaluation methods which enable to create numerical estimates, whereas qualitative figures shall not be reflected in numerical form.

Qualitative methods of analysis are based upon so called heuristic evaluations to be usually used by experts, expert groups and commissions, councils, staff based on experience, intuition and comparison. Qualitative analysis shall be carried out according to procedures the algorithm of which is not fixed forwards, i.e. the context of these procedures are not regulated and they as such do not have any calculative nature.

Quantitative analysis methods are reflected in calculation and computational procedures and determination of quality criteria in numerical form. Herewith, quantitative evaluations may be a result of the qualitative method if at the final stage of qualitative analysis experts determine numerical appraisal (for example, score, coefficient, and predicted value) of qualitative parameter.

Level of railway economic safety will be defined both by means of value judgement reflecting the opinion of certain heads, experts, and by means of objective appraisal based on existing data on railway service.

Level of railway economic safety depends on those figures that completely cover its service and its calculation will be based on the determination of an aggregate criterion (C_k) using a formula:

$$C_k = \sum_{s=1}^n K_j \alpha_j, \quad (1)$$

where k_j - figures of partial functional element of railway economic safety;

α_j - ratio of importance of partial functional elements of railway economic safety ($\sum \alpha_j = 1$);

n – number of selected functional elements of railway economic safety.

The ratio of importance of partial functional elements of railway economic safety shall be defined according to experts' conclusions.

Taking into consideration the fact that the aggregate criterion of railway economic safety depends on the figures of partial functional elements of railway economic safety level and ratio of importance of partial functional elements that include: financial (K_f); technical and technological (K_t); legal (K_p); personnel (K_k); environmental (K_e); informational (K_i) and security (K_o). It is defined using a formula (2).

$$C_k = K_f \cdot \alpha_f + K_t \cdot \alpha_t + K_p \cdot \alpha_p + K_k \cdot \alpha_k + K_e \cdot \alpha_e + K_i \cdot \alpha_i + K_o \cdot \alpha_o, \quad (2)$$

where $K_f, K_t, K_p, K_k, K_e, K_i, K_o$ – values of partial functional elements upon certain elements of railway economic safety;

$\alpha_f, \alpha_t, \alpha_p, \alpha_k, \alpha_e, \alpha_i, \alpha_o$ – figures of the ratio of importance of partial functional elements of railway economic safety.

Ratio of importance of partial functional elements of railway economic safety shall be defined by the expert evaluation method through previous questioning of 12 experts under 10-score scale. The experts were as follows:

- heads of economic services with work experience of 15 years and above – 7 persons;
- specialists with work experience of 10 years and above – 2 persons;
- scientists with academic degree and academic title – 3 persons.

The aggregate criterion of railway economic safety shall be defined based on the received data of ratio of importance of each functional element by means of weighting coefficients using a formula 3:

$$C_k = K_f \cdot 0.217 + K_t \cdot 0.219 + K_p \cdot 0.123 + K_k \cdot 0.136 + K_e \cdot 0.126 + K_i \cdot 0.081 + K_o \cdot 0.098. \quad (3)$$

Prior to the determination of railway economic safety level, it is required to classify figures which will characterize each functional element of railway economic safety. The selection of these figures upon separate functional elements will be defined based on the threats.

The calculation of weighting figures shall be the basis for the determination of economic safety figures and potential upon each criterion and, generally, of economic safety and potential of railway transport.

3 Conclusion

Thus, under current conditions of operation, railway enterprises need to implement any structural transformations that would be consistent with up-to-date peculiarities of competition and ensure the proper level of economic safety and potential. According to the railway economic safety management scheme reviewed, those proposals concerning the improvement of integral part and enforcement of the high level of railway economic safety and, thus, of the state, will be developed.

References

1. T. Tymofyeyeva, N. Gritsenko, Y. Myroshychenko International Journal of Science “Internauka”: Zbirnik naukovich articles. **14 (54)**, 46 -50, (2018).
2. T. Vasylytsev National Institution of Strategical Researches, 385, (2008)
3. S. Dovbnia. Finance of Ukraine, **4**, 91-97, (2013).
4. S. Kavun. Scientific review “Economics of growth”. **3 (43)**, 97–101, (2013).
5. O. Kirichenko. Investments: practice and experience. **23**, 22-24, (2012).
6. V. Geets, M. Kyzym, T. Klebanova, O. Chernak. Monographs, 240, (2006).
7. O. Sudakovaia. Economy: problems of theory and practice: collection of scientific papers, **231(9)**, 165–171, (2012).
8. S. Shkarlet. Synopsis, 24, (2008).