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**DETERMINATION OF ECONOMIC SECURITY COMPONENTS  
AND INDICATORS ON RAILWAY TRANSPORT**

*In the paper an investigation of the existing methodological approaches towards determination of economic security of an enterprise was been carried out as well as developed proposals for a complex analysis using functional components: financial, technical and technological, investment, human factor have been developed.*

*We developed economic security estimation of an enterprise based on the selected functional threshold levels and weighting coefficients. Using the current methodological approach economic security estimation of enterprise allows minimizing risks for railway enterprises during transformational changes.*

*Key words: economic security, railway transport, functional-sectorial areas of economic security*

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**ВИЗНАЧЕННЯ ЕКОНОМІЧНОЇ БЕЗПЕКИ КОМПОНЕНТІВ  
І ПОКАЗНИКІВ НА ЗАЛІЗНИЧНОМУ ТРАНСПОРТІ**

*Проведене дослідження існуючих методичних підходів до визначення економічної безпеки на підприємствах, а також розроблено пропозиції щодо комплексного аналізу із застосуванням функціональних складових: фінансової, техніко-технологічної, інвестиційної, людського фактора.*

*На підставі вибраних функціональних порогових значень та вагових коефіцієнтів розроблено інтегральну базову оцінку економічної безпеки підприємства. Оцінка стану економічної безпеки підприємства із застосуванням даного мето-*

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*дичного підходу дозволяє мінімізувати ризики підприємств залізничного транспорту в період проведення трансформаційних перетворень.*

*Ключові слова: економічна безпека, залізничний транспорт, функціонально-галузева сфера економічної безпеки.*

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### **ОПРЕДЕЛЕНИЕ ЭКОНОМИЧЕСКОЙ БЕЗОПАСНОСТИ КОМПОНЕНТОВ И ПОКАЗАТЕЛЕЙ НА ЖЕЛЕЗНОДОРОЖНОМ ТРАНСПОРТЕ**

*Проведено исследование существующих методических подходов к определению экономической безопасности на предприятиях, а также разработаны предложения по комплексному анализу с применением функциональных составляющих: финансовой, технико-технологической, инвестиционной, человеческого фактора.*

*На основании выбранных функциональных пороговых значений и весовых коэффициентов разработано интегральную базовую оценку экономической безопасности предприятия. Оценка состояния экономической безопасности предприятия с применением данного методического подхода позволяет минимизировать риски предприятий железнодорожного транспорта в период проведения трансформационных преобразований.*

*Ключевые слова: экономическая безопасность, железнодорожный транспорт, функционально-отраслевая сфера экономической безопасности*

**General problem definition.** In terms of planned economy, when the state proprietary form was dominant, the state was regulating economic processes through rigid centralized administrative measures. Such processes as unfair competition, industrial espionage, corruption, second economy were present, but in smaller scale than now. At the same time the enterprises were not necessary to pay attention to their economic security. The state, by redistribution of national income, granting benefits, grants, subsidies, artificially maintained even loss-making enterprises.

The transition to a market economy, emergence of a large number of enterprises of different organizational forms based on different forms of ownership, emergence of various competition methods, inadequate legal framework, weakness of state structures to create normal conditions for business entities, forced enterprises to pay special attention to ensure their economic security. In the current economic situation, manufacturing units have full economic independence. They determine their economic policies, create portfolio, organize production and marketing, bear responsibility for business results. All this actualizes the problem of economic security in today's business environment.

This problem is actual for rail transport enterprises that are currently operating under a constant exposure to external threats. As the largest entities that affect the efficiency of industrial, agricultural, construction and other sectors of Ukraine, they suffer many negative

factors, such as: almost 100% wear of basic means, especially vehicles, inefficient state policy in the field of transport, critical lack of public funding for industry issues, and so on. In such circumstances, the problem of economic security management has become actual.

Formation of market relations, transformation of ownership, changes in motivation factors determine the need for new approaches to methodology and organization of economic management in railway transport. In the set of these processes a specific role is paid to ensure an adequate level of economic security as a prerequisite for sustainable operation and achieving national economic growth, its industries and businesses.

Scientific literature has many developments to identify and support national economic security. Some researchers are tending to link national economic security with security of the international economic system and add to its problematic such issues as uneven economic system and economic development, external debt growth, spreading famine, cyclical fluctuations and other aspects of general destabilization of the world economy. Other experts believe that the main issue is to ensure conditions adopted for the most effective development of a particular national economy, including free access to foreign sources of raw materials and energy, stability, foreign investment and guaranteed freedom of goods and services exchange.

Thus, we can conclude that the strategy to ensure economic security is to create suitable conditions for personal living and development, socio-economic and military-political stability in society, and ensuring state integrity, successful standoff against impact of internal and external threats. Now, one of the major challenges for the state transportation system, in our opinion, is to determine goals and strategy of the state regulation to ensure economic security of transport, which includes creation of conditions to maintain this level of traffic. It would provide vital needs of the economy and population in transportation and its willingness to work. In possible emergency situations and to counter these internal and external threats that reduce the economic security of transport. In view of the diagram showed in Figure 1 on presented a diagram describing place of transport component as a separate unit in the national security.

**Analysis of recent research and publications.** Foreign and domestic science and practice gained extensive research experience on economic security of enterprises (Lyannoy G., Kompakov R., Shevchenko, I., Shemayeva L., Kozhevnikov R., Stortseva A. et al.), which fully revealed its management strategy, methodical bases to form units for realization of economic security in enterprises, integrated approaches to its assessment, etc. Unsolved issues represent substantial part of the general problem. However, some aspects of economic security in enterprises, including rail transport, in current economic development conditions were not revealed.

**Object and purpose of the article.** The article aims to study the existing international trends to ensure economic security for enterprises and develop proposals for a comprehensive analysis and evaluation of the integration basis for economic security in rail transport enterprises.

**Basic material.** According Shemayeva L.G., the content of economic security in enterprises is revealed through ensuring implementation of strategic interests of the enterprise based on use of the environment using productive interaction with the subjects of the environment [1]. Thus, an economic security of the economic entity is an economic entity specification that reflects its ability to implement their strategic economic interests in certain environmental conditions due to protection against existing and potential threats and use of opportunities provided environment. Economic security, by definition Lyannoy G. [2] – a state of its protection from negative influence of external and internal threats, destabilizing

factors. External threats and factors include: illegal activities of criminal organizations, competitors, companies and individuals engaged in industrial espionage or fraud insolvent business partners, previously dismissed employees for various reasons, as well as offenses of corrupt elements represented by law enforcement and control agencies. Internal threats and factors include passivity (including intentional and unintentional) of employees, that contradict interests of its business, which may result in economic damage, leakage or loss of information resources (including information constituting trade secrets), undermining its business reputation in the business circles, problems in relations with actual and potential partners, conflicts with competitors, law enforcement and control agencies, etc. Quantitative and qualitative analysis of the above threats suggests that reliable protection of economy of any enterprise is possible only in case of integrated and systematic approach to its organization. Given the range of possible threats to economic security organization, all types of resources involved for achieving economic and social goals of the organization shall be protected. The following directions are outlined:

- Physical security of business facilities: buildings, vehicles, machinery, inventory, material and financial resources;
- Information security, protection of information networks, resources, software, and intellectual property and other intangible assets, including property interests of participants in entrepreneurship;
- Legal security, which includes competent execution of order and business environment;
- Safety of personal, security, personal security of entrepreneurs, top management, business relationships.

Ensuring economic security for production activity requires creation of its own security system aimed at early detection and prevention of dangers and threats, ensuring the objective of the enterprise. Realization of this goal is based on solving a range of tasks, including – identification of actual and forecasting potential dangers and threats and ways to prevent them, mitigation or elimination of their consequences, analysis effort and resources needed to provide security, and so on.

The economic security system can be defined as a linked set of special structures, tools, methods and measures to ensure of business security against internal and external threats. In this context, the system can be characterized by a set of managerial, insurance, legal, economic, security, operational, judicial and other measures to protect businesses from unlawful attacks, avoid or minimize material and other losses [3].

The main tasks of economic security are as follows: protect the legitimate rights and interests of the company and its employees; data collection, analysis, evaluation and developments prediction; investigation of partners, customers, competitors, candidates for the job; detection, prevention and suppression of possible unlawful activity and other negative actions of enterprise employees to the damage of its security; preservation of assets and information; receiving the necessary information to develop the optimal managerial decisions on strategy and tactics of economic activity, etc.

The basic principles and their implementation in enterprise's security will increase its effectiveness [4]:

- 1) consistency – creation of such security system that would ensure security of the enterprise, its assets, personnel, information from different areas against dangers and threats, force majeure. All employees of the enterprise shall be involved in ensuring security. Security software of the enterprise shall be an organizational form of complex use of capabilities and means;

2) timeliness – detection of various destructive factors, measures to prevent their harmful actions and damage to the enterprise;

3) continuity – security system shall be created so that it always active, protecting enterprise's interests at risk;

4) planned nature – organization of the system security. Activities to ensure security shall be organized based on a single idea defined in the complex program and specific plans for certain areas and types of security.

Main elements of enterprise's security system are: 1) protection of trade secrets and confidential information; 2) computer security; 3) internal security; 4) security of buildings and structures; 5) physical security; 6) technical security; 7) security communications; 8) security of cargo and persons; 9) environmental security; 10) competitive intelligence, etc.

Methods of constructing a system of economic security includes the following steps:

– study of specific business enterprise segment, which it occupies in the market, staffing, and familiarity with the staff;

– analysis of internal and external threats to economic security of the enterprise and study information about crises, their causes and ways of settlement;

– audit of existing facilities to ensure safety and compliance analysis of detected threats;

– modeling a new system of economic security: development of a plan for addressing the identified deficiencies during the audit; preparation of proposals on improving economic security (including creation of security service for the enterprise, if such is missing, or security system based on it, mechanisms to ensure its development and organizational structure of the system), calculation of all kinds of necessary resources; planning the monthly running costs of the economic security system (budget);

– approval of the new system and budget for its maintenance;

– creation of a new economic security system;

– evaluating effectiveness of the existing system and its improvement.

The main role of economic security system is that it shall have a warning nature, and the main criteria for evaluation of its reliability and efficiency are:

– ensuring stable operation of the enterprise, conservation and increase of finances and assets;

– preventing crises, including various emergencies related to the activities of «external» or «internal enemies» [5].

Problems of personal economic security faced by each enterprise not only in times of crisis, but when working in a stable economic environment, the set of solved targets substantially differs.

During consistent functioning mode when solving the economic security tasks the enterprise focuses attention on maintaining normal rhythm of production and marketing to prevent material or financial loss, unauthorized access to proprietary information and destruction of computer databases, etc. In crisis periods, greatest risk for the enterprise poses destruction of its potential (industrial, technological, scientific, technical and human) as the main factor of its activity, its opportunities. The main set of problems and underlying causes of the current troubles many industrial enterprises are concealed in: lack of demand for products in domestic and foreign markets, its low competitiveness; unavailability of investment resources; customs and currency barriers. At this time it is necessary to develop an economic security strategy that shall include: description of the external and internal threats to economic security of the enterprise; identification and monitoring of the factors that enhance or destroy stability of the socio-economic situation in the short and medium term; development of economic policy that covers accounting

mechanisms affecting the economic security factors; direction of the enterprise's activity to implement the strategy.

Complex economic security system is a set of interrelated measures of legal organizational character carried out by special bodies, agencies, departments of the economic entity established to protect the vital interests of individuals, enterprise and the state against illegal actions by actual or potential physical or legal persons that may lead to significant economic losses and economic growth in future.

State transportation system that meets the economic security requirements is characterized by a set of certain key resource and rising components of the stable system, beyond the thresholds where the system loses the ability to play, and the cost for its maintaining in working condition are growing exponentially.

Proportion of state's economic security components, including the transport system, is not yet developed. In order to characterize economic security, it is proposed to carry out a comprehensive analysis using functional components: financial; technical and technological; investment; human factor. The financial component of economic security in rail transport describes its financial stability. To assess financial stability it is necessary use a general formula of the financial condition stability for each legal entity:

$$J^S + K \geq F + U + Z; \quad (1)$$

where  $J^S + K$  – amount of equity capital and reserves equal to their liabilities and accounts payable;

$F$  – fixed assets;  $U$  – reserves;  $Z$  – expenses and losses.

This dependence defines two main areas of financial stability assessment regarding extent of coverage and sources of inventory costs or fixed assets. The most common indicators of financial stability is balance or lack of funds to cover the costs calculated as the difference between the value of the expenditures and sources. Depending on the degree of coverage it is necessary to consider three parameters characterizing:

- availability own sources:

$$E^S = J^S - F - U; \quad (2)$$

- availability of own and long term sources:

$$E^T = J^S - F - U + K^T; \quad (3)$$

- availability of general sources:

$$E^O = J^S - F - U + K^T + K^t; \quad (4)$$

These parameters correspond to three indicators of financial stability:

- balance or lack of own sources:

$$\pm E^S = F^S - Z; \quad (5)$$

- balance or lack of own and long term sources:

$$\pm E^T = E^T - Z; \quad (6)$$

- balance or lack of overall value sources:

$$+E^O = E^O - Z. \quad (7)$$

With these three indicators it is necessary to define a three-fold indicator of financial situation:

$$S_{(E)} = \{ S_1(\pm E^S), S_2(\pm E^T), S_3(\pm E^O), \quad (8)$$

$$S_i = \begin{cases} 1 & \text{if } E^{S(T,O)} > 0 \\ 0 & \text{if } E^{S(T,O)} \leq 0 \end{cases}, \quad (9)$$

Based on this indicator it is possible to distinguish 4 types of financial stability: absolute stability = (1;1;1); normal stability = (0;1;1); unstable financial condition = (0;0;1); critical financial condition = (0;0;0).

It should be noted that the practical application of the financial stability method requires additional testing to find those specific examples of business activity.

Technical and technological component is characterized primarily by technical status and movement of key fixed assets that are determined on the basis of indicators:

Movement indicators:

input factor; update factor; output factor; elimination factor; extension factor.

Technical state indicators:

factor of wear and aging assets; fitness factor; replacement factor.

Efficiency indicators:

assets ratio of fixed assets; capitalization ratio of fixed assets.

Among all above mentioned indicators the main is the factor of aging and wear of fixed assets that characterizes their condition.

As a thresholds it is possible to take the following values of the factor by determination of their classes (Table 1).

*Table 1. Degrees of depreciation of fixed assets*

Condition class of fixed assets	Depreciation degree of fixed assets
Exhilaration	from 0 to 25% minor wear
Rise	from 25 to 50% average wear
Depression	from 50 to 75% major wear
Crisis	from 75 to 100% critical wear

In modern conditions, railway transport works with fixed assets depreciated on about 80%. In the absence of regulatory updates, only since Ukraine's independence, depreciation has increased by 34 points (from 46%). The level of rolling stock depreciation that exceeds a critical value. Yes, traction rolling stock is depreciated by 89%, cargo cars – 70.7%, passenger cars – 82.9%. Traction rolling stock and freight cars exceeded its shell life is still massively used. All this leads to accumulation of physically and morally obsolete equipment, reduces carrying possibility of rail network, impairs security conditions, depreciation rate on fixed railway assets is 55%. Number of rail kilometers with overdue repairs has increased in recent years and reached 6400 km (30% of the total length).

From 324 mio wooden railway sleepers almost 38% are nonserviceable. As a result train speed is limited, there is a real threat to passengers and technogenic accidents.

The railway operates 4856 (35%) beam structures that have a lifespan of 50 years or more; 905 (11.5%) railway bridges are defective or weak. This requires an increase in funds for routine maintenance and repairs.

Aging of fixed electricity and communication assets is also faster than their restoration and modernization.

The following is operated as overdue: 81% of traction substations; 38% of contact networks; 57% of railway switches; 84% of ATO are obsolete, of which 63% are physically worn out.

Investment component of economic security is closely related to the previous component. The threshold for this indicator is the minimum required investment for the annual

renewal of fixed assets, enabling expanded reproduction. It is hard to determine the threshold value of this index by expertise, because it depends on many factors and general state of national economy.

The European countries experience says that the level of investment in development of rail transport shall constitute 10 – 11% of the fixed assets cost. For Ukraine this value shall be clarified in additional researches. Presence of significant reserves of freight railway capacity in post-Soviet times has formed a constant view of their infinity. And in fact, all these years, railway transport was not updated, but credited development of the state and budget revenues as well as supported many charity events.

Since 2000, when reserves of transport capabilities have substantially exhausted, the rail transport needs have been met only by one third. Furthermore, even these funds were concentrating on investments in «prestigious and demonstrative», but not primary objects (South Station, rail and road bridge across Dnipro in Kyiv, passenger station complex of Darnytsia, Kyiv – Odessa highway, purchase Hyundai trains, etc.) and not in replacement of worn fixed infrastructure and rolling stock assets.

The main reason for the investment «hunger» in the railway sector is violation of the simple reproduction principle of fixed assets at the expense for depreciation for renovation. During inflation process on has allowed considerable (more than 4 times) underrun of book value of fixed assets comparing to their real value that has led to an adequate reduction of depreciation and unwarranted increases in profit from ordinary activities, 75 – 80% of which were deducted to the budget in the form of expenditures.

Currently, when traffic volumes are increasing, the need for renewal of logistics in rail transport is particularly acute. For fixed assets renewal, investment needs until 2020 are about 268 bln. UAH, including the need to procure rolling stock to the amount of 178,7 bln. UAH, in particular: freight cars – 65 bln. UAH; locomotives – 68 bln. UAH; passenger cars – 37 bln. UAH; electrical and diesel trains – 8,7 bln. UAH.

at the same time, the foretasted investments will give only 50 bln. UAH. (20% from the necessary amount), thus, the deficit is expected to be 194,5 bln. UAH.

The economic component security dealing with human factor is the most important component of economic security.

It is reasonable to propose the following structure of major indicators groups.

1. Quantitative structure indicators group and its dynamics includes such factors as average number of personnel, its structure, rates of employee turnover, age and qualification.

2. Personnel use efficiency indicators group is estimated rates by labour productivity in absolute and finance measurements, capital-labor ratio, intensity of its load during working hours, etc.

3. Motivation and social conditions indicators group contains indicators of average salaries, bonuses, social benefits, social conditions, etc.

4. Intellectual potential indicators group is an educational structure of employees involved in research activities, preparation of articles, essays, dissertations, availability of patents, innovations, etc.

Based on the selected functional components of economic security, thresholds and weighting coefficients, calculation table 2 is composed. Using these parameters, the total score is defined by the formula:

$$Z=Z_i+ K_i$$

where  $Z$  – number of scores for  $i$ -component according to factual value of the indicator;

$K_i$  – weight coefficient of the indicator.



## ЗАЛІЗНИЧНИЙ ТРАНСПОРТ

*Table 2. Integrated scoring table of economic security*

Functional components	Weight coefficients	Scores			
		from 8 to 10	from 5 to 8	from 2 to 5	from 2 to 2
Financial	$K_{\phi}$	Abs.	Norm.	Unstable	Crisis
Technical and technological	$K_{\pi}$	Renovation	Rise	Depression	Crisis
Investment	$K_i$	Abs.	Norm.	Unstable	Crisis
Human factor	$K_{\pi}$	Abs.	Norm.	Unstable	Crisis
Total					

Depending on the total score, one of 4 classes of enterprise's economic security is determined (Table 3).

*Table 3. Classes of enterprises*

Class	Scores	Comments
1st	30-40	Enterprise with high economic security level, table to possible crisis
2nd	20-30	Enterprise with normal economic security level, threats consequences will be substantial, but can eliminated
3rd	10-20	Enterprise with problematic economic security level. Crisis consequences can be catastrophic
4th	0-10	Enterprise of increased risk almost incapable to work at the time being

Assessment of the economic security level in enterprises must be supplemented by comments concerning dynamic trends of its state.

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