

Modern approach to the comprehensive assessment of production performance of transport companies

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Abstract. Currently it is becoming more and more difficult to assess the efficiency of production of any transport company. This problem requires a thorough scientific analysis of functions and activities of such a complex economic facility. In this case, it is necessary to consider not only the complexity of the internal structure of the enterprise, but also the peculiarities of its interaction with the external environment. The existing methods are poorly adapted to industry specifics, are built on a limited number of parameters, and do not allow quickly and comprehensively assessing the detail of the company with the definition of problem areas. A systematic integrated assessment is needed that will allow simultaneously and effectively solving the current tasks of the enterprise, flexibly rebuilding after its production program and, at the same time, considering its long-term development. The practical significance of the study is the possibility of using the developed modern methodology for a comprehensive assessment of the production performance of a transport company for its further optimization. The obtained results will allow quantitatively and qualitatively monitoring the current state of the transport company, identifying bottlenecks, and justifying further directions of its improvement and development based on such calculated information.

1 Introduction

The efficient performance of a transport company can only be ensured in conditions of optimal consumption of production resources, minimum costs, and maximum profitability. That is why the study of the problem of assessing the efficiency of the transport company in modern conditions is of great theoretical and practical interest.

In practice, the efficiency of any transport company, be it freight forwarders or seaports and terminals, is most often determined by primitive analytical and expert methods, when the results of several indicators over a certain period are compared. Such an elementary evaluation technique is not always informative and necessary.

It is not enough to consider only financial or economic indicators, it is also necessary to consider other indicators in the future, which depend on the specialization of the activities of the transport company, port or terminal, work and development strategy, equipment of transshipment and transport equipment, work technology, infrastructure development, etc. A new approach to assessing the efficiency of production activities is needed, which will allow simultaneously and effectively solving current problems, flexibly rebuilding after the production program of the enterprise and, at the same time, considering its long-term development [1, 2, 3].

Therefore, it is proposed to use a comprehensive assessment of the activities of the transport company,

which presents a comprehensive study, i.e., a simultaneous and coordinated study of the aggregate of criteria indicators reflecting various aspects of production. Its use in analyzing the performance of a transport company will make it possible to assess the dynamics and stability of its economic growth, the efficiency of using economic and production potentials, the position and reputation of the enterprise on the market among customers and competitors, as well as its ranking among other transport companies [2, 4].

2 Materials and Methods

Modern economic literature does not contain any methodological approach to building a system of indicators that would comprehensively characterize the efficiency of the enterprise.

There are two approaches to the selection of a methodology for studying the efficiency of the transport company: the results of financial and economic activities are presented in the form of a system of private indicators; the results of financial and economic activities are characterized by a generalizing indicator. Often both approaches are used simultaneously.

To obtain a comprehensive assessment, all indicators of the enterprise's activity are used, which can be combined into a single integral indicator that allows measuring the difference between the analyzed enterprise and the other and planning its activities by analyzing each individual indicator included in the general system [4, 5].

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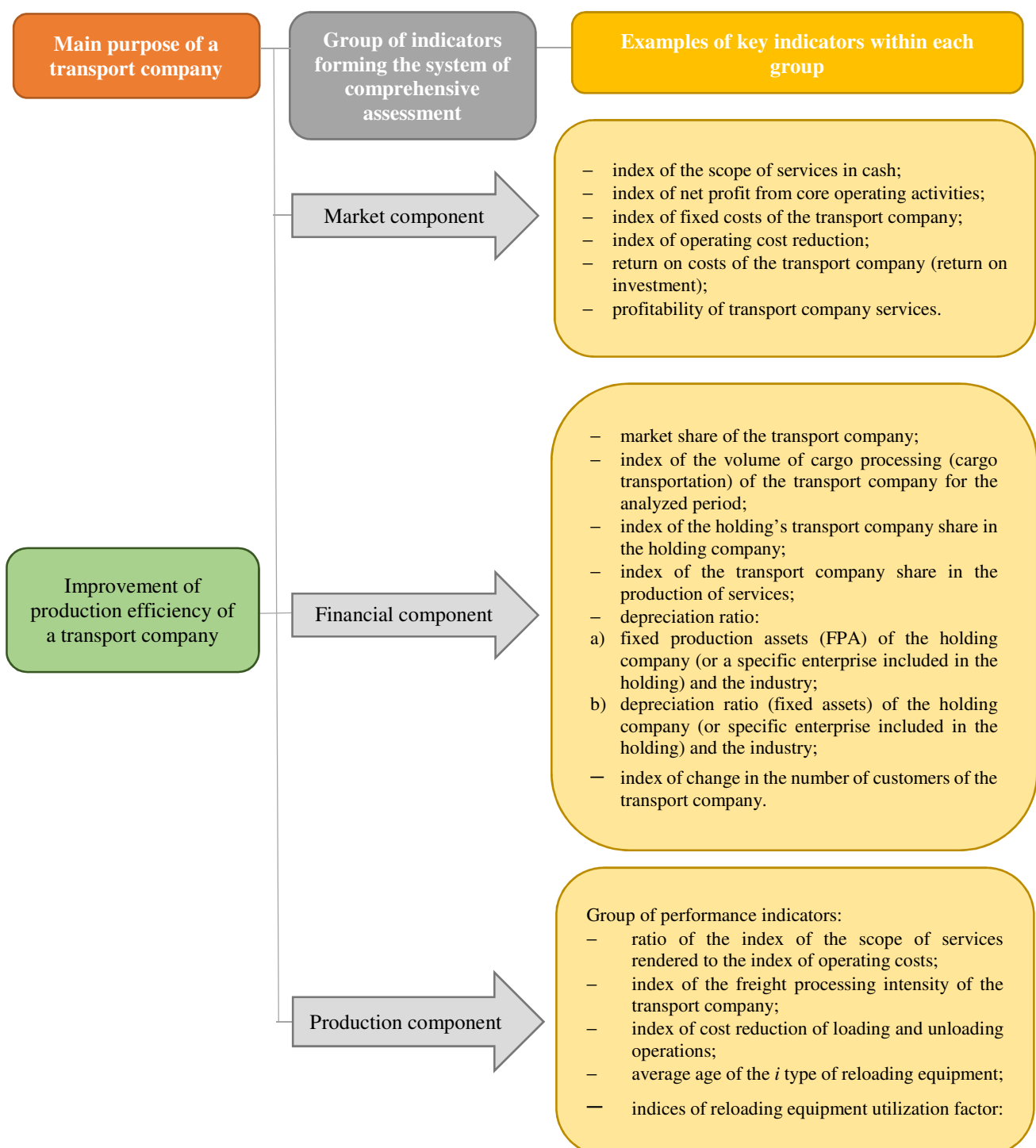
The above also applies to transport companies. At the moment, there is also no one generally recognized approach to assessing the efficiency of their activities, especially regarding its production component. One of the most important prerequisites is the development of a comprehensive assessment of the performance of the transport company with the system of criterial indicator constants that would allow analyzing, planning and justifying the result of this activity in more detail in the context of a rapidly changing external environment.

The system of criteria indicators is a system with the identification of key indicators necessary for analyzing and monitoring the efficiency of an organization, the main aspect of which is the study of the current strategy of the enterprise, as well as its adjustment and methods of implementation.

The existing methods are poorly adapted to industry specifics, are built on a limited number of parameters and do not allow quickly and comprehensively assessing the detail of the company with the definition of problem zones.

Today's methodology for assessing the activities of a transport company is partially based on the system of balanced indicators developed by Dr. Robert S. Kaplan and David P. Norton focusing on the market (client) and financial components as key [2, 3, 6, 7].

But it is also necessary to consider the production component of the analysis, paying attention to the technical, technological features of the transport company, the information and investment group of indicators for a more comprehensive new system assessment of efficiency (Fig. 1).



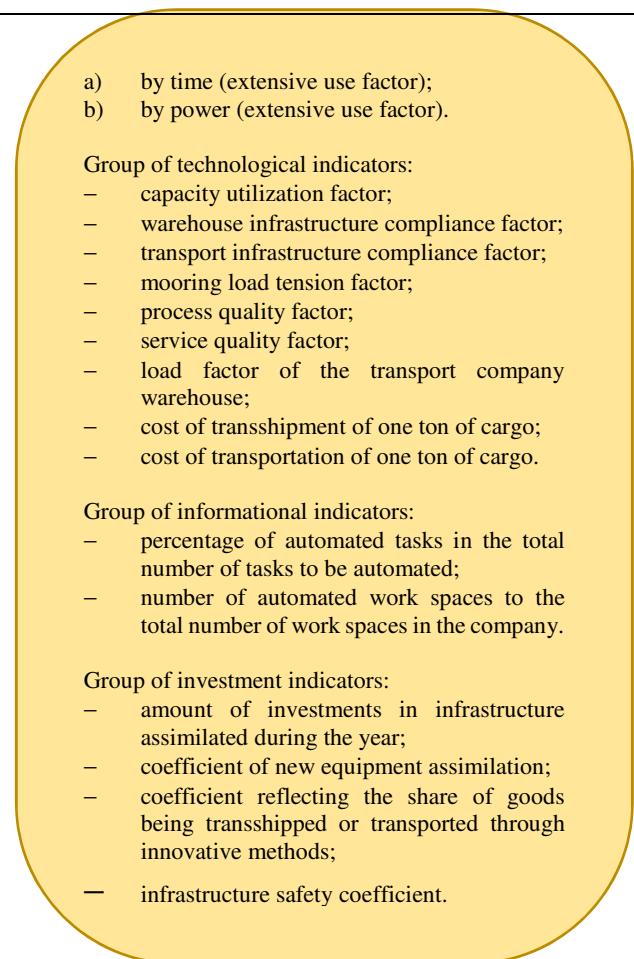


Fig. 1. Comprehensive methodology for assessing the production activities of a transport company with the identification of criteria indicators of its efficiency.

The comprehensive assessment considers new indicators for transport companies, the high level of which will allow achieving good results in the operational (production) sphere and, therefore, providing high-quality services to the company's customers [3].

It should be noted that the comprehensive analysis is extremely important, since the normal functioning of a transport company requires a balance of all indicators determined through the assessment of each component of its activity (Fig. 2).

3 Results

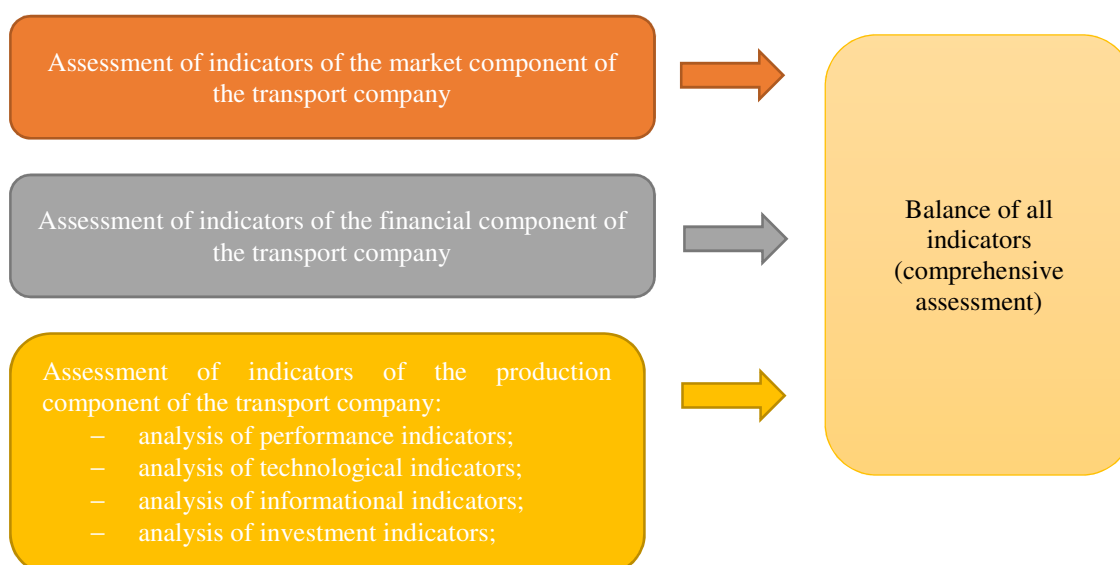


Fig. 2. Components of the balance of indicators of the comprehensive assessment of the transport company performance.

In addition to the above private indicators, the extensive assessment requires the generalizing index of the effective development of transport company I_{ii} . It is characterized by the dependence of the dynamics of each indicator (growth rate) over a fixed period of time. The formula for calculating the proposed effective development index will be as follows:

$$I_{ii}(t) = \frac{1}{N} \sum_{i=1}^N \left(\frac{x_{i(t)}}{x_{i(t-1)}} \right) \cdot 100,$$

where $x_{i(t)}$ – index at time t ; N – amount of indicators in the group; i – number of the indicator in the group.

The comprehensive assessment of the efficiency of production activities of transport companies should be performed in stages and sequence (Fig. 3).

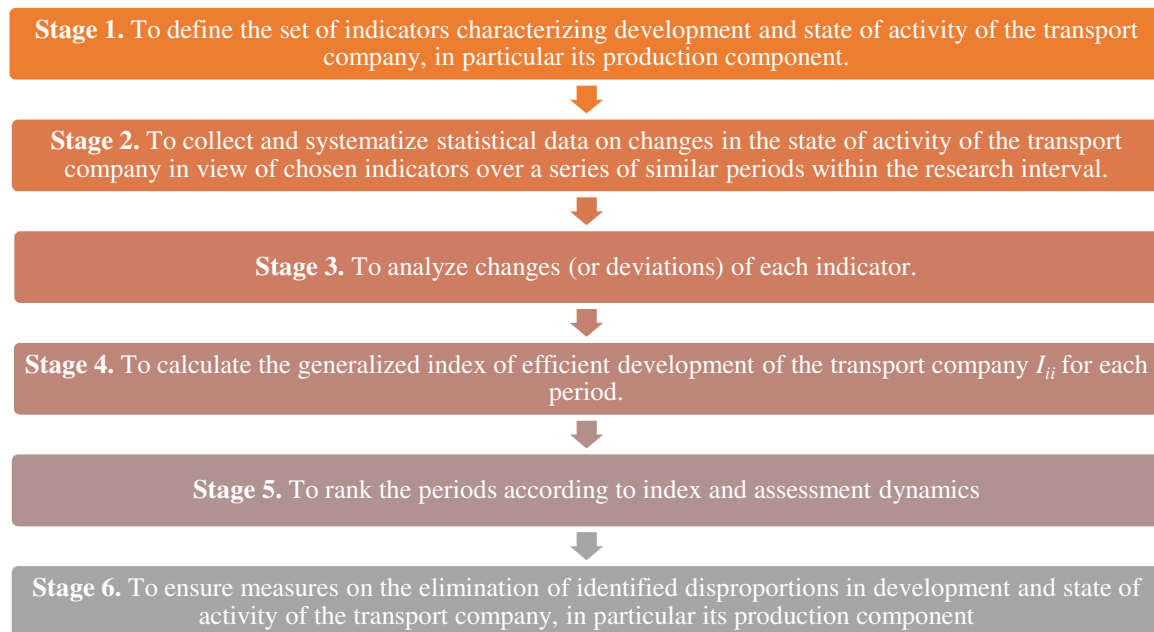


Fig. 3. Algorithm for the comprehensive assessment of production performance of transport companies.

4 Calculations and Discussion

Table 1 suggests criteria for the comprehensive assessment of production efficiency, which must be considered when analyzing the activities of transport companies according to the above algorithm.

The developed system of comprehensive assessment of the performance of the transport company makes it

possible to identify the influence of factors, the reasons that cause them and apply relevant corrective measures to improve the efficiency of the functioning and development of the company's activities, and its productive component.

Table 1 Criteria for the comprehensive assessment of the production efficiency of a transport company and their calculation methods¹

n/n	Indicator	Calculation method	Symbols and measuring units
1. Market component			
1.	Market share of the transport company	$Sh_{trans.comp.} = \frac{V_{trans.comp.}}{V} \cdot 100\%$	$V_{trans.comp.}$ – volume of services of the transport company in a given market segment (in a given basin) in the reporting year (t; MU); V – total volume of services of a given market segment (a given basin) in the reporting year (t; MU).

¹ Transport enterprises include stevedoring companies, terminals, freight forwarding enterprises. The indicators of the comprehensive assessment are chosen taking into account the specifics of their activities.

2.	Index of the volume of cargo processing (cargo transportation) of the transport company for the analyzed period	$I_{Q_{cgo}} = \frac{Q_{cgo \text{ anal. per.}}}{Q_{cgo \text{ ref. per.}}}$	$Q_{cgo \text{ anal. per.}}$ – quantity of cargo processed or transported by the transport company during the analyzed period (t); $Q_{cgo \text{ ref. per.}}$ – quantity of cargo processed or transported by the transport company for the reference period (t).
3.	Index of the holding's transport company share in the holding company ²	$I_{shold.comp.} = \frac{S_{enter_i}}{S_{hold.comp.}}$	S_{enter_i} – share of the enterprise included in the holding; $S_{hold.comp.}$ – holding company share.
4.	Index of the transport company share in the production of services	$I_{stransp.comp.} = \frac{S_{transp.comp.anal.p.}}{S_{transp.comp.ref.p.}}$	$S_{transp.comp.anal.p.}, S_{transp.comp.ref.p.}$ – share of the transport company in the industry market in the analyzed and reference periods.
5.	Depreciation ratio: a) fixed production assets (FPA) of the holding company (or a specific enterprise included in the holding) and the industry; b) depreciation ratio (fixed assets) of the holding company (or specific enterprise included in the holding) and the industry;	a) $R_{deprec.} = \frac{Deprec.FPA_i}{Deprec.fix.assets}$ b) $R_{deprec.} = \frac{Deprec.fix.assets_i}{Deprec.ind.}$	$Deprec.FPA_i, Deprec.fix.assets$ – depreciation of the FPA of the holding company (or a specific enterprise included in the holding) and the industry (monetary unit); $Deprec.fix.assets, Deprec.ind.$ – depreciation of fixed assets of the holding company (or a specific enterprise, which is part of the holding) and the industry (monetary unit).
6.	Index of change in the number of customers of the transport company	$I_{cl.} = \frac{N_{cl1}}{N_{cl0}}$	N_{cl1} – number of customers of the transport company in the reporting year (people; number of companies); N_{cl0} – number of customers of the transport company in the previous year (people; number of companies).
2. Financial component			
1.	Index of the scope of services in cash	$I_V = \frac{V_{transp.comp.}}{V} \cdot C$	$V_{transp.comp.}$ – volume of services rendered by the transport company in a given market segment (in a given basin) in the reporting year (t); V – volume of services rendered by the transport company in a given market segment (in a given basin) in the previous year (t); C – cost per unit of service (MU).
2.	Index of net profit from core operating activities	$I_{netpr} = \frac{V_{netpr1}}{V_{netpr0}}$	V_{netpr1} – net profit from the main activities of the transport company in the reporting year (MU); V_{netpr0} – net profit from the main activities of the transport company in the previous year (MU).

² This indicator should be calculated if the transport company is merged into a holding or a group of enterprises.

3.	Index of fixed costs of the transport company	$I_{fix.c} = \frac{C_{comp1}}{C_{comp0}}$	C_{comp1} – fixed costs of the transport company in the reporting year (MU); C_{comp0} – fixed costs of the transport company in the previous year (MU).
4.	Index of operating cost reduction	$I_c = \frac{Ce_{anal.p.}}{Ce_{ref.p.}}$	$Ce_{anal.p.}, Ce_{ref.p.}$ – operating costs (costs for fuel and electric energy, depreciation, repair, wages fund of mechanization workers) on loading and unloading operations in the analyzed and basic periods, (MU)
5.	Return on costs of the transport company (return on investment)	$R_c = \frac{NP}{\sum c} \cdot 100\%$	NP – net profit of the transport company in the reporting year (MU); $\sum c$ – sum of all costs of the transport company (MU).
6.	Profitability of transport company services	$R_{ps.} = \frac{GP}{C_{serv.}} \cdot 100\%$	GP – gross profit of the transport company in the reporting year (MU); $C_{serv.}$ – cost of services (MU).
3. Production component			
Group of performance indicators			
1.	Ratio of the index of the scope of services rendered to the index of operating costs	$R = \frac{I_q}{I_c}$	I_q – indices of the volume of rendered services (ratio of the volume of rendered services for the analyzed period to the base period); I_c – cost index (ratio of costs for the analyzed period to the base period).
2.	Index of the freight processing intensity of the transport company	$I_{Qco} = \frac{Q_{coanal.p.}}{Q_{co tech.}}$	$Q_{coanal.p.}$ – number of cargo operas for the analyzed period (t); $Q_{co tech.}$ – number of cargo operations according to the technical passport of the transshipment facility (production capacity) (t/h).
3.	Index of cost reduction of loading and unloading operations	$I_{slunop} = \frac{\sum R_{lunop}}{Q_{phys}}$	$\sum R_{lunop}$ – sum of expenses for loading and unloading operations (MU); Q_{phys} – amount of cargo in physical tons passing through the moorage front from one mode of transport to another (t). This indicator can be calculated separately for cargo areas or for the processing of certain goods.
4.	Average age of the i type of reloading equipment: a) bridge cranes $T_{II.K.}$; b) mobile cranes $T_{M.K.}$; c) automotive equipment $T_{asmo.}$	$T_i = \frac{(\sum_j T_{ij})}{N_i}$	T_{ij} – age of j handling equipment of i type (years); N_i – quantity of i refueling assembly (pcs.).
5.	Indices of reloading equipment utilization factor a) by time (extensive use factor) k_{ext} ;	$I_{k ext} = \frac{IT_{act}}{IT_{cal}}$	IT_{fact} – index of actually used time of the loading machines (machine hours);

	b) by power (extensive use factor) k_{power} .	$I_{k_{power}} = \frac{IQ_{fact}}{IQ_{max}}$	IT_{cal} – index of calendar time fund (machine hours); IQ_{fact} – index of the actual quantity of tons of cargo utilized by machines during the reporting period (t); IQ_{max} – index of the maximum possible number of tons of cargo, which can be utilized by machines (t).
Group of process indicators			
1.	Capacity utilization factor	$k_{util.f} = \frac{Q}{C} \cdot 100$	Q – actual cargo turnover (thousand tons); C – possible carrying capacity (thousand tons).
2.	Warehouse infrastructure compliance factor	$k_{wh} = \frac{\min(\sum C_{wh}; \sum C_{total})}{\max(\sum C_{wh}; \sum C_{total})} \rightarrow 1,0$	$\sum C_{wh}$ – total capacity of port warehouses (t); $\sum C_{total}$ – total capacity of the mooring front (t).
3.	Transport infrastructure compliance factor	$k_{transp} = \frac{\min(\sum C_{transp}; \sum C_{total})}{\max(\sum C_{transp}; \sum C_{total})} \rightarrow 1,0$	$\sum C_{total}$ – total capacity of the transportation ground infrastructure of the company (t).
4.	Mooring load tension factor	$k_{znp} = \frac{Q}{\sum l_{np}}$	Q – annual cargo turnover of the company (t); $\sum l_{np}$ – total length of the mooring front (m).
5.	Load factor of the transport company warehouse	$k_{anct} = \frac{Q_{wh}}{\sum S_{wh}}$	Q_{wh} – annual cargo turnover of the warehouse (t); $\sum S_{wh}$ – total area of warehouses (m ²).
6.	Service quality factor	$k_{koefn} = \frac{Q - Q_{non-sec}}{Q}$	$Q_{non-sec}$ – volume of non-secure cargo transshipment (t).
7.	Process quality factor	$k_{koef} = \frac{t_{cw}}{t_{gross}} \rightarrow 1$	t_{cw} – duration of cargo vessel working (days); t_{gross} – duration of gross vessel maintenance (days).
8.	Cost of transshipment of one ton of cargo	$s_{lmload\ oper} = \frac{S}{Q}$	S – operating costs of loading operations (RUB)
9.	Cost of transportation of one ton of cargo	$s_{lmtransp} = \frac{S}{Q}$	S – operating costs of transportation (RUB)
Group of process indicators			
1.	Percentage of automated tasks	$d_{tasks} = \frac{n_{auto}}{N}$	n_{auto} – number of automated tasks (units); N – total number of tasks to be automated (units).
2.	Percentage of automated work spaces	$d_{handmade} = \frac{r_{auto}}{R}$	r_{auto} – number of automated workspaces (units); R – total number of work spaces in the port (units).
Group of process indicators			

1.	Amount of investments in infrastructure assimilated during the year	$I = \sum i_{projects}$	$i_{projects}$ – volume of investments for individual investment (innovative) projects (RUB).
2.	Infrastructure safety coefficient	$k_{sav} = \frac{C - D}{C}$	D – amount of accumulated depreciation (RUB); C – initial cost of infrastructure facilities (RUB).
3.	Coefficient of new equipment assimilation	$k_{ass} = \frac{n_{units}}{N} \cdot 100$	n_{units} – number of new equipment units (units); N – total number of machines in the company (units).
4.	Share of goods being transshipped or transported through innovative methods	$k_{innovat} = \frac{Q_{innovat}}{Q}$	$Q_{innovat}$ – volume of transshipment (transportation) of goods handled (transported) by innovative methods (t).

5 Conclusion

Based on the above it can be noted that standard approaches are used to assess the activities of transport companies. It is necessary to correctly combine market, financial, production indicators into one assessment model, i.e., to apply a more balanced (integrated) approach that considers internal organizational, operational, technological, information and investment features and interests of customers.

The assessment of activities implies the use of a system of indicators that would allow monitoring the dynamics of certain data, and objectively and comprehensively reflecting the activities of transport companies. This assessment model combines all indicators into a single system. Such a system will allow solving problems on time and increasing efficiency.

The assessment of the potential of the transport company requires the comparison of the information and design indicators of the technical equipment of the analyzed enterprise over several years with the maximum achieved in the industry or theoretically possible values characterizing the technical equipment, the degree of its adaptability to innovations and changes in market demand [8]. This comparison makes it possible to determine the reserves of the structure and quality of services, to identify the main directions of the multilateral development of the transport company.

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