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BUSINESS ADMINISTRATION BASED ON ASSESSMENTS OF TOTAL INDUSTRY COMPETITIVENESS

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Abstract

A developing company moves through all life cycle stages, requiring a constant monitoring of the level of competitiveness in order to choose a further development strategy. Based on a modern interpretation of competitiveness as a multifactorial process of nurturing competitive relations, it should comply with the most important condition for its full implementation – competitiveness-oriented business management. In the most general form, competitiveness-oriented management is a conscious human impact on objects and processes with a view to calling the tune to economic development and achieving the desired effect. The paper discusses the stages of implementing a methodology for assessing the competitiveness of an industry enterprise. It primarily focuses on adapting universal metrics of competitiveness to industry and developing the most integrated calculation option. Obtaining total sectoral competitiveness is necessary for a more detailed assessment of the phenomenon, which necessitates the implementation of such comprehensive stages as calculation and conversion of simple metrics into relative values; calculation of group competitiveness indicators; construction of a polygon of industry competitiveness; integral assessment of competitiveness. The subject of research is a container terminal and the details of assessing its competitiveness. The proposed methodology for assessing competitiveness is focused on the industry practices and provides for the calculation and assessment of five groups of metrics: competitiveness of production base; competitiveness of production processes; competitiveness of financial processes; efficiency of sales and promotion; competitiveness of services. The paper proposes to use a model of managerial impact with an appropriate level of intensity, focused on total business competitiveness.

Keywords: Competitiveness, simple metrics, polygon of competitiveness, integral index, managerial impact

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1. Introduction

In a highly competitive transport market, the focus of industry management on the use of science-based approaches to assessing and strengthening competitiveness is becoming increasingly important.

Foreign and Russian authors studied the issues of competitiveness (Azoev & Chelenkov, 2000; Fatkhutdinov, 2005; Hamel, 2002; Learner, 1984; Mescon et al., 1993; Porter, 2005; Yudanov, 2001). Porter (2005) defined competitiveness as the ability of a certain object or subject to meet the needs of those interested in comparing it with other similar subjects or objects. Mescon et al. (1993) called competitiveness a relative characteristic that recognizes the level of development of a given firm relative to competing firms in terms of customer satisfaction and the efficiency of production and economic operations. According to Fatkhutdinov (2005), competitiveness is a property of an entity, characterized by the degree of real or potential needs to be satisfied as compared with similar entities on the market.

2. Problem Statement

However, these definitions of competitiveness, as well as other definitions proposed by the above authors, do not sum up the processes characteristic of the transport industry, nor do they essentialize the phenomenon of competitiveness at such a special form of transport company as a container terminal.

A poorly depicted portrait of container terminal in defining the concept of competitiveness in scientific literature is accordingly a poor guide to the choice of industry criteria for its assessment. The existing methods for assessing the competitiveness of a transport company showed that they all have certain shortcomings questioning their application to assess the performance of container terminals. Firstly, some of the methods require a lot of information that businesses do not always have. Secondly, some individual competitiveness metrics duplicate production and financial indicators, but are calculated in non-comparable values and therefore cannot be assessed in an integrated way. Thirdly, the methods are not adapted to the container transshipment industry, they are universal, so service quality indicators are insufficiently elaborated and are not very informative.

3. Research Questions

A container terminal operates as a transshipment (stevedoring) facility and is a geographically designated point featuring a set of transport vehicles and structures for performing operations related to arrival-departure, loading-unloading, import-export, sorting and temporary storage of containers, as well as commercial and technical services to maintain these operations.

The competitiveness of a container terminal as a phenomenon has been little described in the scientific literature. However, the following definition can be found saying that it is a relative attribute indicating the ability of a terminal operator to meet full customer's transshipment requirements within the end-to-end supply chain, to retain current cargo flows, and to win new by competing in both domestic and foreign markets at the expense of quality improvements and in response to external conditions (Abolentseva, 2008).

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4. Purpose of the Study

The paper aims to develop a system for assessing the competitiveness of container terminals and use it to guide managerial actions on enhancing the level of competitiveness.

5. Research Methods

The following scientific methods were used, namely: analysis (including economic, systemic), synthesis, comparison, description, method of scientific abstraction, model building, expert methods, etc.

6. Findings

6.1. Development of a modern methodological approach to assessing the competitiveness of container terminals

Having explored a list of shortcomings found to be present in universal methods for evaluating the competitiveness of an enterprise, it is necessary to highlight the main requirements for the system to be developed to assess the competitiveness of a container terminal (Radionova, 2019). The assessment system should be based mainly on quantitative methods, which will reduce as far as possible any subjective slanting in evaluation; the system of indicators should be adapted to the activities performed by container terminals; competitiveness is a complex characteristic, so it should be expressed through a system of generalizing metrics – simple, group, integral; the system of indicators should be visual, so, along with quantitative assessments, graphic evaluation methods should be used.

In accordance with the approach proposed, the competitiveness of a container terminal should be assessed in four stages, as shown in Figure 01.

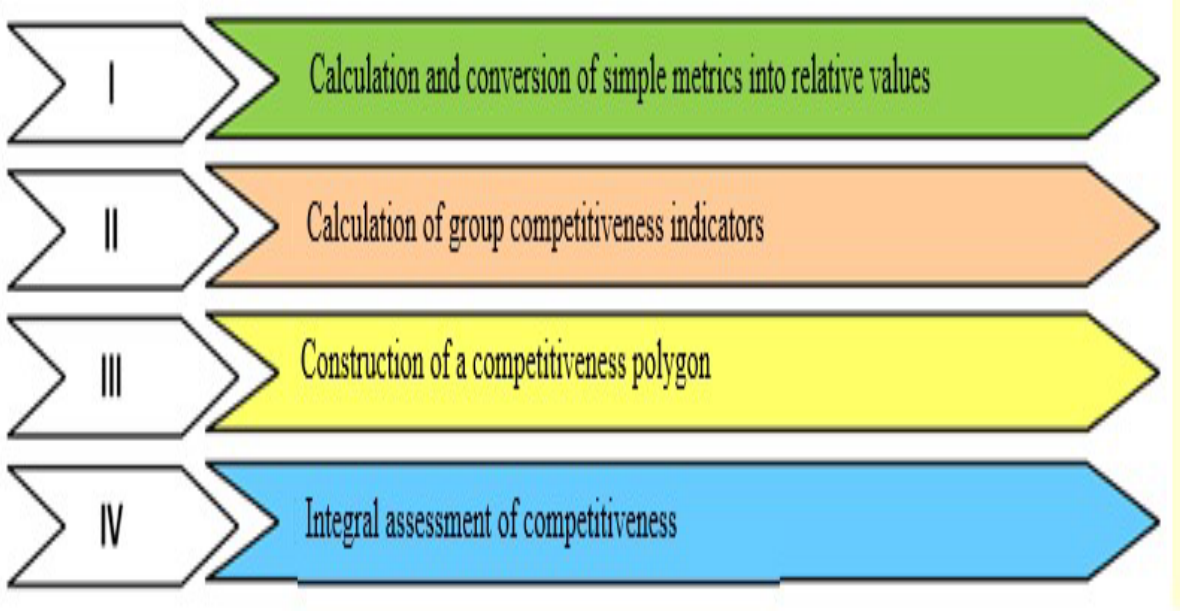

Figure 1. Algorithm for assessing the competitiveness of transport company

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For a detailed consideration of the algorithm, we highlight the main sequential stages to be taken in assessment.

Stage 1. All simple metrics coming under different groups are calculated. The author offers five groups of metrics. For the most part, the simple metrics in groups 1-4 are universal and many of them are consistent with the theory of effective competition. Since today the competitiveness of a container terminal is largely attributed to its infrastructure available, it is also proposed to evaluate the indicators characterizing the competitiveness of production base, including production capacity of freight terminals, peak capacity of railways, area of warehouses, availability of transshipment equipment and road trains.

Competitiveness metrics and formulas are shown in Table 01.

Table 1. Simple metrics to measure the competitiveness of container terminals

Competitiveness criteria and metrics	The role of metrics in assessment	The rule for calculating
	1. Production base competitiveness	
1.1. Production capacity of freight terminals 1.2. Peak capacity of railways 1.3. Warehouse area (inside and outside) 1.4. Availability of transshipment equipment and road trains	Characterize production capabilities of container terminals	Taken from actual values
	2. Competitiveness of production processes	
2.1. Production costs per unit of output	Measures transportation cost-effectiveness	Production costs / Quantity of transportations
2.2. Yield per unit of assets	Characterizes the efficiency of fixed assets exploited	Sales proceeds / Average annual cost of fixed assets
2.3. Product profitability	Characterizes the amount of profitability of services provided.	Sales profit x 100% / Total production costs
2.4. Workforce productivity	Measures the efficiency of production organized and the use of workforce	Sales revenue / Average headcount
	3. Competitiveness of financial processes	
3.1. Equity ratio	Measures the amount of leverage used by a company	Own company funds / Total funding sources
3.2. Financial sustainability ratio	Evaluates company's ability to meet its financial obligations and measures the likelihood of bankruptcy	Equity and non-current liabilities / Balance sheet currency
3.3. Cash ratio	Measures the quality of funds that cover current liabilities	Cash and fast-trading securities / Short-term liabilities
3.4. Sales to working capital	Characterizes the efficiency of working capital used. Corresponds to the time during which current assets pass through all stages of production and circulation.	Sales proceeds / Average annual balance of working capital.
	4. Organization of sales and promotion	
4.1. Capacity utilization factor	Characterizes business activity, the efficiency of welfare services	Quantity of transportations / Production capacity

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4.2. Return on sales	Measures the amount of company profitability in the market, the sanity of pricing.	Sales profit x 100% / Sales revenue
4.3. Coefficient of advertising and sales promotion effectiveness	Characterizes the economic efficiency of advertising and sales incentives	Advertising and sales promotion costs / Increment in sales profit
	5. Competitiveness of transport services	
5.1 Rate	Rate (price) for transport services per unit of output	Sales revenue / Quantity of transportations
5.2 Product mix width	Measures the variety of product lines (product categories) offered to the market	Quantity of goods handled by the company / Number of goods offered by the market
5.3 Product mix completeness	Measures the ability of goods from a homogeneous group to satisfy the same needs and market demand	Number of services offered by the company / Number of services offered by the market
5.4 Reliability of container terminal	Describes the likelihood of fulfilling an order on time and in full	Total number of orders executed / Total number of orders submitted by clients
5.5 Loss and damage to a package	Damage, theft and other loss of a package during reloading and transportation	Number of requisitions with cargo damaged or lost during transportation and handling / Total number of requisitions
5.6 Timeliness	Measures the timing of a service request	Total number of orders executed without violating the terms of service / Total number of orders executed by the company
5.7 Promptness	Speed of response of the container terminal to urgent/unplanned orders of clients	Completed urgent orders / Total number of orders

The following metrics are advised to assess the competitiveness of services provided by container terminals:

1. Rate. Since companies providing transshipping services are toughly competing, rate policy is of great importance for attracting and retaining clientele. The rate is the price per unit of hauling operations, adapted to the cost of transshipment operations, as well as profitability defined as the profit-to-cost ratio.

2. Product mix width and completeness. Today, clients using cargo terminals seek to receive a full transshipment cycle, handling as much cargo as possible, on the one hand. On the other hand, customers find it relevant to know a whole range of cargo, services and operations performed therewith. For this reason, the product mix width should be assessed by the ratio of the number of goods handled by the terminal and the number of goods offered by the market, with competing terminals in mind, whereby completeness – by the ratio between the number of services offered by the terminal and the market.

3. Reliability of a container terminal measures its ability to fulfill orders on time and in full.

4. Loss and damage of a package shows the proportion of orders completed with damage or loss of a package during transportation or loading and unloading operations in the total annual number of orders completed by the container terminal.

5. Timeliness measures the share of on-time, i.e. non-disruptive, orders in the total number of orders executed by the container terminal throughout a year.

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6. Promptness characterizes the share of urgent orders completed throughout a year in the total number of orders.

To convert simple metrics into relative values, they are compared with a baseline. The following can be used as a basis for comparison: the industry average; the performance of any competing or market leader; and the past performance of the company being evaluated.

To convert the metrics into relative values, a 15-point scale should be used. A 5-point scale is defined as an indicator with a value worse than the baseline value; a 10-point scale is equal to the baseline value; a 15-point scale is better than the baseline value.

Stage 2. Group metrics are comprehensive characteristics that measure the competitiveness of certain activities performed by container terminals. The group metrics basically can be calculated by the point method (Abramova, 2017):

$$K_i = \sum_{i=1}^{n} a_i \cdot W_i \qquad \sum_{i=1}^{n} a_i = 1 \tag{1}$$

where ai is the weighting coefficient of a metric (criterion); Wi is the score in relative values assigned to a metric (criterion); n is the number of criteria, i =1,...n and j =1,...n.

Below are the formulas for calculating the group metrics, where the numerical coefficients are the weights of the criteria defined by the expert method. The competitiveness of the production base:

$$C_{pb} = 0{,}4C_{pc} + 0{,}2C_{rfc} + 0{,}2C_{wa} + 0{,}2C_{re}, \tag{2}$$

where Cpc is production capacity available; Crfc is railway front capacity; Cwa is warehouse area available; Cre is reloading equipment and road trains available.

Competitiveness of production processes:

$$C_{pp} = 0{,}25C_{costs} + 0{,}15C_f + 0{,}4C_{pp} + 0{,}2C_{wp}, \tag{3}$$

where Ccosts is production costs per unit of transport products; Cf is return on assets; Cpp product profitability; Cwp is workforce productivity.

Competitiveness of financial processes:

$$C_{fp} = 0{,}3C_e + 0{,}2C_{fs} + 0{,}3C_{cr} + 0{,}2C_{wc}, \tag{4}$$

where Ce is company's equity; Cfs is financial sustainability; Ccr is cash ratio; Cwc is sales to working capital.

Organization of sales and promotion:

$$Csp = 0{,}35C_{cu} + 0{,}4C_{rs} + 0{,}25C_{adv}, \tag{5}$$

where Ccu is capacity utilization; Crs is return on sales; Cadv is effectiveness of advertising and sales promotion.

Competitiveness of transport services:

$$C_{ts} = 0{,}2C_r + 0{,}15C_{pmw} + 0{,}15C_{pmc} + 0{,}15C_r + 0{,}12C_{ld} + 0{,}13C_t + 0{,}1C_p \tag{6}$$

where Cr is rates; Cpmw is product mix width; Cpmc is product mix completeness; Cr is company's reliability; Cld is loss and damage to cargo; Ct is timeliness; Cp is promptness.

Stage 3. It involves using one of the graphic methods for assessing competitiveness. For example, a competitiveness polygon. It is a vector-axe graphical representation of assessments connecting the position

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Corresponding Author: Marina S. Ilyina
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of the terminal and competitors in the most significant areas of activity. The facets of the polygon characterize the competitiveness of the container terminal each in a particular way, based on 22 simple metrics, or on 5 group criteria.

Stage 4. Total company competitiveness (Cc) is calculated (Abramova, 2017):

$$K_c = \sum_{i=1}^{5} a_i \cdot W_i \quad , (7)$$

where ai are the weights assigned to the indicators (criteria); Wi is the score in relative values assigned to an indicator (criterion); n is the number of criteria, n = 5.

The weighted values of the metrics are determined by one of the expert methods – the method of paired comparisons. The expert "weighs in twos" the parameters in a paired-comparison matrix, answering the question: "Which of the two parameters has a greater impact on competitiveness metrics?" and line by line in the matrix indicates: "How many times the "weight" of the parameter in row i is greater than the "weight" of the parameter in column j".

There are a number of approaches to decide on the number of experts. It is recommended to involve 10-30 people in an expert survey to solve various classes of problems (Beshelov & Gurovich, 1980), which corresponds to the size of a group of experts composed of 15 people. The experts were managers working at container terminals (8 people), forwarding companies in the container shipping market (3 people), operators of container lines (2 people), academia (2 people).

The methods of paired comparison of criteria should start with composing a square matrix kij, in which the number of columns and rows is equal to the number of parameters. The table should be filled in in the following order (Abramova, 2017): first, the cells above the diagonal consisting of values equal to 1 are filled in the table: expert values are put into the cells of rows i and columns j above the diagonal in accordance with the scale; second, the cells below the diagonal are filled in, into which values are put that are equal to the reciprocal of the values in the cells above the diagonal, symmetrically arranged.

The paired comparison matrix is filled with the coefficients kij as per the condition in the formula:

$$k_{ij} = \begin{cases} 1,5 \ \ if \ \ K_i \ is more \ impor\tan t, \ \ than \ \ K_j \\ 0,5 \ \ if \ \ K_i \ is less \ impor\tan t, \ \ than \ \ K_j \\ 0 \ \ if \ \ K_i and \ K_j \ are \ equally \ impor\tan t \end{cases}$$

In this case, the following condition must be fulfilled: $k_{ij} + k_{ji} = 2$ for $i \neq j$

When the criteria corresponding to the condition are ranked, after filling the paired comparison matrix with the coefficients k_{ij}, we obtain that the importance factors for the criteria k_i (i = 1,…n) are members of a decreasing arithmetic progression with a step: $\Delta = 1.5 - 0.5 = 1$

The following expressions take place (Beshelov & Gurovich, 1980):

$k_1 = (n - 1) \cdot 1.5 + 1$; $k_n = (n - 1) \cdot 0.5 + 1$; $k_i = k_1 - (i - 1) \cdot \Delta$

The cumulative importance is calculated by the formula (Spiridonov, 2017):

$$k_c = \sum_{i=1}^{n} k_i \quad (8)$$

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The cumulative importance can be calculated as a sum of the members of this arithmetic progression using the following formula:

$$k_c = \frac{k_1 + k_n}{2} \cdot n = n^2 , \quad (9)$$

The weight coefficients of the a_i criteria are calculated by the formula (Spiridonov, 2017):

$$a_i = \frac{k_i}{k_c} , \quad (10)$$

where k_c is the cumulative importance of the criteria.

After substituting the values of k_i and k_c into formula (10), we obtain the following formula for calculating the weight coefficients of the criteria (Spiridonov, 2017):

$$a_i = \frac{0{,}5 \cdot (3n+1) - i}{n^2} , \quad (11)$$

where i is the reference number of an ith criterion (the reference position in the matrix).

Table 02 is filled in line with the above algorithm.

Table 2. Resulting paired comparison matrix of the competitiveness of transport company

		j column					Sum in row	Rank
		1	2	3	4	5		
i row	1	1	0.5	0.5	1	0.5	3.5	5
	2	1.5	1	1	1.5	1	6	2
	3	1.5	1	1	1.5	0.5	5.5	3
	4	1	0.5	0.5	1	0.5	3.5	4
	5	1.5	1	1.5	1.5	1	6.5	1
	Sum in column	6.5	4	4.5	6.5	3.5	-	-

The paired comparison matrix is compiled by assigning reference numbers to the criteria: 1 criterion – the competitiveness of the production base; 2 criterion – the competitiveness of production processes; 3 criterion – the competitiveness of financial processes; 4 criterion – sales efficiency; 5 criterion – competitiveness of transport services.

The rank of a metric is determined by the sum of the values in each row of the matrix. The criterion with the highest sum of values ranks first. In our case, this is the fifth criterion (competitiveness of transport services). Then the places are sequentially assigned to each of the criteria. The weighting coefficients are calculated for each of the five criteria as follows:

$$a_1 = \frac{0{,}5 \cdot (3 \cdot 5 + 1) - 5}{5^2} = 0{,}12 ; \quad a_2 = \frac{0{,}5 \cdot (3 \cdot 5 + 1) - 2}{5^2} = 0{,}24 ; \quad a_3 = \frac{0{,}5 \cdot (3 \cdot 5 + 1) - 3}{5^2} = 0{,}2 ;$$

$$a_4 = \frac{0{,}5 \cdot (3 \cdot 5 + 1) - 4}{5^2} = 0{,}16 ; \quad a_5 = \frac{0{,}5 \cdot (3 \cdot 5 + 1) - 1}{5^2} = 0{,}28$$

Based on the known weighting coefficients and five parameters, we obtain a formula for calculating total competitiveness of a container terminal:

$$C_c = 0{,}12C_{pb} + 0{,}24C_{pp} + 0{,}2C_{fp} + 0{,}16C_{sp} + 0{,}28C_{ts} , \quad (12)$$

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where C_c is company competitiveness; C_{pb} is competitiveness of the production base; C_{pp} is competitiveness of production processes; C_{fp} is competitiveness of financial processes; C_{sp} is the effectiveness of sales and promotion on the market; C_{ts} is competitiveness of transport services.

6.2. Container terminal management model based on the results of assessing total competitiveness

The main goal of measuring and analyzing total competitiveness of a container terminal is a subsequent managerial impact aimed at enhancing the competitiveness. The managerial impact should be expressed as a set of measures that strengthen the position of a company in external and internal environment. A list of measures to enhance the competitiveness of the container terminal is concentrated in the main problem areas: they are geared to reduce costs of operations and services provided by the terminal, promote sales and improve the quality of work. Each of the problem areas calls for terminal administration to implement a set of tactics aimed at improving it. A list of possible actions within problem areas is shown in Figure 02.

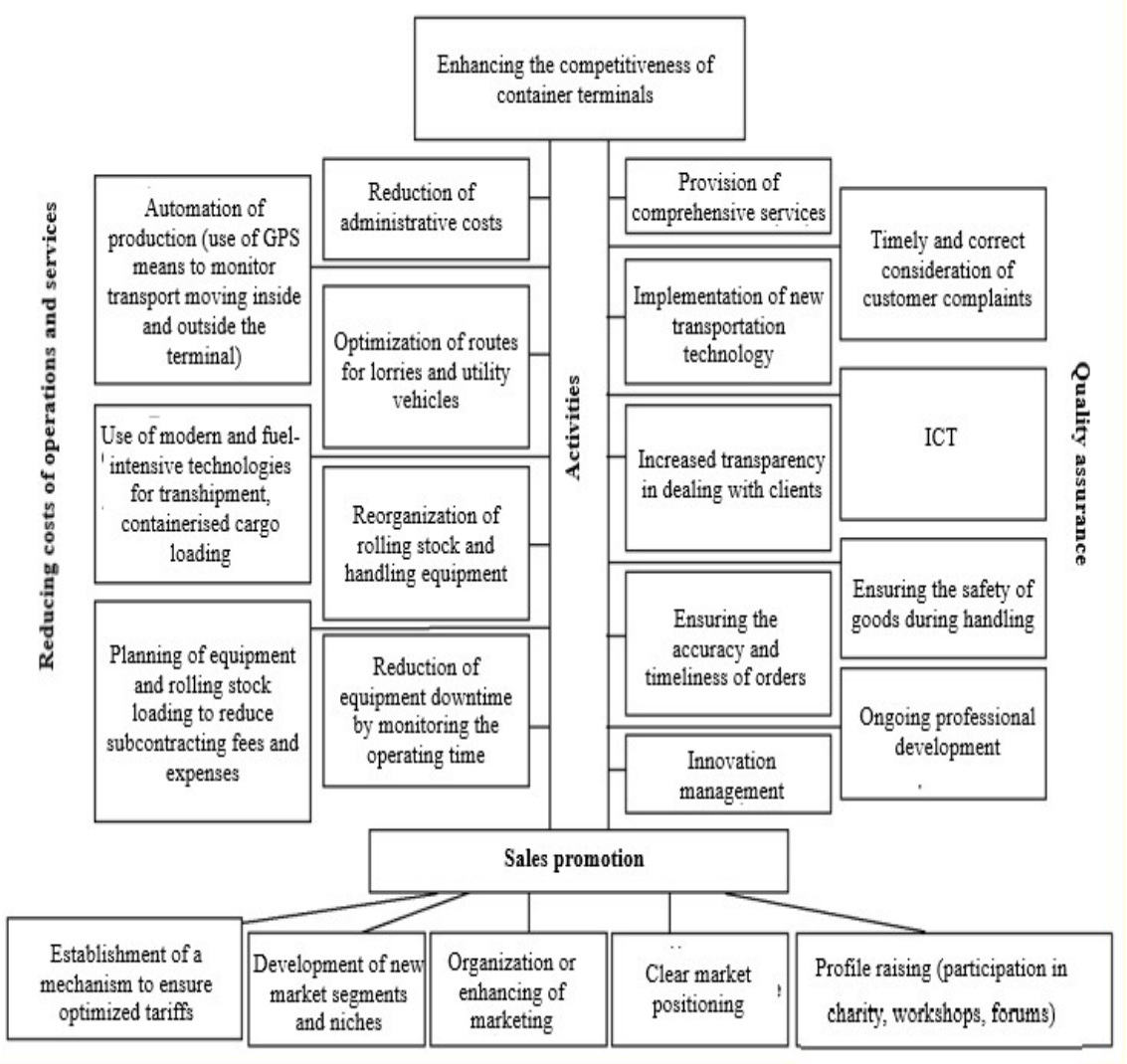

Figure 2. Problem areas and related measures to enhance the competitiveness of container terminals

https://doi.org/10.15405/epsbs.2022.03.82
Corresponding Author: Marina S. Ilyina
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Managerial impacts can have different intensity. There can be a different number of actions for measures implemented, both per unit of time and by the totality of simultaneously covered problem areas. A 15-point scale can also be used to measure the intensity of managerial impact. A 5-point scale should be used to rate intensity at a level lower than the past performance of the company being evaluated; a 10-point scale should rate intensity for the previous years; and 15 points – a higher intensity than the past performance of the company. Based on the proposed grading of management intensity, the dependence of the latter on the level of detected total competitiveness can be as follows (Table 03).

Table 3. Inverse correlation between the degree of managerial impact and the level of integral competitiveness

Target measures to enhance the competitiveness of the terminal	Levels of integral competitiveness		
	Approaching 5	Approaching 10	Approaching 15
Reduction of costs	15	10	5
Quality assurance	15	10	5
Sales promotion	15	10	5

Based on the inverse correlation between the degree of managerial actions and the level of integral competitiveness derived during the analysis, the model of this correlation may have the following graphic form shown in Figure 03, where P is the intensity of measures implemented to enhance competitiveness (intensity of management impact); Q is the level of total competitiveness.

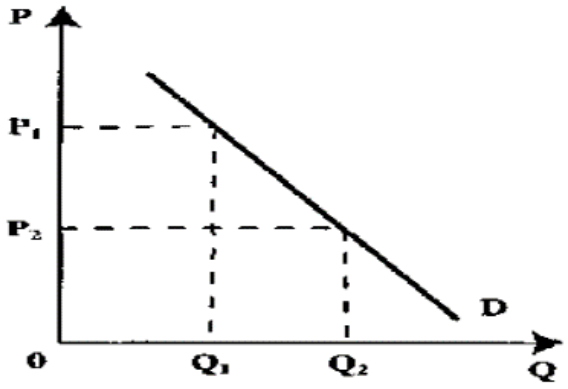

Figure 3. Model of managerial impact based on integral competitiveness

7. Conclusion

Tougher competition in transport services forces container terminals to pay greater attention to measuring the level of their own competitiveness in comparison with economic rivals. However, adapting versatile approaches to assessing the level of specific industry competitiveness is quite relevant.

The proposed method for assessing competitiveness is tailored to specific characteristics of container terminals. The author's method used for assessing the level of competitiveness on a practical example has shown its flexibility, efficiency and informative value.

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The analysis and assessment of integral competitiveness should be followed by corresponding managerial actions. The model proposed by the author based on integral competitiveness shows the inverse correlation between the intensity of managerial actions and the level of competitiveness.

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