OPTIMIZING THE TRANSPORT COSTS AS A BASIS FOR INTENSIFYING THE EXPORT ACTIVITY OF NATIONAL ENTERPRISES

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Pysmak V. O., Serpukhov M. Yu. Optimizing the Transport Costs as a Basis for Intensifying the Export Activity of National Enterprises

The article considers the theoretical bases of intensifying the export activities of modern domestic enterprises using the logistic conception. It is determined that, in terms of the organization of export activities, additional emphasis should be placed on developing a transport and logistics scheme of delivery. The authors formulate the basic elements that should be coordinated to implement any transport operation, i.e: technical, technological, economic, legal, and organizational. The basic factors influencing the organization of the process of goods movement in both national and international communication have been identified (form of transport, nature of cargo, type of notification, transportat and technology system, range of transportation, effective national and international legal regimes). It has been proven that the main causes of occurrence of logistic risk are three factors of the external environment, determined by different situations or circumstances: uncertainty, randomness and counteraction. For compensation of high logistic risks it is suggested to use the methodical apparatus of insurance of both transportations and cargo at delivery. It is determined that an important task of finding the optimal option for the export shipments is the identification and integration of interrelated factors that impact the amount of conditionally constant and variable costs for delivery.

Keywords: logistics, exports, optimization, transportation and logistics costs.

Fig.: 3. Bibl.: 11.

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Письмак В. О., Серпухов М. Ю. Оптимізація транспортних витрат як основа активізації експортної діяльності вітчизняних підприємств

У статті розглядаються теоретичні засади активізації експортної діяльності сучасних вітчизняних підприємств із застосування логістичної концепції. Визначено, що окремий акцент при організації експортної діяльності необхідно приділяти розробці транспортно-логістичної схеми доставки продукції. Сформовано основні елементи, які необхідно координувати для здійснення будь-якої транспортної операції, а саме: технічні, технологічні, економічні, правові, організаційні. Виявлено основні чинники впливу на організацію процесу руху товару у внутрішньому та міжнародному сполученні (вид транспорту, характер вантажу, вид повідомлення, транспортно-технологічна система, дальність перевезення, діючі національні та міжнародні правові режими). Досліджено, що основними причинами виникнення логістичного ризику є три фактори зовнішнього середовища, які визначаються різними ситуаціями або обставинами: невизначеність, випадковість і протидія. Для компенсації високих логістичних ризиків пропонується використовувати методичний апарат страхування перевезень і вантажу при поставці. Визначено, що важливим завданням пошуку оптимального варіанта перевезень на експорт є виявлення та врахування взаємопов'язаних факторів, що впливають на величину умовно постійних і умовно змінних витрат на доставку.

Ключові слова: логістика, експорт, оптимізація, транспортно-логістичні витрати.

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Письмак В. А., Серпухов М. Ю. Оптимизация транспортных расходов как основа активизации экспортной деятельности отечественных предприятий

В статье рассматриваются теоретические основы активизации экспортной деятельности современных отечественных предприятий с применением логистической концепции. Определено, что отдельный акцент при организации экспортной деятельности необходимо уделять разработке транспортно-логистической схемы доставки продукции. Сформированы основные элементы, которые необходимо координировать для осуществления любой транспортной операции, а именно: технические, технологические, экономические, правовые, организационные. Выявлены основные факторы влияния на организацию процесса товародвижения во внутреннем и международном сообщении (вид транспорта, характер груза, вид сообщения, транспортно-технологическая система, дальность перевозки, действующие национальные и международные правовые режимы). Доказано, что основными причинами возникновения логистического риска являются три фактора внешней среды, которые определяются различными ситуациями или обстоятельствами: неопределенность, случайность и противодействие. Для компенсации высоких логистических рисков предлагается использовать методический аппарат страхования перевозок и грузов при поставке. Определено, что важной задачей поиска оптимального варианта перевозок на экспорт является выявление и учет взаимосвязанных факторов, влияющих на величину условно постоянных и условно переменных затрат на доставку.

Ключевые слова: логистика, экспорт, оптимизация, транспортно-логистические затраты.

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ЕКОНОМІКА ТРАНСПОРТУ І ЗВ'ЯЗКУ

ЕКОНОМІКА

In the conditions of globalization, issues of positioning of national goods and services in the international arena, and therefore improvements of the mechanisms for regulation of export commodity flows and national security, are at the forefront for Ukraine. At the same time, the mechanisms for regulation of flow processes in the sphere of foreign trade are not yet fully formed and need scientific and practical recommendations, based on the logistic approach. One of the effective directions towards increase of efficiency of foreign economic relations is use of logistic mechanisms for its coordination.

A definite fact is that there is expediency of planning logistics at the stage of projecting the entry to a new foreign market. The first and foremost is the necessity to analyze the modes of delivery: forms of transport, optimal and alternative routes. It is essential to collect information on potential logistic partners that will meet requirements of exporter: to have an impeccable reputation, to be able to deliver products in the maximum possible volumes and to comply with the necessary terms within international contract, to ensure preservation of the goods and, if necessary, to compensate losses, etc. [1; 2]. It is known that the cost of logistics is one of the main components of the production cost of manufactured products, the cost part, which, in the end, impacts the pricing, which in turn impacts the further competitiveness of national products in the global market [3].

Solutions to problems of projecting and optimizing the systems of delivery of cargoes, together with organizing the logistic activity of enterprises have found reflection in the works of various domestic and foreign scholars, e.g.: Anikin B. A., Benson D., Gadzhinskyi O. M., Lukinskyi V. C., Krikavsky Ye. V., Miloslavskaya S. V., Mirotyn L.B., Netron Yu. M., Nikolaychuk V. Ye., Sergeev V. I., Smyekhov A. A., Uvarov S. A. and others. However, to improve both the competitiveness of national products and the efficiency of delivery of products to international markets, one should use the methodical base of optimization of transport processes, including the apparatus of linear and dynamic programming, methods of economic analysis and logistics, which is significantly complicated by the specifics of domestic production, in view of the lack of experience of producers as to organization of foreign trade and implementation of the cycle of transport and forwarding works, otherwise the transportation of export products will be inefficient. As result, a producing enterprise can be forced to pay for services of logistic intermediaries, which in turn in most cases increase the final cost of production.

Formation of the efficient transport and logistics support of the export activity of enterprise is an important scientific and practical task. Doing research on logistics in the context of export activity provides that the basis of transport and logistics support should rely on the analysis methodology, which optimizes the flow processes, as well as the evaluation of efficiency of the decisions made. An optimization is aimed at prompt mobilization of reserves and, above all, organizational factors. It aims to adapt economic actors to a constantly changing market environment. All components of the logistic system in the complex should be exposed to analysis and synthesis, so are the interconnected flow processes (material, information, transport, warehousing, service and others) in their unity and interdependence.

The reduction of transport and logistics costs in supplying for export of domestic products requires primarily a solution of tasks related to selection of transport and technological scheme of delivery together with development of ways of its effective implementation, which provide the maximum reduction of the final price of domestic production to the level, attractive for a foreign user [4].

The first stage of the logistic support for intensifying the export activity of national enterprises is selection of methods of the transport and technological scheme of delivery of domestic production, and consequently of the versatile process of planning the corresponding transportations.

To carry out any transport operation it is necessary to coordinate a number of its elements [4; 5]:

1. *Technical* – coordination of technical parameters of cargo with technical and operational parameters of vehicles.

2. *Technological* – definition of technology and method of cargo transportation.

3. *Economic* – transportation planning, pricing, calculations, accounting, determination of efficiency.

4. *Legal* – compliance with national and international legal regimes.

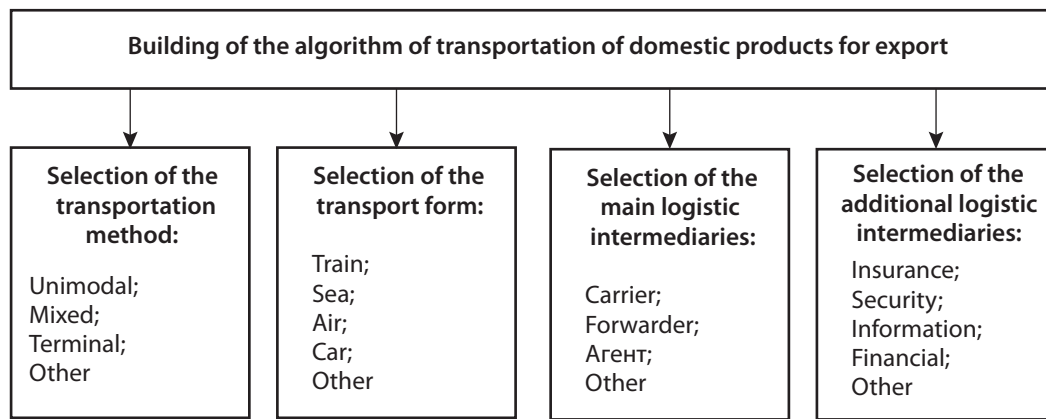5. *Organizational* – information support, decision of managerial tasks, etc.

The following factors have the greatest influence on the organization of the process of goods movement in both national and international communication:

✦ form of transport;
✦ nature of cargo;
✦ type of notification;
✦ transport and technological system;
✦ range of transportation;
✦ effective national and international legal regimes.

At the same time, according to the note by V. I. Sergeyev [5], it is necessary to solve a large number of optimization tasks, also necessary is a complex planning of transportation along with other logistic functions:

✦ general planning of transport processes in terms of different forms of transport in the case of multi-modal transportations;
✦ ensuring the technological unity of the transport and warehousing process;
✦ general planning of transport process with warehouse and production processes, etc.

In order to decide on the form of transport it is expedient to use the general algorithm of transportation organization (*Fig. 1*), which includes the following logistic procedures:

Building of the algorithm of transportation of domestic products for export

Selection of the transportation method: Unimodal; Mixed; Terminal; Other	Selection of the transport form: Train; Sea; Air; Car; Other	Selection of the main logistic intermediaries: Carrier; Forwarder; Агент; Other	Selection of the additional logistic intermediaries: Insurance; Security; Information; Financial; Other

Fig. 1. General algorithm of organization of transport activity

Source: revised by the author on the basis of [4; 6].

+ selection of mode of transport (whether transportation method or cargo delivery system);
+ selection of form (or several forms) of transport;
+ selection of main and auxiliary logistic intermediaries.

Each of the stages of the algorithm has its own specificity and principle approach to the organization. In turn, selection of the form of transportation depends on a number of factors. Waters D. puts forward, in our opinion, the most complete list of them, distinguishing between basic and minor ones [4]. To the basic ones were included: characteristics of cargo, its overall parameters, and distance. Other factors include:

+ importance (even products with low turnover in some cases delay the performance of operations, require fast and reliable delivery);
+ cost of production (because expensive types increase the cost of stocks and encourage the selection of faster methods of transportation);
+ time on the road (there are operations that need to react quickly to changes, so vendors should not use slow delivery forms to transport the components of such importance);
+ reliability (stable delivery characteristics often are more important for customers than time on the road);
+ costs and flexibility, which are considered during negotiations of the parties on tariffs;
+ reputation of the carrier and stability of indicators of its activity;
+ safety, indicators of losses and damages;
+ graphics and frequency of delivery;
+ availability of special conditions.

The selection of transport form is determined by many factors of both objective and subjective character:

+ economic, i. e., the level of costs for transportation, time of transportation and preservation of cargoes;

+ natural-geographical conditions of existence of one or another form of transport depending on the location of counter-parties of agreement;
+ nature of the transported goods and the provided services;
+ universality or specialization of vehicles;
+ level of development of the economic relations of partners;
+ legal regime of world trade and the activities of transport companies;
+ degree of environmental impact, ecological safety;
+ conditions of the historical development of notifications, etc.

Additional emphasis should be placed on the cost of cargo insurance, which many shippers neglect in carrying out export operations. For cargo owners the moment of transfer of responsibility (risk) for cargo and possibility of its insurance must be important. The main causes of risk occurrence are three factors of the external environment, determined by different situations or circumstances: uncertainty, randomness and counteraction. Uncertainty is considered as the sum of circumstances which it is possible to foresee beforehand, but is impossible to know in advance how they will influence the result of logistic activity. Randomness includes circumstances that may occur regardless of the general situation and in most cases do occur under the influence of factors of the external environment. Counteraction is a deliberate resistance to circumstances that need to be foreseen, planned and, if possible, reduced and prevented.

Risk management in logistics is reduced to the development of risk perceptions (identification of risks), identification of limits of permissible risk, development of methods of analysis, assessment and management of risk.

Identification of risk is related to the definition of the source of risks, their kinds and possible losses. Risks can be:

+ *transport risks* – fire, road accident, theft or disappearance of vehicle, damage at loading-un-

loading, loss or damage of cargo containers and packaging, improper processing of documents, etc.;

✦ *risks of realization* – refusal in registration of goods, loss of profit, decrease of profitability, direct financial losses, etc.;

✦ *risks of customs clearance* – untimely certification, incorrect calculation of customs duties, excises and VAT, violation of documentation requirements, etc.

Risks are also distinguished by other signs:

✦ *existence of losses:* potential possibility of loss of additional profit or sales volume – conditional risk; no such possibility – net risk;

✦ *environment of occurrence:* external risk occurs as a result of interaction with market counterparties; internal risk occurs within the enterprise – features of organization, system of accounting and control, staff recruitment, etc.;

✦ *contractual conditions.*

Several approaches and methods are used to assess risk. According to the theoretical approach the risk is calculated:

✦ on the basis of logical considerations, empirically – by extrapolating past situations for the future;

✦ on the basis of statistics – by studying the statistics of losses with determination of frequency of occurrence of certain levels of losses;

✦ expertly – based on the assessments and information received from experts;

✦ analytically – by building a loss probability distribution curve.

The selection of risk assessment methods is related to the necessary accuracy of loss estimation. A simple method is to assess risk based on a statistical approach. The methods that allow to obtain more accurate quantitative estimations are based on the modern apparatus of statistics, sociology (scenarios, decision tree, Delphi Oracle), financial mathematics (sensitivity analysis, stability check, break-even analysis), probability theory, and mathematical statistics.

The results of assessment allow to decide on measures of compensation, reduction or prevention of risks. The main methods are risk transfer (risk reduction) on the basis of contract conclusion, risk limitation by insurance (reinsurance, self-insurance, double insurance), elimination of risk by means of refusal of some activities related to risk, etc. Outside the country, transportation insurance makes almost 100%; inside the country, mostly the risks of transportation in the international traffic are insured. Risks can be objective (earthquakes, hurricanes), and subjective (theft, accidents); both insured and not insured. The risk that is insured can be determined in advance, so a reasonable reward is offered due to the fact that there have been troubles (vehicle breakage, loss or damage to the cargo, improper completion of documents, confiscation of the insured property by sanitary inspectorate, loss during unloading of cargo, cargo explosion, etc.). The risk that is not insured cannot be calculated (determined), so that the insurance companies do not agree to participate in the establishment of a fund for the payment of insurance premiums.

In some cases, insurance companies may refuse insurance payments (loss of cargo associated with its special natural properties, inappropriate containers or packaging of goods, etc.).

The insurance fee is a measure of the danger to which the owner of the cargo or the carrier can be subjected, so it is important to properly project the transportation system and take measures that avoid the people-dependent risks. Insurance organizations in the presence of insurance agreement with specific reasons can compensate the loss of the insured risk in the event of transport accident, which will allow the transport organization to pay compensation of the cargo to the owner.

For compensation of high logistic risks it is suggested to use the methodical apparatus of insurance of both transportations and cargo at delivery. In this case, the cost of compensation for logistic risks depends on the number of logistic intermediaries who take part in the delivery process, the amount of revenue that the owner of the goods receives from the sale of products and conditions of insurance. In case if implementing of the chosen delivery scheme can be carried out with low level of logistic risks, cargo insurance may be not carried out at the shipper's discretion.

In the general format of insurance it is a universal mechanism, by means of which the policyholder (insured person) evades financial consequences of the risk by means of transferring them to the insurance company (insurer), after having paid the insurance premium [6]. The essence of insurance consists in the insurance company collecting small insurance premiums from a large number of clients and forming an insurance fund to cover the probable insured event. Insurance as a method of reducing risk is to transfer the risk to a third party.

One of the main stages of reduction of transport and logistics costs for delivery of export products is determination of ways of effective realization of the chosen optimal transport and technological scheme of delivery, which provide minimum costs on the part of both consignor and consignee in terms of paying for the services of logistic intermediaries and compensation of logistic risks under certain conditions of delivery [7].

Determining the method for an efficient implementation of the optimal delivery scheme involves solving a number of multi-criteria tasks. The multi-criteria approach to selection of methods of an efficient realization of optimal delivery is conditioned to customer requirements. In addition to the basic requirements to ensure the required delivery time and cost of services, the consumer

puts forward a number of additional requirements for the preservation of goods during transport and storage, reliability of fulfillment of the terms of contract, assistance when performing customs clearance procedures, availability of cargo tracking systems and many other requirements [8; 9]. Selection criteria often contradict each other to a greater or lesser extent. In this case, there can be a necessity to search for a compromise solution.

An important task of finding the optimal option for the export shipments is the identification and integration of interrelated factors that impact the amount of conditionally constant and variable costs for delivery. Big impact on the amount of these costs is caused by form of transport and means of transportation, which in turn is determined by availability in the importing country of sea routes, developed network of port terminals, roads and railway lines (*Fig. 2*).

This process includes assessment of the technological capabilities of consignor for the entire delivery scheme or any of its parts by own efforts. The elements of the transport and technological scheme, which cannot be performed by consignor on its own in view of lack of technological capacities or high costs are implemented by logistics intermediaries [10].

An important task in the finding the optimal option for export shipments is the identification and integration of interrelated factors that impact the amount of conditionally constant and variable costs of delivery. Big impact on the amount of these costs provides a form of transport and a method of transportation which in turn is determined by the importing country's sea routes, developed network of port terminals, roads, and railway lines.

Thus, let us comment on the algorithm of optimization of transport and logistics costs when supplying products for export for each block (*Fig. 3*). The purchase orders for supplement of products contain basic information: names and characteristics of products, quantity, time-lines, place and terms of delivery. If the application can be satisfied according to the basic parameters, the enterprise-producer (exporter) projects the logistics chain for supply of products. First of all, affiliation of the importing country to a certain group of countries as to customs procedures and transit transport be defined. After defining the form of transportation scheme, a detailizing for technological operations is carried out, the conditionally constant and the variable costs are estimated. To select the optimal variant of the transportation and logistical delivery scheme, the economic-mathematical modeling of possible schemes of delivery is conducted according to the criterion of minimum time or money depending on the purchase order conditions. After selecting the optimal scheme taking account of the
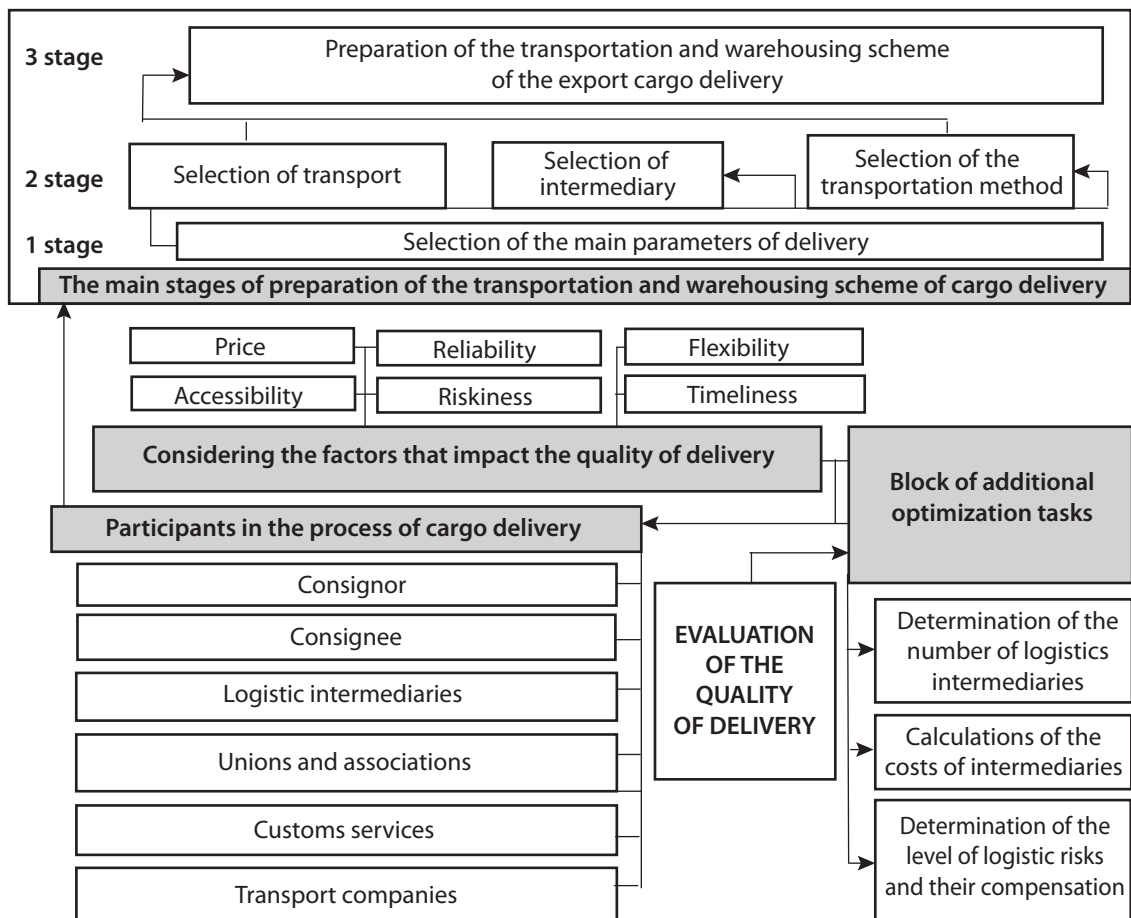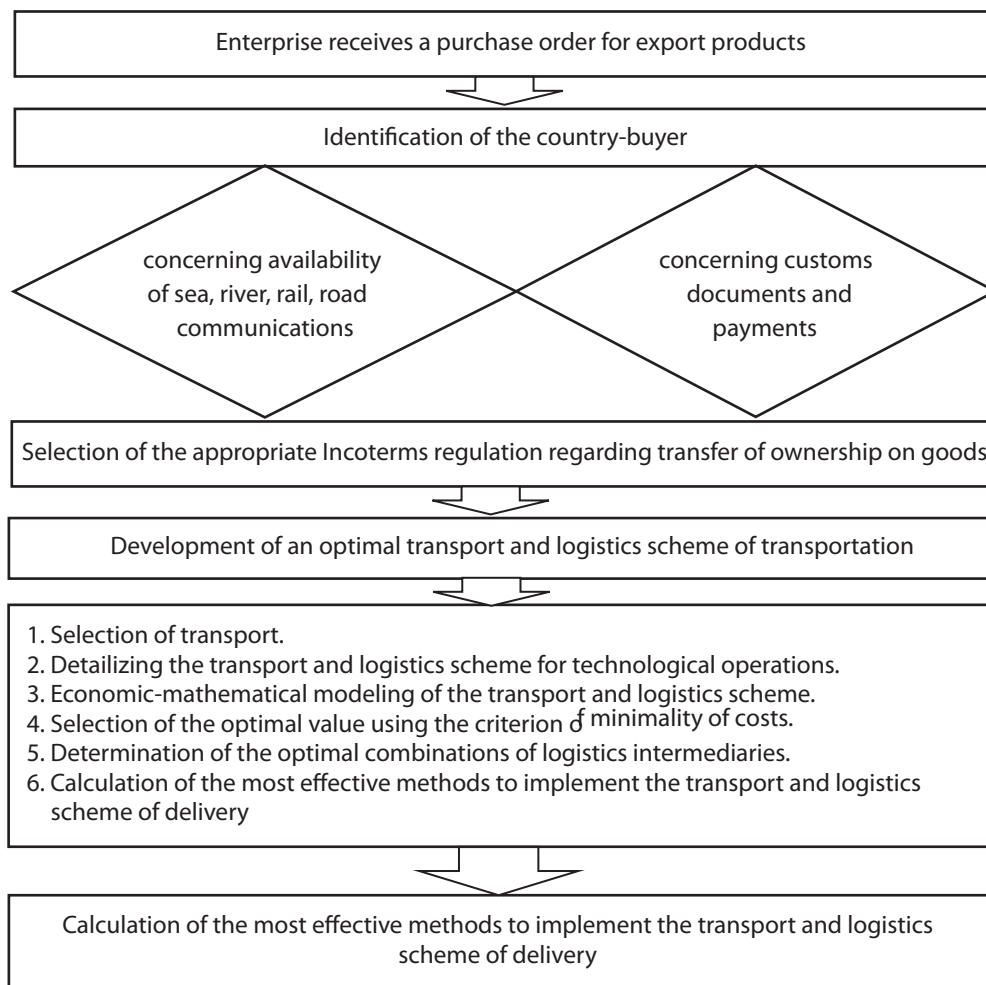

Fig. 2. Block diagram of the optimal transportation and warehousing scheme of the export cargo delivery

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┌─────────────────────────────────────────────────────────────┐
│      Enterprise receives a purchase order for export products│
└─────────────────────────────────────────────────────────────┘
                            │
┌─────────────────────────────────────────────────────────────┐
│            Identification of the country-buyer               │
└─────────────────────────────────────────────────────────────┘
        ◇ concerning availability        ◇ concerning customs
          of sea, river, rail, road          documents and
          communications                     payments
┌─────────────────────────────────────────────────────────────┐
│ Selection of the appropriate Incoterms regulation regarding  │
│          transfer of ownership on goods                       │
└─────────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────────┐
│ Development of an optimal transport and logistics scheme of  │
│                   transportation                             │
└─────────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────────┐
│ 1. Selection of transport.                                   │
│ 2. Detailizing the transport and logistics scheme for        │
│    technological operations.                                 │
│ 3. Economic-mathematical modeling of the transport and       │
│    logistics scheme.                                         │
│ 4. Selection of the optimal value using the criterion of     │
│    minimality of costs.                                      │
│ 5. Determination of the optimal combinations of logistics    │
│    intermediaries.                                           │
│ 6. Calculation of the most effective methods to implement    │
│    the transport and logistics scheme of delivery            │
└─────────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────────┐
│ Calculation of the most effective methods to implement the   │
│    transport and logistics scheme of delivery                │
└─────────────────────────────────────────────────────────────┘
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Fig. 3. The practical algorithm of optimization of transport and logistics costs

technological possibilities of consignor and consignee, feasibility of the selected schema is checked by efforts of consignor without attracting third-party logistics intermediaries. If the implementation by own efforts is not possible, then services of logistics intermediaries may be seeked. To proceed with this, one must determine the available number and the status of logistics intermediaries. Then the level of logistics risks be evaluated in view of the possible methods to implement the optimal variant of the delivery scheme. Further, both the total transportation and logistics costs throughout the supply chain and the ultimate cost of production as to the necessary delivery conditions is calculated. Should the vendor price be higher than acceptable levels of buyer's price, then it is possible to revise delivery terms and redistribute the costs between the supplier and the buyer, which be settled with use of new delivery conditions [10; 11].

So, an optimization of the transport and technological schemes of delivery of domestic exports goes as follows:

1. Compile all possible direct transport and transport-warehouse delivery schemes, in view of the type of importing country, engagement of logistics intermediary, form of transport and methods of transportation.

2. Elaborate a breakdown of delivery options for technological operations: allocating of the conditionally constant and the conditionally variable costs.

3. Define the optimization criterion.

4. Build an economic-mathematical model of delivery.

5. Calculate the delivery costs for each alternative.

6. Select the best option of delivery (variant of transport and technological scheme) by the criterion of optimality.

Thus, to intensify export activities of national enterprises and in order to support their competitiveness, there is a need to select rational options for exports of domestic products, in view of the specificity of products and of the importer country. Particular emphasis in planning export activities must be placed on the development of transport and logistics delivery scheme, which should be optimized using an appropriate optimization model. It is expedient to pay attention for the logistics risks and implementation of the action plan to minimize them. ■

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