

Logistics potential of enterprise: theoretical and applied aspects

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Abstract— modern logistics market can be characterized with structural changes, dynamics and turbulence. Intensified attention to effective logistics potential management for enterprise is a prerequisite for stable development in such conditions; this covers modern methodical instruments usage, which allow managers to choose proper priorities for investment, staffing, innovative, marketing enterprise policies, to form reasoned development strategies and to succeed in the long run by operating with numbers. The main purpose is studying of logistics effectiveness metrics usage practice by enterprises of various logistics services segments; logistics potential measurement based on the author's method and forming recommendations considering its usage for enterprise practice. **Methods:** in-depth interview with enterprise chairpersons representing various logistics market segments; author's method for logistics potential calculation considering five components measurement: technico-technological, economical, eco&secure, competence and quality. Logistics enterprises research results demonstrate more intuitive than purposeful logistics potential management. This is mainly caused by the lack of organized logistics potential measurement system. Logistics potential underestimation leads to missed opportunities, what may turn out to become problems, and overestimation alienates goals achieving. Only purposeful logistics potential management based on clear indicators measurement and calculation methods system is capable of providing enterprise with a long-term competitive advantage and a breakthrough strategy in global competition.

Index Terms— logistics potential of enterprise, logistics performance, logistics operators, transport company.

XVIII. INTRODUCTION

Modern logistics services market is characterized by global market space formation, network infrastructure, economies openness, advanced technologies, information and leading

logistic operators' service availability, which actualizes the need for modern methodical tools for effective enterprises logistics potential management, which enables managers operating in numbers and having integrated picture to choose the right priorities in the innovation, personnel, investment, marketing enterprise policies, to form a reasonable development strategies and succeed in the long run.

Research has shown, that logistics potential evaluation is reduced, basically, to cargo turnover and transport and warehouse system capacities estimation. This approach proves to be outdated. It does not reflect logistics potential usage effectiveness and does not take into account other components that shape enterprise logistics potential importance. Therefore, there is a need for new methods developing for assessing enterprise logistics potential. This implies: 1) defining logistics potential evaluation criteria / components; 2) metrics / methods for evaluation criteria measuring / estimating selection; 3) a single complex enterprise logistics potential indicator construction and calculation.

The article purpose consists of theoretical and methodological provisions development for managing enterprise logistics potential. These problems had to be solved in accordance with the selected goal:

- to study the economic thought evolution about logistics potential essence;
- to research logistics efficiency metrics used at enterprises;
- to evaluate enterprise logistics potential index; summarize the results and make appropriate recommendations.

The article is organized as follows: a literature review on the content of logistics potential concept is presented and publications with practical examples of logistics potential assessment analyzed. The empirical re-search methodology and the obtained results are described. One of the largest domestic logistic operators' logistics potential index calculation is



provided. The author's technique approbation results and discussion point are described. The article is summarized in the last section and ends with future research prospect.

XIX. LOGISTICS POTENTIAL OF ENTERPRISE: THEORETICAL ASPECT

Research of the evolution of logistics potential concept itself and logistics potential evaluation studies lead to necessity for differentiation of this concept at different hierarchical levels. It should be noted, that theoretical-applied aspects and problems of logistics potential are researched sufficiently at region and state levels. However, further research is needed for logistics potential at enterprise.

Drucker (1962) mentioned, that practical logistics potential index means nothing, but possibility to save costs while material flows moving. It should be noted, that such logistics potential interpretation covers direct interconnection with material flows, but influence on strategical enterprise management is not taken into account.

Scientist Porter (1985) has an opinion that logistics potential, that is logistics methods applying, is a component of enterprise strategy management.

One of the main aspects of logistics effectiveness is information component management. That is why the scientist believe, that logistics potential consists of two main interconnected processes – material flows moving and information support for it (Pfohl&Miller, 2015, 139-149 pages).

Stock & Lambert (2001) in their book offer instruments for strategic and operative enterprise logistics management, describe system of indicators, which are the best for logistics system describing and influencing.

In Krykavskyy Y. (2014) opinion logistics potential is combined logistics system ability to provide long-term functioning and strategic goals achievement.

Matwiejczuk (2011) states about logistics potential importance for enterprise in his publication. He divides logistics abilities into operational and dynamical, compares them and rates importance of each kind. Logistics abilities influence on enterprise market success confirmation is the result. It was proved, that effective strategy and logistics decisions are the most important processes related with potentials usage and leading company to market success. The paper concludes that logistics abilities has strategical value for achieving expected market and economical effects.

There also exists number of practical examples of logistics potential researches. Wagner (2016) made a taxonomy analysis for logistics potential of Polish voivodships in her publication. For ranging voivodships by their logistics potential usage level four sets of variables were used: infrastructure, warehouse capacity, logistics companies operating results and ecology factor. Great emphasis was put on ecology factor, because logistics potential development while limiting negative impact on the environment is very important. The value of this work is logistics potential index evaluation, which can be used as an instrument for enabling management to control and compare

real situation with strategic goals. In addition, research results proved that it is possible to develop the logistics potential and at the same time take care of the environment, which is the goal of sustainable development of regions and the country as a whole.

A group of authors (Maas et al.) offered a method of ensuring the productivity of enterprise incoming supply for automotive industry through the logistics potential of individual parts optimal use. The main idea of the article is the rationale for the logistics potential development necessity for ensuring enterprise competitiveness, using an appropriate concept for spare parts input supply. The internal logistics problems of car-building enterprises, related to hundreds of suppliers and thousands of spare parts coordination, are covered. The proposed methodology provides a possibility to get a general picture of company supplying situation without much effort. This method is flexible, it can be reproduced at any time and can be adapted to the individual requirements of the company.

The study of logistics potential trade balance as an indicator of the Macedonian logistics industry potential is interesting (Trajkova&Biljana, 2012, 314–322 pages). The publication states that the logistics industry is one of the world's leading industries and has a respectable impact on the flows of the world economy. Many indicators confirm the importance of the logistics industry in a particular country. Potential and development indicators of the logistics sector are divided into non-economic and economic. The first group includes: the infrastructure quality, the number of transactions and the number of actors involved in the supply chain, the time of import / export, etc. Economic ones include revenue and logistics services implementation results. This paper emphasizes on the analysis of logistics services trade balance indicator, which is expressed by the international logistics operations of the country. Logistics potential analysis at macro level has shown that the potential of Macedonia is still not fully realized. In addition, the positive impact of logistics services on the national economy has been revealed, which in turn confirms the great potential and importance of the logistics industry.

A hypothesis was revealed in publication (Jedlinski, 2009, 1-7 pages) considering the lack of an exact description for "logistics potential of the enterprise" term, which leads to its fuzzy interpretation. The logistics area representatives use the phrase "logistic potential of the enterprise" in the daily language and usually interpret it from different points of view, which is not a positive phenomenon for science. It is undoubtedly easy to interpret in daily speaking. The paper provides a discussion on this concept and thus logistics potential within the enterprise was determined as possibility to provide the maximum logistic service output in a given time interval.

In this paper, we are most inclined to the definition proposed by Y. Krykavskyy. In our opinion, such logistic potential interpretation takes into account the most important logistic potential characteristic - the ability to influence the further development direction. However, the practical application of logistic potential at the micro level needs further considering, and it is necessary to determine a specific evaluation method that could be adapted for use at different logistics enterprises.

This issue solution has become an impetus for research described in this article.

XX. RESEARCH METHODOLOGY

The enterprise logistics potential research interest is caused, first of all, by the relevance of this topic's applied aspects.

Our research hypothesis: the main obstacle for enterprise logistics potential effective management is the lack of a purposefully organized logistic indicators system that characterize enterprise logistics potential. It was also suggested that individual evaluation criteria / components metrics are absent for logistics potential.

We used in-depth interviews with logistics companies representing different logistics market segments managers, in particular: CER, transportation, storage, 3PL (production and distribution companies were not taken into account). In total, 20 face-to-face interviews were conducted during March-April 2018. Respondents were asked questions including:

- Do you assess your company's services quality? What is the indicator for it? What does it include? How is it measured in your company?
- Does the enterprise logistics potential depend on logistics expertise? What is the level of enterprise demand for logistics specialists?
- Does the enterprise logistics potential depend on the environmental component? What is your company's policy as a socially re-sponsible business?
- Do you use your enterprise logistics potential assessing methods?
- What logistics indicator do you monitor?

The undoubted advantages of an interview as a research method are the abilities to obtain qualitative information and informal data from competent persons. The disadvantages include high time consumption (about 1.5 hours per contact); subjective evaluation data.

After empirical studies conduction we generate methodological approaches for solving the problem itself – enterprise logistics potential estimation / measurement. The authors propose index method usage. The basis for enterprise logistics potential index evaluation incorporates the following components: technic-technological (reflects the existing infrastructure objects capacity); economical (defines logistics activities effectiveness); eco&secure (reflects the managerial aspects of environmental and safety preservation); competence (reflects the ability to provide its own different levels and profile specialists for infrastructure objects, and also determines logistics professional competences usage and level of demand for them); quality (reflects enterprise policy regarding service quality). Enterprise logistics potential index evaluation is proposed to be carried out using the multivariate analysis method. Indicators calculation for this method involves objects under study characteristics number reducing by multidimensional elements transforming to one-dimensional form; summarizing the results obtained for each component into integrated representation.

Proposed author's methodology for enterprise logistics

potential evaluation has the advantages of versatility (possibility to be used by different logistic operators) and simplicity (all indicators are statistical). Logistics potential assessment serves as a benchmark for further enterprise development direction choosing. In addition, the resulting index analysis is important for enterprise management, investors, suppliers and other partners. The method has not been tested on a large number of enterprises, so it can be considered a disadvantage.

XXI. LOGISTICS POTENTIAL OF ENTERPRISE: APPLIED ASPECT

During research process, an understanding was concluded considering expediency for enterprise logistics potential concept expanding. 100% respondents agreed with the importance of the eco-component inclusion. Most of the enterprises surveyed position themselves as a socially responsible business. 14% - have ISO 14001 certificates, 40% - do not have, but plan to get one. Rarely, but there are enterprises that measure their activities (transport) impact on the environment with the help of so-called CO2-calculators. Interesting is the fact that 86% of respondents indicate company logistics potential dependence on professional competence in logistics. Particularly acute shortage of specialists with logistics competence is experienced by domestic enterprises.

All respondents (100%) indicated to monitor the service quality. Complaints analysis dominates (60%) among the methods used in quality assessment. However, only 5 managers were able to name the absolute indicator of service quality. The indicator includes order execution timelines, which are measured as the ration of orders executed in time to the total number of orders. 100% respondents showed practical interest in a complex indicator reflecting company logistics potential level in general, which inspired the authors for developed methodology approbation.

Based on practice of the most developed countries it can be concluded that in the overwhelming majority the railway industry is a pillar of entire country economy. Logistics potential index will be evaluated for JSC "Ukrainian Railways". This object has not been chosen by chance. On the one hand, we have a large number of favorable conditions for the enterprise in the country, on the other - the loss-making of this enterprise. Such fundamentally different factors suggest that inefficient management of the existing logistics potential and misguided development strategies are being used in "Ukrainian Railways". It is necessary to introduce new management approaches and increase the work efficiency for more effective work of the main rail freight transportation enterprise JSC "Ukrainian Railways". One possible approach for this is to manage enterprise logistics potential. Logistics potential usage level determination allows moving from the general problem to the root causes of its occurrence. It is the inefficient use of logistics potential of the strategically important area for the country that negatively affects the whole economy.

Authors in paper (Chornopyska&Stasiuk, 2019, 18-25 pages). Logistics potential calculation method for enterprise) provided detailed description for logistics potential index

evaluation. Author's methodology for enterprise logistics potential evaluation includes the following steps: affecting indicators identification, indicators grouping by components, partial indices calculation for each logistics potential component, logistics potential possible usage limits definition, sub-index calculation for each of the component, enterprise logistics potential index calculation.

Indicators that became the basis for logistics potential evaluation are taken from the site of Ukrainian State Statistics Service, from the enterprise annual reports and some were received as a result of managers interview. The indicators, which in our opinion are the best to describe company logistics activities, are grouped into five main components of logistics potential, namely technic-technological, economical, eco&secure, competence and quality. The indicators of technology and information systems usage has not been taken into account due to measuring complexity. Indicators included in each of the components are quantified, realistic and oriented to the results that are relevant to the study purpose. Indicators characterizing JSC "Ukrainian Railways" operating are described in Table 1.

TABLE 1.
JSC "UKRAINIAN RAILWAYS" LOGISTICS POTENTIAL
AVALUATION INDICATORS

Indicators	Years						
	2012	2013	2014	2015	2016	2017	2018
Technic-Technological component (K1):							
Cargo transportation on average per day, thousand tons	1250	1215	1058	959	938	930	883
Average transportation distance for one ton of goods, kilometers	520	506	544	557	546	565	578
Transportation intensity, million ton-kilometer for 1 kilometer of road length	11	10.39	10.06	9.29	8.93	9.69	8.7
Warehouse capacity (cargo stations), units	1447	1447	1398	1389	1200	945	998
Total number of rolling stock, units	4496.4	4314.9	4081.8	4074	4067.2	3796.5	3703
Economical component (K2)							
Revenue, billion UAH	42	46	49	60	66	73	67.5
Cargo transportation, million tons	457	444	386	350	343	339	322
Cargo turnover, billion ton-kilometers	237.7	222.4	210.2	195.1	187.6	191.9	186.3
Enterprise capital investments, million UAH	6189.9	6088	6875.9	6789.5	7055.2	11312	17690.3
Expanses, billion UAH	40	44	46	54	64	68	71
Eco&secure component (K3)							
Pollutants emission rates into atmospheric air, thousand tons	27941.1	28095.9	27913	22976	28386.5	37396	38788

Transport safety (transport events), units	764	718	673	602	550	539	481
Competence component (K4)							
Total number of employees involved, thousand persons	59.1	56.9	53.4	147.2	280.2	190.9	190.1
Skills/higher education and training of Logistics&SCM	0	0	0	0	0	0	0
Quality component(K5)							
On time, %	45	36	29	29	35	33	30
In Full, %	45	46	37	39	45	34	31
Error-free, %	55	56	49	49	45	43	40

Source: author's own elaboration based on State Statistics Service of Ukraine, State agency «Agency for the development of the stock market infrastructure of Ukraine», Official website «Ukrainian Railways».

“Ukrainian Railways” logistics potential index was evaluated by analyzing and comparing statistical indicators with similar ones in other years. JSC “Ukrainian Railways” logistics potential index evaluation results for 2017 are presented below as an example.

The first step of logistics potential index evaluation is the partial indicators definition for all isolated components of the potential. The best indicator value (minimum for the eco&secure component and maximum for all other components) is chosen and all the others are compared with it to determine partial indices. Partial indices calculation for technic-technological component in 2017:

Cargo transportation on average per day:

1. Cargo transportation on average per day:

$$X_{16} = \frac{930}{1250} = 0.74$$

2. Average transportation distance for one ton of goods:

$$X_{26} = \frac{565}{565} = 1.00$$

3. Transportation intensity:

$$X_{36} = \frac{9.69}{11.00} = 0.88$$

4. Warehouse capacity (number of cargo stations):

$$X_{46} = \frac{945}{1447} = 0.65$$

5. Total number of rolling stock:

$$X_{56} = \frac{3796.5}{4496.4} = 0.84$$

The next step is sub-index calculation for each potential component, determined as an average of indicators group. Sub-index for technic-technological group in 2017:

$$K_{16} = \frac{0.74 + 1.00 + 0.88 + 0.65 + 0.84}{5} = 0.45$$

The final step is logistics potential index calculation. JSC “Ukrainian Railways” logistics potential index in 2017:

$$I_{ELP6} = \frac{\sqrt{0.45^2 + 0.83^2 + 0.81^2 + 0.22^2 + 0.74^2}}{5} = 0.28$$

The resulting value of $I_{ELP6} = 0.28$ indicates low ($0 < I_{ELP6} < 0.4$) JSC “Ukrainian Railways” logistics potential level in 2017.

Similar methodology was used for dynamic logistics potential index dynamics in 2012-2018 years. The results are provided in Table 2.

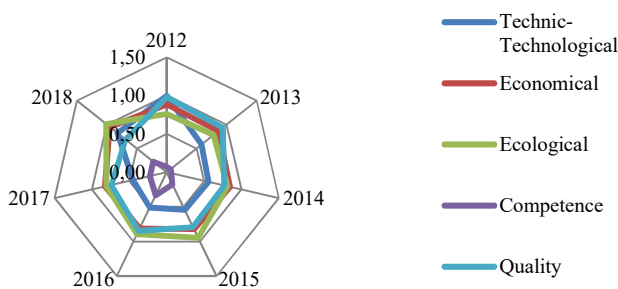
TABLE 2.
SUMMARISED TABLE FOR JSC “UKRAINIAN RAILWAYS”
LOGISTICS POTENTIAL USAGE INDEX CALCULATION

Indicators	Years						
	2012	2013	2014	2015	2016	2017	2018
Technic-technological component sub-index (K1)	1.00	0.58	0.56	0.54	0.51	0.45	0.82
Economical component sub-index (K2)	0.89	0.86	0.85	0.82	0.81	0.83	0.95
Eco&secure component sub-index (K3)	0.76	0.78	0.81	0.95	0.89	0.81	0.89
Competence component sub-index (K4)	0.07	0.07	0.06	0.07	0.33	0.22	0.23
Quality component sub-index (K5)	0.98	0.93	0.77	0.79	0.85	0.74	0.68
Enterprise logistics potential index (I _{ELP})	0.37	0.32	0.30	0.32	0.32	0.28	0.35

Source: author’s own calculations.

The above calculations indicate low level of logistics potential usage by rail freight transportations. In the period between 2012 and 2018, the best logistics potential usage indicator is 37% in 2012 (Figure 1).

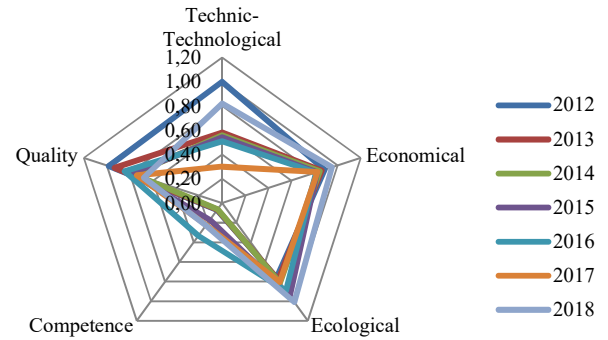
FIGURE 1.
JSC “UKRAINIAN RAILWAYS” LOGISTICS POTENTIAL INDEX COMPONENTS DYNAMICS FOR THE PERIOD BETWEEN 2012 AND 2018 YEARS



Source: author’s own calculations based on State Statistics Service of Ukraine, State agency «Agency for the development of the stock market infrastructure of Ukraine», Official website «Ukrainian Railways».

Negative tendency of indicators deterioration is observed for ones characterizing technic-technological and economical components, positive changes are observed for competence and quality indicators (Figure 2).

FIGURE 2.
JSC “UKRAINIAN RAILWAYS” LOGISTICS POTENTIAL COMPONENT CHANGES FOR THE PERIOD BETWEEN 2012 AND 2018 YEARS



Source: author’s own calculations based on State Statistics Service of Ukraine, State agency «Agency for the development of the stock market infrastructure of Ukraine», Official website «Ukrainian Railways».

The railway rolling stock problem is extremely acute. All the “Ukrainian Railways” problems have led to the fact that the rolling stock used is in very bad condition. According to the data, the most part of rolling stock has already exhausted its resources. This result in gradual cars number decrease yearly. In such conditions, the railway has no opportunity to demonstrate the economic indicators growth; it simply does not have enough resources for this. Similar claims apply to railroads, which are significantly worn every year and are not repaired properly. As a result, faulty gauges and rolling stock have a negative impact on rail freight traffic safety and ecology.

It is clear from the results that the railways management tries to cover all the problems of the company's losses by increasing transportation tariffs. This approach proves to be inefficient because logistics potential is decreasing year after year.

XXII. CONCLUSIONS

Logistics enterprises research results show rather intuitive than purposeful enterprise logistics potential management. This is mainly caused by the lack of a purpose-built system for defining logistic efficiency indicators. Only a small percentage of enterprises have complete information on their logistics effectiveness, but uses partial indicators, which are not confined to an integrated representation.

Enterprise logistics potential evaluation and usage enhances the effective enterprise management practice with new methodical approaches that can be used for justifying strategic development directions. Having enter-prise logistics potential index and significance of its individual components calculated, the management receives all-inclusive, but compact analytical information indicating logistics potential level, possible priority directions for its formation and usage in modern conditions.

The received values for logistics potential index of JSC “Ukrainian Railways” confirmed the hypothesis of ineffective logistics potential usage for one of the largest domestic logistic operators of the country’s strategically important rail transportations industry. Political and economic crisis in the country, the loss of a significant part of a territory exacerbates

the tendency to drop the volumes of rail freight transportation by railway enterprises annually. One of the promising methods for past positions retaining and railway companies efficiency improving is the optimal use of logistics potential.

The necessity for logistics potential identifying, calculating and managing at the micro level has been substantiated, because enterprises activity results are influencing the whole country.

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