International Journal of Engineering & Technology, 7 (4.3) (2018) 257-261

SPC

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Development of the Methodological Proposals for the Use of Innovative Risk-Based Mechanism in Transport System

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Abstract

It can be concluded that the system of analysis and risk management is an effective mechanism for accelerating of customs clearance and improving of the quality of customs control in the functioning of the transport system. The proposed risk management mechanism for performing customs and technological procedures within the transport system reflects a sequence of actions that involves selecting one or more monitoring objects for careful analysis and determination of risk indicators, followed by a decision on the use of forms and methods of customs control, taking into account the probability the occurrence of potential or real loss. The use of the proposed methodology will significantly shorten the time of customs procedures, and therefore, reduce the time of transportation of goods across the border, exclude the downtime of transports through the implementation of simplified controls taking into account the requirements of the World Trade Organization, as well as the integrated use of the Kyoto Convention on the basis of assessing of the loss from the risk situation.

Keywords: *Customs control process; innovation technology project; risk-based mechanism; roadmap of risk management; transport system.*

1. Introduction

The current development of the cargo flows organization has a clearly defined tendency for the integration of national transport networks into a single world economic complex. The geopolitical position of Ukraine gives the state the opportunity to become the main logistics center of the European continent. Significant place in the functioning of the transport system is the implementation of control procedures by public services, primarily by customs authorities. The imperfect system of customs control and registration of goods moving across the border, its non-compliance with world standards greatly complicates the passage of goods through the ports of Ukraine. The ability of the transport system to handle the existing freight traffic is the necessary condition of its development. It cannot be carried out without effective customs support – a complex of organizational, economic and technological procedures aimed at promoting balanced development of the transport system of the state under the conditions of guarantees of protection of its economic security. Execution of procedures of state regulation of the process of moving across the border of Ukraine provides for the effective customs control and clearance of goods, transport in accordance with the International Convention on the Simplification and Harmonization of Customs Procedures. There is a need to transform the role of customs institutions and the essence of their tasks while performing of the customs procedures in the conditions of globalization of foreign trade, active development of interstate integration processes in the field of protection of economic interests. Transport activity is always associated with the emergence of risk situations. Their influence can be foreseen calculated, determined by the set of ways to overcome them, preparation of options for minimizing of the negative consequences in the conduct of foreign economic activity and the direct implementation of customs regulation.

2. Literature Review and Problem Statement

The formation of a flexible system of logistic chains of delivery of goods is presented in [1]. Work [2] is devoted to the development of the theory of transport systems, as well as the study of the effectiveness of the ways of their functioning. The methodical bases of organization of transport technological processes in cargo delivery systems are offered in work [3]. The methodological principles of the formation of the transport process in Ukraine on the basis of logistic principles are given in [4]. The study of the problem of optimization of the system of international freight traffic with the interaction of different types of transport is given in [5]. Methods for optimizing the delivery of foreign trade goods, taking into account the production capabilities of the elements of the transport system, are considered in [6]. Issues of the development of the port is investigated in [7]. The method of determining the customs value of goods, taking into account all components of the transport process, is considered in [8]. The structure of the customs service, its separate elements and the issues of reorganization were investigated in [9]. Theoretical aspects of project and program management of organizational systems are presented in works [10–11]. Conceptual model of project selection of system development is proposed in [12]. Theoretical basis of the use of the risk-based mechanisms is described in scientific studies [13]. Method of transportation system capacity determination considering cargo flow forecasting is proposed in [14]. Transportation system development modeling subject to customs control of cargo flows is considered in [15]. Risk management bases of simulation modeling of the cargo transportation flows across the border is presented in [16]. Modeling of customer-oriented construction of project management of organizational systems is given in [17–18]. Other conceptual models of risk-based management of organizational system is proposed in works [19–22]. Other organizational

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issues of improving of the delivery system, taking into account the methodology of project management are considered in [23–24]. At the same time, a number of theoretical positions and methodological principles are not fully studied. This aspects concern the procedures for forecasting of freight traffic, taking into account the tariff rate, improving of the technology of customs clearance and control. Available methods of transport system management do not allow minimization of the whole number of risks in the process of delivery of goods.

3. The Aim and Objectives of the Study

Development of methodological bases of risk management in the organization of the delivery system of goods, taking into account the implementation of customs procedures is the purpose of the article.

For the purpose of the research, the following tasks are set:

1. Clarifying the concept of risk taking into account the customs regulation of cargo flows.
2. Identifying the main risk indicators while functioning of the cargo delivery system.
3. Determining the actual and potential loss from the situation of risk in the transport system on the basis of the ranking of criteria evaluation system.

4. Materials and Methods of the Risk-Based Transport Processes Control Mechanism

Risks, as a category of conducting of foreign trade activity, can be considered: from the position of state controlling bodies (including customs) and from the position of the direct participants in foreign trade.

In this case, we will understand risks as uncertainty associated with the occurrence of violations of the norms of the national customs legislation aimed at evading payment of the proper amounts of taxes, as well as non-compliance with prohibitions and restrictions on the movement of goods across the border. For transport entities, risk is a combination of factors or circumstances that lead to decrease in the profitability of the transaction, to losses and do not allow full-fledged transport operations.

The consequences of the impact of the risk situation on the process of regulating of transport activity should be assessed using concepts of potential damage – possible losses that can have a negative impact on the implementation of customs and transport activities. To counter possible violations it is supposed to determine the subject and form of customs procedures in a specific situation.

The refusal by the inspector of the customs authority to carry out of the registration in the future until the circumstances of the case are clarified in case of repeated violation of the legislation by the subject of foreign trade activity lead to the elimination of this type of damage.

Real damage are losses arising from the violation of customs legislation and having a negative impact on the indicators of replenishment of the state budget (in case of evasion from payment of customs duties), as well as on the state of the environment and the safety of the population (in case of non-compliance with non-tariff regulation rules). The payment of a fee at the due date entails a refusal to allow the transport to cross the border. This causes downtime and associated losses [13].

International standards provide for the conduct of customs control, taking into account the minimization of the procedures necessary to perform the tasks on the basis of the principle of selectivity with the maximum use of risk management methods.

In order to improve the efficiency of customs and transport activities, it is necessary to develop, introduce and improve a system of selective customs screening, including the control of goods after their passage through the border and inspection prior to their shipment.

When introducing unreliable information in the customs declaration, the applicant has the opportunity to evade paying the duty for the movement of goods; to take advantage of illegal benefits, privileges; receive unpredictable monetary compensation, subsidies; avoid compliance with the prohibitions and restrictions imposed on certain categories of goods.

In accordance with the requirements of the Kyoto Convention on the simplification and harmonization of customs procedures, risk management is the main basic principle of modern methods of customs control, which provides optimal use of the resources of customs authorities, without reducing of the efficiency of clearance, exempt most participants in foreign economic activities from unnecessary detailed control procedures.

5. Results of the Use of the Risk-Based Mechanism in Transport System

The risk situations arising while moving of goods can be divided into the following groups: the risks of the external economic agreement, the risks of customs and tariff regulation, the risks of non-tariff regulation, the risks of customs control technology and clearance.

Risk management mechanism provides rationale for decisions related to the analysis of risk situations, as well as the development of technologies to limit (minimize) actual or potential damage in the customs and transport regulation of foreign trade.

Risk management activities include the following main phases:

- risk analysis: risk identification (qualitative analysis); risk assessment (quantitative analysis);
- choice of method and tools for risk management;
- risk prevention and control;
- risk financing;
- evaluation of risk results.

The purpose of the risk analysis system is obtain the necessary data by the customs body to make a decision on the expediency of carrying out of detailed customs control of goods, transport and other items with the purpose of identifying the facts of smuggling or possible violation of customs rules.

Quantitative risk analysis in the implementation of customs and technological schemes is conducted to determine the risk factors, the stages of their occurrence or elimination, taking into account the potential areas of damage with regard to the possible occurrence of violations of customs legislation.

Risk factors include characteristics of goods (quantity, price, code according to the Ukrainian classification of foreign economic activity), country of origin.

The use of quantitative methods of analysis of risk situations enables potential participants in customs and transport activities to obtain the necessary information for a decision, the content of which may include one of the following categories: loss control, loss insurance, loss elimination, loss absorption.

An example of the implementation of the first category is the implementation of a controlled delivery of drugs, psychotropic substances.

The second category provides for the duty of the carrier to pay the necessary amount of customs payments as a guarantee in the event of non-delivery of goods to the customs office of destination. This measure is used as a means of guaranteeing the financial responsibility of the carrier.

In case of repeated violation of the legislation by a subject of foreign trade activities, an official of a customs authority may refuse further registration before clarifying of the circumstances of the case, thereby eliminating potential loss from the onset of a risk situation.

If the probability of a customs offense is insignificant or the loss does not have a significant negative impact on the participants of customs and transport activities, it is necessary to offer the subjects of foreign trade a simplified scheme of control procedures, ensuring, so-called, the absorption of the loss.

Calculation of the loss from the emergence of a risk situation in the customs system, for example, in determining the country of origin of goods, is associated with the detection of violations of conditions and rules for granting of tariff preferences, that ultimately affects the appearance of negative deviations from the planned indicators of replenishment of the state budget.

Carrying out the analysis of risk situations provides for the identification of a risk area; establishment of its indicators taking into account the quantity, quality of goods, country of origin; assessment and identification of the degree of the loss; drawing up a risk profile, including a description of the necessary control actions.

While assessing the actual loss when a risk situation occurs, the most likely and socially unsafe violations of customs rules should be taken into account, for example, in the environmental or radiological fields.

Analysis of potential damage involves decisions on the level of customs control necessary to counter possible violations of customs legislation, and the definition of the subject and form of customs procedures in a specific situation.

Risk analysis involves the study of information that is updated and supplemented with new information in the analytical management process.

If there are signs of loss to the working group for risk analysis of the customs authority, a decision is made to conduct a customs inspection with an indication of its causes. Requests for clarification of information are sent to both the units of the customs office and to external control structures (Security Service of Ukraine, Border Guard Service) related to the process of regulating the movement of goods across the border.

Further, during the organization and implementation of customs control and clearance, sampling criteria are formed. Among them are the following. The loading of the transport does not correspond to the data in the technical documents leads to the receipt by the customs body of unreliable information about the declared quantity of the goods. The registration of one of the parties to an external economic contract in the offshore zone determines the financial position of the counterparty of the agreement and the possible consequences for the implementation of customs and transport activities. The criteria for selectivity include the existence of different conditions and requirements in the countries of export and import (commodity code, processing criteria, price indicators), as well as repeated violations of customs legislation by foreign trade participants - senders and recipients of goods (level of violation of customs regulations).

Criteria for assessing of loss from the onset of risk situations can be classified according to the type of declared information on the nomenclature and origin of the goods: the classification code (proper tariff classification by trade participants); customs value (proper customs valuation by traders); country of origin (possibility of using preferences, benefits, seasonality of goods); high profitability of the goods.

The criteria for selectivity can also include information on customs procedures: customs regime (probability of simplified procedures, criteria for processing); transit operations (financial guarantee of delivery); warehousing, free customs zones.

The information on participants in foreign economic activity (the period of registration of the enterprise, the type of economic activity, the terms of delivery, force-majeure, the level of violation of customs legislation), transport characteristics (number of goods, description of goods, compliance with the transport documents - the bill of lading, the manifest, the waybills, the number of containers), as well as other indicators (safety environmental issues, intellectual property rights, the observance of trade and transport law) is the important base in the selection of the form of control that further affects the transport process.

Based on the analysis of the risk situation, it is possible to assess by establishing the degree of loss: significant loss – causes the need for detailed customs control (inspection); serious loss – involves sampling control; minor loss – provides for the implementation of simplified customs procedures.

Once the criterion for assessing loss has been determined, a risk roadmap must be developed (**Fig. 1**). It is based on the formation and systematic analysis of data in order to determine the probability of a wrongful act.

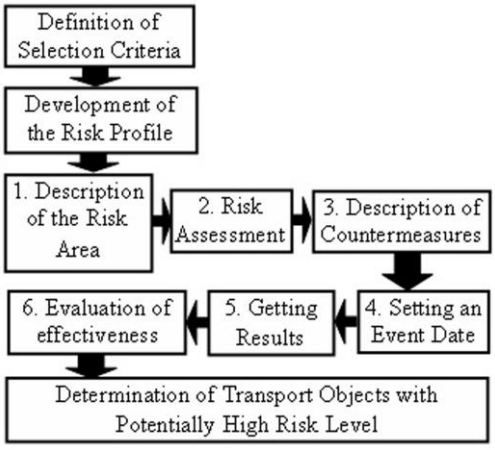


Fig. 1: Roadmap for risk management in the transport system

The official of the customs authority that carrying out of customs control and clearance on the basis of the road map makes a decision on the expediency of performing a detailed inspection of goods, transport and other items transported across the customs border (**Table 1**).

Drawing up a roadmap for the risk situation management in the transport system is a well-planned and object-oriented practical method that allows maximum use of customs resources in the delivery system.

Table 1: Criteria for selectivity in compiling of a roadmap for risk management in the transport system

Risk area	Customs procedures	Transportation process	Participants of foreign economic agreement
Criteria for selectivity	Product Detail	Delivery route	Principal
Indicators	Specific country of origin	Unusual transportation route	Certain principal
Caused loss	Significant	Serious	Insignificant
Countermeasures	Detailed control	Selective control	Simplified control
Efficiency	Improving of transport efficiency (reduction of delivery time)		

A roadmap allows to identify a movement object with a potentially high level of risk.

The assessment of the effectiveness of risk management should be carried out by the customs body through an ongoing process of determining of the loss, taking into account the level of compliance with customs legislation.

To improve the efficiency of customs procedures, it is necessary to review the developed risk profiles periodically, perform unplanned inspections of the operations of participants in the customs transport process to identify other types of risk.

To develop measures to promote compliance with customs legislation, it is necessary to use statistically based methods of unplanned sampling in order to determine the degree of conformity of traders, carriers, their declared data on goods, transport to customs procedures. The application, along with the assessment processes of profiling and identifying of possible violations, creates the necessary balance for efficient concentration of resources in areas having a particular interest to the customs authorities, and also generates important information to strengthen the risk management methodology, taking into account actual and potential loss.

In order to identify priority areas for customs regulation to implement a rational concentration of customs resources in transport system, we introduce a ranking criteria evaluation system. The following classification of customs procedures is used: DTCC

(detailed customs control); SLCC (selective customs control); SMCC (simplified customs control).
This allocation is carried out depending on the degree of the loss to the terms of cargo transportation. Scenario ranking assumes their placement in the risk matrix. The quantification is concentrated in this case on scenarios that give higher levels of risk. **Table 2** shows an example of a risk matrix in the organization of the transport system.

Table 2: Risk matrix in the transport system

Qualitative characteristic of the frequency of the event	Frequency of occurrence of event	The severity of the consequences		
		SI	MI	II
Frequent	>1	DTCC	DTCC	SLCC
Probable	$1–10^{-1}$	DTCC	DTCC	SLCC
Random	$10^{-1}–10^{-2}$	DTCC	SLCC	SMCC
Unlikely probable	$10^{-2}–10^{-4}$	DTCC	SLCC	SMCC
Implausible	$10^{-4}–10^{-6}$	SLCC	SMCC	SMCC
Improbable	$<10^{-6}$	SLCC	SMCC	SMCC

Note: SI – significant influence; MI – medium influence; II – insignificant influence; DTCC – detailed customs control; SLCC – selective customs control; SMCC – simplified customs control.

In relation to this example, the severity of the consequences is determined as follows: significant influence (SI) – major loss to the transport system of state regulation of foreign trade (refusal to move goods across the border); medium influence (MI) – the average level of loss, assuming a slight downtime due to the lack of certain permits; insignificant influence (II) – insignificant influence on the transportation process. At the same time, each grade corresponds to certain points. They are summed up after the analysis of risk situations. The resulting value is equal to the margin and it is decided to apply one of the prescribed forms of control – simplified (50-125 points), selective (126-200 points) or detailed (201-300 points).

6. Discussion of Results of the Use of Risk-Based Mechanism in Transport System

The purpose of analyzing of the frequency of violation of customs legislation is to determine the frequency of each of the undesirable events or scenarios at the stage of identification of the loss. In this case, it is necessary to determine the indicators characteristic of the event that occurred in the past (actual loss), and compare them with the indicators of the future event (potential loss). You can also use methods to predict the probability of occurrence of a risk situation on the basis of statistical data. There are a number of methods for drawing up expert opinions that exclude the ambiguity of assessments, help in raising the relevant issues. Expert assessments should take into account all available information, including statistical, experimental. The analysis of the consequences of the violation of the customs legislation provides for the determination of the results of the impact on the economic, technological, and temporary indicators of transport activity in the event of an undesired event. To calculate the risks related to the financial component, the impact analysis is an approximate definition of the loss from the onset of the risk situation.
Unwanted events consist of such situations as the introduction of inauthentic information in the customs declaration, the inconsistency of the declared data on the quantity, description of the goods, country of origin, customs value to the information in the submitted documents.
Models of consequences are required to predict the amount of the loss to the country's budget. It has an impact on the further functioning of the public payment system.
Let's consider the influence of the system of customs regulation on the process of delivery of goods. For the performance of customs operations, the applicant submits to the customs post a customs declaration, completed in accordance with the chosen customs regime, its electronic copy and a complete set of documents necessary for the customs clearance of goods.
The construction of the technological scheme makes it possible to determine the number of customs inspectors based on the analysis of the technological processes of customs operations, which in the future will affect the total time of cargo handling.
It is assumed that: Q_i – the number of containers transported through the customs post in i–mode per day; t_{ij}' – the time of processing one container in i–mode on the j–workplace with a simplified procedure; t_{ij} " – time of processing of one container in i–mode on the j–workplace in detailed procedure (in case of identification of a risk situation and carrying out of a detailed customs inspection); k_i – part of containers processed in a detailed procedure in i-mode.
In order to reduce the time for customs operations, it is necessary to use a risk management system that will allow the processing technology to be developed taking into account international experience in the implementation of customs procedures to prevent transport downtime.
The technology of customs control and clearance of goods moved through a customs post is presented in **Fig. 2**.

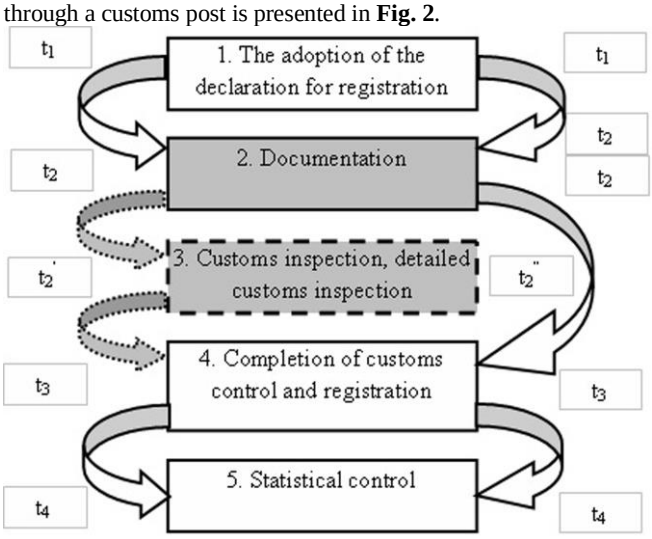


Fig. 2: The technology of customs control in the functioning of the transport system

To determine the number of customs inspectors we should use the method of solving of the task of appointment. We accept N_{ij} – the number of customs inspectors carrying out of customs control and registration of containers in i–mode in the j–department of the customs authority. In view of the above, in the i–mode on the j–workplace, the registration of containers transported across the customs border is carried out in the following terms:

$$t_{ij} = \sum_{i=1}^{l} \sum_{j=1}^{m} \left(Q_i * K_i * t_{ij}^{"} + Q_i * (1 - K_i) * t_{ij}^{'} \right) \quad (1)$$

It should be noted that N_{ij} must take the integer value (i = 1, ..., l; j = 1, ..., m) and round off the bigger side.
The number of inspectors of the customs post, who carry out control and registration at the j–workplace, is determined by the formula:

$$N_{ij} = \frac{t_{ij}}{t_c}, \quad (2)$$

where t_c – time of change, hours.
For the development of cargo turnover of containers transported across the customs border, the total number of customs inspectors is determined as follows:

$$N_{opt} = \sum_{i=1}^{l} \sum_{j=1}^{m} N_{ij}. \quad (3)$$

This indicator is made by adjusting of the staffing schedule, identifying the required number of customs inspectors to ensure the effective implementation of procedures for the registration and control of transported goods using a risk management system.

The proposed method for determining of the number of customs post inspectors on the basis of the use of risk management system allows, depending on the level of conducting control procedures, to determine the required number of inspectors who can process the available traffic, taking into account the possible level of risk from the occurrence of a risk situation. The level of control depends on the risk criteria that can occur while moving goods across the border. For example, during a detailed inspection of 20% of imported goods and 10% of export cargoes, for the development of cargo turnover of containers transported through the customs post of South Customs, the number of inspectors will be N_{opt} = 33. The developed method can also be used in the opposite direction – If it is necessary to determine the level of control at the maintenance of transport cargo flows at a considerable number of customs inspectors. The calculated indicator is estimated for the customs post of the Southern Customs. The presented methodology can be used to determine the required number of inspectors of other customs posts, taking into account the specific organizational structure of the unit and the level of available traffic.

7. Conclusion

1. Based on the analysis of the state and laws of the development of the transport system, it was found that the necessary condition for its functioning is the ability of the system to process the available freight traffic. Having analyzed the impact of customs regulation on the efficiency of the transport system's functioning, it was found that the formation of cargo traffic is influenced by the state of the system of customs control.

2. The proposed method for determining of the form of customs control on the basis of the use of risk management system in the execution of customs-technological procedures can reflect the sequence of actions, which involves the selection of one or more control objects for a thorough analysis and definition of risk indicators, with the subsequent adoption of a decision regarding the use of certain forms of customs control taking into account the probability of occurrence of potential or actual loss. The use of the proposed risk management mechanism in the customs system will significantly reduce the time of cargo flows forecasting.

3. The determination of the required number of customs inspectors on the basis of analysis of technological operations increases the efficiency of the transport system by increasing the throughput of the system and reducing the cost of functioning of customs units, adequate response to emerging in the process of monitoring and formalizing of the situation of risk, adjusting the values of the characteristics of the transport technological scheme.

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