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Evaluation of Logistics Operators' Operating Efficiency When Performing Knowledge-Intensive Types of Work

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***Abstract* — The Article is dedicated to the assessment of the activity of the logistics operator in the new economy. Using the example of a logistic operator, an assessment was made of the effectiveness of the introduction of modern technologies. A methodical approach to evaluating the performance of logistics operators and the choice of the optimal system of their relationship with the customer is proposed. Clarified terminological apparatus used in solving problems necessary for the implementation of the research objectives. Attention is paid to the evolution of the development of outsourcing in Russia and, in particular, warehouse logistics. The characteristic of a modern logistic operator in Russia is given. The optimization of the cost of its services due to the fact that they to some extent affect the profitability of the logistics service has been considered in details. The authors have developed an economic-mathematical model in which the basic characteristics of the warehouses and the costs of all the work performed are laid. The model allows you to automatically calculate the profitability of customers in general and in terms of operations.**

Keywords — logistics; logistics services; logistics outsourcing; warehousing; charging; logistic operator

I. INTRODUCTION

Logistics is a young branch of the economy. In countries with developed market economies, the term took root and began to be used in the late 1970s, while in Russia the logistics market began to take shape in the 1980s, and active development began at the beginning of the 21st century. Today we can finally talk about the current competitive market of logistics services in Russia.

Outsourcing logistics services for many years is a hot topic for many manufacturing, commercial and industrial enterprises. Outsourcing is being introduced more and more deeply into the structure of many companies. If before the company transferred to the third party only cargo delivery services, then, not without fear, began to give warehouse logistics to service, then today there is a tendency to transfer logistics in production, management of commodity flows to logistics companies (logistics operators) specialized in this.

The global trends of the current knowledge-based economy are based on the development of the service sector, of which logistics is a part. With the so-called post-industrial type of economic development, the share of services in GDP is at least 50%. Thus, services, especially knowledgeable ones, provide for the growth of GDP; physical capital is replaced by human capital. The main factor in the growth of human capital is knowledge. Modern logistics belongs to the knowledgeable field of activity.

The purpose of this study is to study the activities of the modern logistics operator in the new economy, based on informatization and knowledge, the main reason is the lack of full-fledged theoretical and methodological developments in the use of outsourcing logistics functions.

Therefore, following the purpose of the work, the following tasks can be defined: to study the effect of knowledge and information technology on the competitiveness of the logistics operator. Using the example of a logistics operator, assess the effectiveness of introducing modern technologies, and develop a model for evaluating the effectiveness of customers of a logistics operator.

II. LITERATURE REVIEW

The problem of outsourcing is widely studied from the point of view of the customer, that is, the participant in the outsourcing transferring its functions to the logistic operator.

At the same time, there is no clear methodological and theoretical basis for logistics outsourcing in economics, and therefore the authors consider the topic to be poorly studied and relevant, requiring additional study.

Studies of the problems of outsourcing are widely known by the American Management Association, the USA Outsourcing Institute and other organizations.

The works of R. Click and T. Düring, D. Heywood, J. Queen and F. Hilmer, F. Wieskirchen, P. Gottshtalk and H. Solly-Setera, I. Halway and B. Melby, E. Zana, J. Dietrich , M. Brown, D.J. Bowersox, D.J. Klossa, D.M. Lambert, J.R. Stock and others laid the conceptual foundations of the new management methodology, based on the delegation of authority and responsibility to external executives under a special agreement. Western European management schools pay considerable attention to the practical aspects of outsourcing, studying the experience of using a new methodology in managing joint projects. The experience accumulated by the Russian practice of management makes it possible to identify general trends and radical differences in the use of this methodology for managing organizations that are different in their structure, scale of activity and industry specialization.

The study of S.O. Kalenjyan and B.A. Anikin opened the way for Russian theoretical and methodological developments on the problems of outsourcing.

The works of Russian scientists: N.M. Abdikeeva, V.I. Burakova, A.M. Gadzhinsky, E.A. Golikova, M.P. Gordon, C.B. Gorelika, A.B. Zyryanova, T.P. Danko, V.V. Dybskoy, C.B. Ildemenova, S.B. Karnaukhova, A.D. Kiseleva, B.C. Kolodina, I.S. Korodyuka, L.B. Mirotina, H.A. Nagapetiants, Yu.M. Nerusha, D.T. Novikova, O.A. Novikova, B.K. Plotkina, OD Protsenko, L.Yu. Rusaleva, A.I. Semenenko, V.I. Sergeeva, A.A. Smekhov, MM Tretyakov, S.A. Uvarova, V.V. Shcherbakov. The search for solving the problem of optimal evaluation of the effectiveness of the strategies being implemented was devoted to the works of E.H. Vetluzhskaya, Yu.A. Karmazin, V.E. Keriov, E. Nikiforova, N. Reznikova, G.V. Savitskaya, O.A. Freidman (Ostashevskaya), A.N. Chorina Pr are devoted to the problems of the theory of logistics.

However, in our opinion, the problems associated with evaluating the performance of the logistics operator when building a system of relationships with the customer, have not been adequately reflected in the works of these authors. In addition, understanding and clarification requires terminological apparatus. In this regard, we consider it necessary to make some adjustments to the terms used in the work.

In the scientific literature there is no definition of a logistics operator, therefore, the authors give their own definition. A logistics operator is a service (outsourcing) company providing a wide range of logistics services to a customer.

High-tech and knowledge-based services are activities that have a high level of investment in innovation, which make extensive use of acquired technologies and highly educated labor [1].

III. SOURCES OF THE LOGISTICS OUTSOURCING IN THE USSR

In the period of socialist society, only the transport component of logistics could transfer enterprises to a third party. The convoy and Soviet railways were the first logistics operators of the time with a fairly simple functional load. In those days, it was impossible to transfer the warehouse logistics of an enterprise to a third party, since warehouse accounting was conducted on paper, largely based on the human factor – the storekeepers' knowledge of the range and location of goods in the warehouse. Therefore, the transfer of warehouse logistics functions became possible only with the development of information technologies, in particular, the emergence of the first in Russia so-called WMS (Warehouse Management System) warehouse accounting program or warehouse management system – 1C-warehouse and foreign experience, where WMS appeared much earlier [2]. At the end of the 1980s – 1990s — the beginning of this, Russia only began to see the beginnings of outsourcing warehouse logistics, European and American companies viewed the transfer of logistics to a third party as a competitive advantage, which allowed them to concentrate on the company's main activity — production and/or trade in goods logistics costs. Then this market began to form the first transnational corporations that came to Russia. They introduced primary standards for logistics operators of that period. One might say Russian logistics operators got their first experience from corporations such as Colgate&Palmolive, Orbit, Kraftfoods, etc. Following the development of logistics information technologies, the market for high-category warehouse space B, A, and A+ started to develop.

IV. LOGISTIC OUTSOURCING IN MODERN RUSSIA

In the early 2000s, competing WMS systems with 1C of Russian origin began to appear, such as Sevko, Solvo, as well as Western and American developers presented their products to the Russian market (Manhattan, Axapta). Today, the Russian market for warehouse management solutions is about 50 WMS solutions (of which professional are about 15 Russian and 15 western solutions) of different functionality, price and quality [3]. Transportation management also requires automation of processes; for this purpose, the Transportation Management System (TMS) was created, which appeared almost simultaneously with WMS systems, but did not receive such wide distribution. TMS developers offer a variety of solutions with a wide variety of functional capabilities: from route planning, vehicle location monitoring and body load optimization to strategic planning systems and geo-marketing analysis. About 20 Russian and foreign products are represented on the Russian market, such as 1C Logistics, 1C Rarus, Antor Logisticsmaster, Infor SCM transportation management, Interlogistics mercury TSM, SAP for logistics service, etc.

Taking into account the specifics of the business of each logistics operator, the required set of functionality becomes almost impossible to obtain within a single project from a single supplier and on a single platform. All of the above solutions were developed by different manufacturers, data exchange capabilities between the systems are not always foreseen, and systems have emerged that integrate information

flows between all the information systems involved in the logistics chain. As a rule, these are self-written systems adapted to the needs of a specific logistics operator.

The structure of the domestic logistics market according to RBC data for 2017 is divided into: transport transportation up to 88%, storage and warehousing operations up to 9%, forwarding up to 2%, supply chain management up to 1% [4].

What is a modern logistics operator in Russia today? This is primarily a company with high-tech resources (WMS, TMS, CRM systems) and highly qualified personnel located in modern logistics centers. These are companies that provide not just cargo delivery and warehousing services, they take over the planning and optimization of customer traffic. It is the high technological effectiveness of the processes of the warehouse operator that allows its consumer to receive a cheaper service, with a higher quality of services.

Due to what is the optimization of the cost of services of the logistics operator? What factors affect the profitability of the logistics operator? What influences the profitability of the logistics business to the greatest extent? It is possible to answer unequivocally that the applied information technologies, as well as the correctly calculated and fixed prices in the contract, have a greater impact on the effective work of the operator. As a rule, logistic contracts contain a complicated procedure for canceling or changing prices, which is determined by the complexity of changing the logistics operator and the high cost of moving from warehouse to warehouse.

V. METHODOLOGY

Under the competitive market terms and conditions, it is very important to conduct a comprehensive assessment of a potential client and make a mutual choice of partners, observing a balance of interests.

The authors have developed a number of criteria for evaluating a potential partner.

The first step to assess a potential client is to collect information and analyze its cargo traffic, which is done on the basis of a technical task or a survey. For comprehensive information about the traffic flow, the authors have developed a client questionnaire.

Further, on the basis of this information, an economic evaluation of the future contract is made, the calculation of possible prices, at this stage competitive bidding or price negotiation takes place. To participate in the bidding and prompt pricing, the authors wrote an economic-mathematical model, which will be discussed below.

The next step of the client's assessment will be risk analysis: the cost of the goods, the financial stability of the client, the period of existence, the collection of information on judicial procedures related to the recovery of debts.

The fourth step will be the assessment of the operator's own capabilities: the ability of the WMS system and information technology, the adequacy of the warehouse capacity at peak traffic load seasonality, the technological equipment (racking system, RF terminals, the adequacy of the docks in the warehouse), the adequacy of the qualifications of specialists, especially when it comes to updating information systems deadlines.

It is very important to evaluate all the conditions of the contract, especially financial (delaying payment, the possibility of rate changes).

For the purpose of a quick economic assessment of the effectiveness of the activity of SVX Logistics LLC, a regional logistics operator in Yekaterinburg, the authors developed an economic-mathematical model which contains the main characteristics of the warehouses, the costs taking into account the time standards in the context of the estimated operations. When entering information about customer traffic and the estimated cost of operations, the model automatically calculates the profitability of the customer as a whole and in terms of the operations.

The logistic market has clearly formed the rated range of operations to which customers are accustomed. As a rule, the following operations are charged during storage and handling of cargo: storage, acceptance, picking, shipping and stretching (wrapping a pallet with stretch film).

Determine the cost of storage of goods per 1 square meter:

$$P1 = \frac{R1 + R2 + R3 + \frac{C1}{A1} + C2 + \frac{C3}{A2} + C4 + F1 + \\ + F2 + F3 + F4 + F5 + F6 + F7 + F8}{S1}, \quad (1)$$

where R1 – rental costs 1 sq.m.; R2 – utility payments for 1 sq.m.; R3 – other expenses for operation and maintenance of a warehouse per 1 sq.m (cleaning, security, video surveillance service); C1 – the cost of shelving; A1 – depreciation of shelving in months; C2 – service shelving; C3 – the cost of other storage equipment (RF-terminals, floor cleaning machines, access points); A2 – depreciation period for other warehouse equipment in months; C4 – other operating expenses; F1 – Payroll Fund (PF) of the staff (including all deductions) of a warehouse not directly involved in warehouse processing: warehouse manager, accountant, PTM service mechanic, operator, technologist, janitor; F2 – personnel selection costs; F3 – the cost of staff delivery; F4 – communication and the Internet; F5 – office equipment maintenance costs; F6 is the cost of operating office space; F7 – stationery; F8 – other expenses; S1 – warehouse area;

A more informative indicator will be the cost of one pallet (P2):

$$P2 = \frac{R1 + R2 + R3 + \frac{C1}{A1} + C2 + \frac{C3}{A2} + C4 + \\ + F1 + F2 + F3 + F4 + F5 + F6 + F7 + F8}{E1}, \quad (2)$$

where E1 is the storage capacity (number of pallets).

Determine the profitability of storage services for a specific customer B1.

$$B1 = \frac{P3}{P2} \times 100\%, \quad (3)$$

where P3 is the cost of storage without VAT, agreed with the client.

Determine the cost per pallet when accepting cargo P4:

$$P4 = \frac{\frac{1}{2}\times R4 + \frac{2}{5}\times R5 + \frac{1}{3}\times R6 + \frac{C4}{A3} + \frac{C5}{A4} + \frac{C6}{A5} + R7 + \\ + F9\times n1 + F10\times n2 + F11\times n3 + F12\times n4 + \\ + F9 + F10 + F11 + F12 + M1}{T1 + T2}, \quad (3)$$

where R4 is the cost of operating the loading and unloading equipment (LUE), we make an assumption and divide the cost of loaders equally between the service of receiving and shipping loaders; R5 – costs related to the operation of loaders), the costs related to the operation of trucks (divide by 2/5 parts of the total amount of equipment for acceptance and shipment, we include 1/5 of the total number of trucks for a complete set); R6 – costs related to the operation of the stackers used in the warehouse (divide the total number into 3 parts: acceptance / completion / shipment); C4 – cost of loaders; C5 – cost of carts; C6 – cost of stackers; A3 – period of depreciation loaders in months; A4 – amortization period of carts in months; A5 – depreciation period of the stackers in months; R7 – maintenance and other operating costs; F9 – PF of the driver loading and transport vehicles (LTM); F10 – storekeeper's PF; F11 – receiver's PF; F12 – PF loader; n1, n2, n3, n4 – the number of each position, respectively; F9 – expenses for the delivery of personnel; F10 – the cost of clothing; F11 – recruitment costs; F12 – expenses for medical examinations; M1 – consumables and packaging (film, pallets, paper, tape, labels); T1 – number of pallets on arriving at the warehouse during the month; T2 – number of pallets released from the warehouse for the month.

We determine the B2 profitability of the service for cargo acceptance:

$$P2 = \frac{P5}{P4}\times 100\%, \quad (5)$$

where P5 is the cost of accepting one pallet, not including VAT, agreed with the client.

Similarly, the information is laid on the remaining operations – bundling, shipment.

Further, we set the basic parameters for the client's freight traffic and the cost of operations agreed with the client. The main parameters of the client's freight flow are freight flows (the entrance and exit of the number of pallets, we assume that the entrance is equal to the exit), we set the average number of boxes on one pallet (this is done only if any of the operations will not be carried out on the pallet, but boxed). Next, we lay out the information separately for operations: acceptance – mono-pallet, boxed, mixed pallets (equal to boxed acceptance) as a percentage, the same for picking and shipping.

As a result, we get the total revenue for the client, the revenue for each operation and the profitability of each operation.

VI. RESULTS

Following the evaluation of existing customers of SVX Logistics LLC, it was hereby found as follows:

- PF (Payroll Fund) with taxes and deductions in the cost of cargo handling services is about 60% (in the absence of WMS systems, this figure can reach 90%). Therefore, with increasing productivity, profitability increases significantly. What makes it possible to increase the performance of cargo handling operations? Through the introduction of WMS-systems, piece-rate wages of warehouse staff. WMS allows you to monitor and evaluate the actions of all warehouse personnel and, in case of an error, and it is easy to track the moment of its occurrence and the responsible employee. Personal responsibility and transparency of the system lead to an increase in the motivation of workers with a consequent increase in labor productivity.
- The higher the turnover of the customer's goods is, the more profitable the customer is under other equal terms and conditions. The logistic operator can influence this indicator only if he manages inventories himself and monitors the movement of customers' goods, but in Russia this function of the operator is not required.
- In this competitive situation, logistics operators do not earn on storage services, but on cargo handling services. In storage, you can earn only in warehouses with a large working height, large capacity, since the rental rate is not significantly different. The market tracks the trend of dumping rates for storage.
- The most profitable operation is the pallet acceptance and shipment.

VII. CONCLUSION

As a result of the study, the authors received the following results:

- The evolution of outsourcing in Russia as an element of logistics is presented.
- The market for outsourcing services provided by the logistics operator was studied.
- The terminological apparatus used in the study was adjusted.
- A methodology has been proposed for the economic evaluation of interaction systems between the operator and customer of outsourcing services.

The system of indicators presented in the study makes it possible to determine the parameters and make a conclusion about the expediency of applying the above-described economic-mathematical model in the enterprise.

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