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PORT ACTIVITIES COMPETITIVENESS ASSESSMENT METHODOLOGY

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Abstract. The article analyses ports competitiveness. Due to increased demand, competition, the internal complexity of the process and requirements for high performance in the service market, ports must be able to effectively organize their business activities by offering nowadays appropriate range of services. With the aim of promoting the port position in the market they need to identify their own performance indicators and to develop strategic objectives and solutions to improve their competitiveness. There is a need for regular evaluation of the effectiveness of port operations in order to facilitate future growth.

Key words: ports, efficiency, KPI index.

JEL code: F63, R41, R42

Introduction

The industry of transportation is developing dynamically. The volume of transportation is increasing not only in individual states but also on the level of international transportation. The international transportation system includes all the main modes of transportation. International shipments form the very basis of the worldwide market economy. An increasing international turnover of goods leads to the increase of the cargo shipment. International shipments and the transit traffic monitoring via the territory of the Republic of Latvia are the main economic priorities of the state. The organizational structure of every port is unique, thus, it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard.

The aim of this research is to analyze performance indicators of the ports, analyze the the port performance efficiency assessment methodology of the existing ports.

In order to achieve the aims of this research, the following tasks have been set:

- to analyse the port performance efficiency evaluation methods as well as to analyse the latest scientific conclusions (on the basis of the chosen bibliography);
- to come up with proposals in order to improve the port performance efficiency. It is necessary to carry out a study of economic theory widely used in the performance characteristics of different economic processes in the assessment.

In order to achieve the aim of this research successfully and to complete the tasks given, the authors used the following research methods: In order to batch and to analyze the data, the *Analytical method* has been applied, in order to make the *economical calculations*, the quantitative data analysis method has been applied. Novelty in the research is in comparison of different methods for evaluating the effectiveness of ports and evaluation is taken which of these methods are more appropriate for the ports to assess the effectiveness.

Research results and discussion

The organizational structure of every port is unique, therefore it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard. The difficulty to determine a united standards is based on the fact that there is not a united method of how to summarize all the important aspects to measure the port's performance efficiency. The port's performance evaluation is significant to any country since the ports efficiency are very important condition to providing economic growth. Ports further economic growth in such aspects like participating in the international trade; drawing in investments; facilitating the development of production and services; creating jobs as well as advancing the development of an entire region (Bichou, 2006; Bichou, 2004). In order to measure the economic influence of the port, mainly the performance indicators and the related resources (such as the turnover of cargos and employment) are being used to make these calculations. The researcher Talley proposes that one of the options to achieve the economic goals of the port is to increase the turnover of the cargos (Tongzon, 2005). The ports are being classified by the amount of reloaded cargos and these data are further being published on the websites of port administrations or put in the databases of statistics offices. It is a common belief that the increase of the cargo turnover is an indicator of the increase of port performance efficiency. Researcher De Langen opposes to that by stating that the increase of the cargo turnover is mainly related to the flow of international

trade and it does not have much to do with the increase of efficiency (De Langen, 2007). Many other researchers also admit that the amount of reloaded cargos does not indicate its economic influence on a port. It is not possible to choose unequivocal port performance indicators in order to evaluate port performance efficiency. There are many different opinions among researchers regarding this matter (Brooks, 2010; Cullinane, 2004). There is a significant lack of concrete solutions and so far from unified formulas for calculating the port performance efficiency (employing the port's performance indicators) have been proposed. Those port performance indicators related to market tendencies and market structure are supposed to be used for the internal use of the industry in the context of development and competitiveness (Newton, 2010). The indicators of market tendencies and structure would allow the port administrations and the European Commission to oversee such important aspects as the development of port capacity; the cargo concentration; the level of differentiation in different geographical levels of port systems as well as to oversee various segments of the market (Port performance indicators, 2012).

At present there is no developed a common approach in the World on how to assess the port's performance. Some studies and publications thinking of port's efficiency evaluation are analyzed separately in the terminals, but those analysis does not show the overall efficiency of the port.

Looking at the various literary sources (Wang T-F., Cullinane K., Song D.W.,2003), it can be concluded that the most practical uses three data processing methodologies to assess port and terminal performance and efficiency:

1) through Data Envelopment Analysis - DEA;
2) through Stochastic Frontier Analysis - SFA;
3) through port performance indicators.

After literature analysis it can be concluded that the first and second methodology is used to assess the individual, mainly terminal performance, while the third methodology is used to evaluate the overall results of the port. DEA and SFA are parametric and non-parametric statistical methods which port's researchers used to assess mainly container terminal performance, as a basis for assessing the decision-making unit. Performance indicators are indicators that the company makes it easier to assess whether its objectives set are achieved in a given period of time, as well as discover the strengths and weaknesses. They are regularly monitored to ensure the port long-term development. Performance indicators are those that show what actions are needed to be taken to improve performance.

Trends show that more and more port industry appears more progressive ideas on how to assess the operation of ports, however it is not easy to develop appropriate performance indicators to evaluate the functioning of the port as a whole, without offering a specific methods. Looking at several indicators that perspective, it is possible to assess, but it is not developed a common, unified methodologies.

Port authorities with data on market trends and structures oversee the ongoing activities for various port development issues and cargo flows as well as other market segments binding:

- Maritime transport index shall be determined after the shipping port transshipped cargo volume and passenger traffic at a given time period.
- Modal breakdown of the flows calculated for the purpose of use in modal breakdown of freight port.
- The share of containers in the port shows the ratio between the entire amount of cargo unloaded at the port for containerized cargo and containerized setting the trend in port.
- Vessels entering indicator is calculated to determine the ratio between the total capacity of the vessel and the total number of vessels in the port in specified period of time - a distinction between passenger and freight ships.
- Port cargo operations involved in road or railway modal shares is determined by using modal breakdown indicator.

The author believes that the compilation of trends and structure of performance indicators is obtained an overall picture of the current situation, thus it is able to set both positive cues and missing points as well as to identify the vital common position on the market. Using this information in strategic planning and operational policy, the terminal, the port in the region and at the national level are able to appreciably increase the accuracy of the direction and guidance in the choice.

The author believes that the most popular indicators by which to assess the efficiency of ports - port performance indicators - is a Key Performance Indicators (KPIs). KPIs are a critical tool for port management and for authorities to perform their oversight role. The government and municipalities fix

objectives for ports as part of their overall strategy, which port management then needs to implement. The main tools used worldwide for the measurements of these objectives are KPIs. They are designed to measure the performance of the port relative to stated objectives, and hence to allow boards and management to assess progress in improving performance, to monitor trends as well as to identify issues and possible remedies. The selection of appropriate KPIs is critical as it will largely define the focus of efforts and attention (Review of the Ports, 2013).

KPIs which are currently used in the ports provide an incomplete picture of port competitiveness. These KPIs are primarily describing the gross level of port activity (e.g. total TEU or total tonnage). These are commonly reported indicators worldwide, especially for landlord ports (since they are not directly involved in cargo handling operations) and are frequently used to rank ports. However, traffic volumes often present a distorted picture:

- they are not always accurate (e.g. transhipment ports double count containers, once when unloaded and then when reloaded);
- container volumes given;
- equal weight to empty and loaded boxes;
- cargo tonnages often include container tare weight;
- they do not distinguish between low-value/high-volume bulk cargoes and high-value unitized cargoes;
- they are affected by a number of exogenous factors which makes it difficult to establish solid correlations with a port's competitiveness. (Review of the Ports, 2013)

Ports used a different set of KPIs. These KPIs measure market shares (relative to other ports serving the same hinterland), which provide a better measurement of competitiveness. These are complemented by financial ratios and capacity utilization figures. Additional indicators are used to measure the factors that contribute to port competitiveness, especially the quality of service: the quality of logistics services, as perceived by the users of the port, is an important factor in the competition for traffic. Quality of service is measured through various proxies such as:

- berth and gate turnaround times;
- cargo dwell times with and without clearance times;
- average port charges per unit of cargo;
- frequency of scheduled ocean and rail services;
- access to value added services.

The author agrees with that (Haddad E., Hewings G., Santos R.,2006) to put forward the definition of the need to assess the efficiency of the port in order to identify such activity relevant factors as turnover figures (of handled cargo and passenger traffic quantity), necessary for the operation of resources (land, labor, technical solutions, etc.), competitor assessment, internal growth and market trends in advance to meet the objectives of customer satisfaction with the service. The above-mentioned results of the identification, collection and evaluation allows to outline the guidelines, which are directly linked to the future performance of policies and objectives, or in other words, the definition of strategies allowing the port to increase their efficiencies and strengthen its position in the future.

The benefit possible set to weigh effectiveness of present benefit indexes by the method of data envelopment analysis (DEA). Its results lay a solid foundation for further study on ports effectiveness performance evaluation.

These proxies can be further complemented by more detailed and differentiated indicators:

$$\sum_{i=0}^{N} C = C^N \times E \quad (1)$$

N – time period,

C – contribution effectivness,

E – effectiveness.

$$E^N = \sum_{E=0}^{N} i \quad (2)$$

E-Efficient investment

N-time period

i-investments

In order to evaluate efficiency of the port using the following formula you need to collect port investment volumes in specified time period, and the resulting ratio indicates the degree of efficiency of investment. If the resulting ratio is higher, the more effective is the ports investment policy.

Port performance indicators:

- national and regional market shares by cargo;
- tonnage by cargo type;
- turnover of these port companies;
- the number of jobs created near the port (in logistics clusters).

Income (salaries) distributed by terminal:

- berth occupancy;
- average vessel turnaround;
- average vessel waiting time;
- average tons or TEU per vessel;
- revenues per Terminal versus investment.

For bulk terminals:

- tonnes per berth or meter quay;
- average wagon turnaround.

For container terminals:

- box volume per berth;
- TEU per vessel per hour per berth; average berth occupancy;

Supply Chain Performance by cargo type:

- vessel calls by cargo type;
- average vessel size by trade;
- container shipping services and frequency of calls;
- modal split for inland transport;
- average rail travel time border to port station;
- average rail transit time station to terminal; average time and cost for land transport to inland origins/destination.

Port web pages and statistical databases displaying the port's operating results are identified the cargo turnover handled and the number of vessels, as well as comparing these indicators with past performance, and based on their anticipation of future prospects.

Conclusions, proposals, recommendations

The authors draw the following conclusions:

1) The organizational structure, location and services offered are varying from port to port. The combination of these factors makes every port unique, however it is far from being an easy task to measure and analyze the port performance efficiency according to one specific standard.

2) After evaluating the efficiency of port analysis it can be concluded that efficacy can be evaluated after the port cargo turnover is realized, and which depends on a number of factors such as the port area and the use of equipment and is measured as a port turnover per hectare of the total area of the port.

3) The most practical uses three data processing methodologies to assess port's and terminal performance and efficiency: Data Envelopment Analysis, Stochastic Frontier Analysis and port performance indicators.

4) Data Envelopment Analysis and Stochastic Frontier Analysis are parametric and non-parametric statistical methods which the port's researchers used to assess mainly container terminal performance, as a basis for assessing the decision-making unit.

5) Performance indicators are indicators that the company makes it easier to assess whether its set objectives are achieved in a given period of time, as well as discover the strengths and weaknesses. They are regularly monitored to ensure the port long-term development.

6) Theoretical knowledge of the performance characteristics and practical experience in their application gives reason to say that there is no one set of efficiency indicators system, which would be applicable to different economic processes in the study of both the macro level and the micro level. Therefore, for any given study it is necessary to develop its own unique the effectiveness system of indicators, which determine the content and objective of the study.

7) According to the author's most usable indicators to assess the efficiency of ports is the Port performance indicators = Key Performance Indicators (KPIs) which are a critical tool for port management, and for authorities to perform their oversight role. Port authorities are easier to identify, calculate and analyze KPI indices.

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