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WHOLESALER TO RETAILER GOODS FORWARDING CONTROLLING

Summary. The modern trends in the development of logistics controlling through the prism of collaboration between wholesale companies and retail chains have been considered. The nature and structure of cargo transportation by the wholesale company to the retail chain have been analysed. The key transportation processes have been identified and the reliance on transportation drivers-forwarders for their effectiveness has been determined. The study has resulted in the program-mathematical approach to the transportation controlling automation used by the wholesale company to deliver goods to the retail chain as well as the mathematical model of the system information flow. The practical recommendations for the mathematical software implementation using the AWS Forwarder software product as an example have been illustrated.

КОНТРОЛЛИНГ ПЕРЕВОЗОЧНОГО ПРОЦЕССА ПРИ ДОСТАВКЕ ТОВАРНЫХ ПАРТИЙ В ТОРГОВУЮ СЕТЬ

Аннотация. Рассмотрены современные тенденции развития логистического контроллинга через призму сотрудничества оптовых предприятий и розничных торговых сетей. Проанализирована суть и структура процесса транспортировки грузов оптовым предприятием в розничную торговую сеть. Идентифицированы ключевые процессы транспортировки и определено влияние водителей - экспедиторов на их эффективность. В результате проведение исследования сформирован программно-математический подход к автоматизации контроллинговых операций процесса транспортировки грузов оптовым предприятием в розничную торговую сеть, а также математическая модель информационных потоков данной системы. Приведены практические рекомендации по реализации программно-математического обеспечения на примере программного продукта «АРМ Экспедитор».

1. INTRODUCTION

The modern conditions of internationalisation and globalisation processes have been boosting the development of wholesale trade in distribution channels. The increase in freight traffic leads to more stress on freight forwarding companies and the transportation units of production (wholesale) enterprises.

The concept of controlling used by the businesses involves achieving transparency in relation to material flow movement control (including stock) with the aim of achieving increased reliability in goods circulation system, logistics costs reduction, logistics expenditures elimination and the customer service quality improvement. The practical use of the controlling concept will allow a company to enhance its competitiveness as well as its economic and financial performance.

The efficient organisation of goods forwarding in the wholesale industry contributes to logistics services level increase for retailers. Logistics controlling is one of the goods delivery management elements. At the same time, the vehicle operation management provision and the business transaction effectiveness criteria application determination with their subsequent development on the basis of the controlling system result in efficiency enhancement of the goods forwarding activities of wholesalers or transportation providers.

One of the ways to improve controlling of the forwarding process in the wholesale trade is the outsourcing of processes related to the delivery of goods to retail chains. Accordingly, one of the important issues of interaction between the manufacturer (wholesaler) and the transportation provider is the controlling and accounting of the operations related to the transportation process and the evaluation of their quality and timeliness.

The forwarding organisation involves frequent shipment condition changes, which require the adoption of prompt managerial decisions. The most effective tools for improving the efficiency of the transportation process today are information systems and technologies.

This paper [1] contains the analysis of the effectiveness of controlling implementation, where the basic parameters of the logistics system are as follows:
   - Reduction of goods delivery terms;
   - Increase of vehicle efficiency due to the non-optimum haulage and idle hours reduction;
   - 10-20% reduction in shipping costs due to savings on fuel and lubricants;
   - Increase in labour productivity;
   - Improvement of driver discipline;
   - Prevention of vehicle misuse;
   - Minimisation of risks related to thefts of cargo and vehicles.

As discussed in [2], "Risks and uncertainties are ever more noted and factored into decision-making today, and those stemming from supply chains are prominent in the competitiveness and viability of companies and organisations." Rational planning and controlling over expenditures can significantly reduce the costs related to the organisation of goods transportation and delivery. The analysis of the transportation providers' activities has shown that in some cases the savings can amount to as much as 20-25% of the original costs.

The contemporary market of freight forwarding services is rapidly growing due to the increase in the number of the companies providing such services. As a result, the level of competition is rising. In order to maintain their position in relation to competitors and retain their market share, the companies need to take effective measures to improve the organisation of their activities, enhance their organisational, material and technical base as well as make maximum use of their human resources [3, 4].

The analysis of the causes of failure and their levels of importance in business activities leads to the identification of four main reasons [5, 6]: the absence of clearly identified goals (26%), the lack of proper monitoring of the business processes (35%), the unreasonable allocation of resources (26%) and specific individual issues (13%). This analysis suggests the possibility of using planning technology and monitoring in order to reduce uncertainty in the economic systems.

2. PURPOSE, OBJECTIVES AND RESEARCH METHODOLOGY

The aim of this study is to develop the model of optimisation of the cargo transportation process from a wholesaler to retail chains by means of information flows optimisation.

To achieve this goal, it is necessary to perform the following tasks:
- Reviewing the current trends in logistics controlling;
- Analysis of the nature and structure of the transportation of goods from a wholesaler to a retailer;
- Identification of the key processes in cargo transportation from a wholesaler to a retailer;
- Identification of the employees who have a direct impact on the efficiency and effectiveness of cargo transportation from a wholesaler to a retailer;
- Identification of cause-and-effect relationships of inter-operational cooperation in the delivery of goods;
- Formulation of a mathematical model of the information flow within the system of goods delivery;
- Proposition of a software-mathematical approach to controlling automation in relation to the goods delivery;
- Creation of a simulation model of the logistics operations volume accounting in relation to goods forwarding to a retail chain;
- Selection (development) of the appropriate software;
- Development of practical recommendations for the practical implementation of the program-mathematical software.

The study of the transportation process (the analysis of the modern concepts of transport logistics and supply chain management) was carried out using the methods of analysis, synthesis, deduction and induction, based on a systematic approach. The economic, mathematical and statistical models were used in the logistics process information flow modelling.

The method of analysis revealed the problem and its structure. The synthesis method made it possible to establish the system of controlling of the transportation process for the delivery of goods to retail chains. The system of goods delivery to retail chains and the necessity of using specialised software were characterised due to the use of the deductive method. The inductive method made it possible to formulate the conclusions of the study based on an analysis of individual facts.

3. AN OVERVIEW OF CURRENT TRENDS IN LOGISTICS CONTROLLING

The issues related to using controlling for logistics business processes management were studied in numerous works by Russian, European and American researchers. The controlling concept was formulated and firstly developed by the German researchers Dayhle (2001), Folmut (2001), Hahn (2005), Horvath (2006), Küpper (2001), Mann (1995), Mayer (1995), Schmidt (1986), Reichman (1990), Schneider (1992), Weber (1999) and others. The logistics chain is a complex system and requires the implementation of effective planning, accounting and controlling of flow processes. In any business there are a number of flows and, therefore, indicators characterising them. The main feature of the modern market economy is the high level of the dynamics of the environment, resulting in a variety of parameters that describe the flow processes [7, 8]. The development of the appropriate methodology in such conditions will provide for the efficient functioning of the supply chain and the logistics system as a whole [9-11].

The use of controlling in a logistics supply chain encompasses both internal and external logistics processes (transport, storage, distribution, etc.) [12-14]. The supply chain should be divided into several segments in order to refine its structure to improve its management efficiency. Otlivanskaya [15] indicates that controlling is not only about the integration phase of decision-making but also about combining and coordinating plans for various functional subsystems, structural units of information services of a company and projects of information systems, especially when a company operates computerised accounting systems that are not linked and do not meet the new standards.

In general, controlling is to be understood as the system of planning, control and accounting parameters of business processes implementation. In most cases, controlling is viewed at the large enterprise level and is used to coordinate activities of the enterprise subdivision and to collect current information to proactively influence the process agents with the purpose of addressing the causes of the problems leading to the increased costs and the low efficiency of the enterprise performance.

Controlling enables efficient identification and visualisation of discrepancies between actual and planned performance, which helps to timely detect deviations and differences from the projected level of investment of time and finances [16-19].

According to [20] controlling is considered to be supportive of a company's management. In addition to the actual control, it also includes guiding, managing and regulating processes. The primary functions of controlling are information and coordination tasks. In turn, the authors determine logistics controlling as the set of administrative functions of the structural divisions of the enterprise, designed to ensure the implementation of effective logistics management in the company (management of its logistics processes).

Some authors believe that controlling is a function identical to management [21]. In [22] controlling is determined as a managerial function equal to planning, organisation, human resource management and administration. Its main purpose is called coordination of managerial decision-making and coordination of people who make these decisions.

In [23-25] the authors distinguish the concept of logistic controlling, which is based on the indicators of quality, efficiency, the level of logistics services and covers all parts of the supply chain. These indicators are fundamental for the evaluation of logistics processes, causes and consequences of possible deviations. The quality and level of logistics services are some of the most important factors for successful competition exerting a significant influence on the degree of customer satisfaction. The development of the services provides stable relations with consumers and their gradual transformation into a partnership.

A number of studies indicate that the logistics controlling is used at large enterprises within their systems [26, 27]. At the same time, a special case of the logistics controlling is the controlling of transport delivery systems [28]. One important aspect of the transportation companies or transport departments of the enterprise controlling is the level of the logistics costs [29, p. 257].

There are three levels of logistics controlling: the operational, the tactical and the strategic. The operational controlling involves control over the performance indicators of each individual operation to identify the one that is executed with deviations. With regard to the transportation processes, operative controlling can be used to control the implementation of each of the logistics operations within the transportation process [30-32].

The tactical controlling is intended for a business processes group and suggests the control of indexes characterising multiple operations during a short time interval. As part of the transport process, the tactical level is important in assessing the performance of one vehicle on its assigned route and the implementation of all logistics operations in the framework of the transportation process [33].

The strategic management is carried out at the level of the structural scheme of the process. It involves monitoring of the parameters related to a long-term period and the changes in the scheme in case the first and second levels of management can no longer ensure achievement of goals or when a dramatic change in business conditions occurs. With regard to the organisation of cargo shipment from a wholesaler to a retailer, the strategic controlling turns into the evaluation process for the existing system of delivery, the identification of shipment process defects and the planning of the new system, taking into account the identified deviations correction [34].

The performed analysis leads to the conclusion that the cross-functional and inter-operational interaction between the participants of the transportation process has not been studied thoroughly enough. One of the managerial levers of such interaction is the use of the controlling concept based on the modern information technologies. One problem of the complexity of the transportation process is the labour intensity of consignments acceptance and transfer. The range of these operations duration varies considerably (from a few minutes to an hour or longer). One reason for these problems can be the unavailability of proper information technologies and software.

4. ALGORITHMISATION OF THE WHOLESALER-TO-RETAILER GOODS TRANSPORT MODEL AND ITS SOFTWARE-BASED IMPLEMENTATION

4.1. Wholesaler-to-Retailer Goods Transportation Process Analysis

When planning the process of transportation, choosing the type of software and the operating accounting of logistics operations, one should take into account the specifics of the goods and, in particular, their handling. For example, in the case of shipping petroleum products to retail chains, it is sufficient to use only the software capable of monitoring and accounting the vehicles (in most cases, the driver's work does not include goods loading and unloading).

In turn, the process of food products transportation (small-lot dispatch and multiproduct flows) involves a number of additional operations that cannot be controlled using the geographic information system (GIS), navigation systems and electronic maps. At the same time, the accuracy and reliability of delivery and the provision of the proper level of customer service depend on the quality of logistics operations, which are carried out by a forwarding driver on the territory of a client (retailer).

The food products transportation process involves the regularity of deliveries, the relative stability of the route network and a small variability in customer orders' assortment (within the retailers' product mix). All this leads to the need for formalisation of the part of the transportation process associated with the logistics services in the wholesale trade that has both qualitative and quantitative components (the number of returns caused by the wholesale company, the number of delays, the impairment of goods quality during their transportation or unloading, etc.) [35, 36].

The analysis of the goods transportation by wholesaler reveals that the shipment of goods is carried out mainly by means of automobile transport to the destination and within the time period designated by the customer [37]. Thus, the shipment is done either directly to the retail chain (if it has sufficient space for storage) or to its warehouse facilities.

The organisation of the transportation operations affects not only the speed of delivery of consignments to consumers but also the safety of goods, the customer service level and the costs of transportation, all of which make up a large share of the goods circulation costs.

In order to improve its logistics service, a wholesaler can coordinate the delivery schedules with its customers. The untimely delivery of goods in some cases is caused by such factors as delays in loading, traffic jams, delays at a previous delivery site, drivers' failures to perform their work in a timely manner because of a lack of motivation.

Upon the delivery the goods, unloading should be carried out by the loading hands of the client company. However, in some cases, for the purpose of time saving, the unloading can be done by the driver of the wholesaler. In this connection, a number of additional operations, along with the necessity of the goods control and accounting, occur in the process of goods transportation by wholesalers to retailers.

A wholesaler on a daily basis collects applications from retail sales points using sales representatives assigned to particular areas. In order to provide complete market coverage, a town is divided into corresponding sectors. A sales representative concludes the agreement on goods delivery for a certain period with his customers. At the same time, the prices and product range are specified for each subsequent client's request. Thus, the sales representative might visit each sale point 1 to 2 times a week.

During his visit to the retail sales point, the sales representative prepares a request for the delivery of a certain product range with the indication of the price of each item and the total cost of delivery, the agreed delivery time as well as the payment method. After that the representative enters the request data into the warehouse inventory control software to specify the name of the client company, the range of goods, their quantity, the sum of the order and the delivery terms.

After the request has been registered, its processing becomes the responsibility of the routing and destination managers. Their main task is to ensure the delivery is carried out by the shortest routes with minimum time- and finance-related expenditures. The large orders are distributed to large cars.

The rest of the orders are arranged on the principle of the maximum use of the vehicle cargo capacity. Once the requests have been grouped, the information is transferred to the warehouse.

The requests for each vehicle are formed using "1C: Enterprise" software. For the purpose of the batching-up, the warehouse manager issues the invoices for the batching technician. Further, on the basis of the delivery notes and invoices, the batching technician packs the goods into boxes. Large orders are arranged directly on pallets. Once all the requests are ready, the goods shipment starts along with the preparation of the supporting documents. The order intended for the last delivery destination is loaded first with the subsequent loading of the previous-in-order, etc., until at least 88% of the vehicle's cargo carrying capacity has been reached.

After the goods loading completion, the vehicle sets off for the assigned route. Upon its arrival at the sales point, the deliveryman hands the goods' supporting documents over to the merchandise specialist. When the goods are being unloaded, the representative of the retailer examines the goods and their packaging integrity and checks the positions indicated in the supporting documents. On the spot (in close contact with the sales representative of the sales point), the handling complaints might be settled. At this point, the reverse material flows might occur [38].

Thus, the delivery driver (a materially responsible person who drives a vehicle) carries out the acceptance of products from the warehouse and their delivery and, if necessary, the unloading of the vehicles.

The analysis of the existing systems of goods transportation by wholesalers to retailers indicates that in there are three main stages in the formation of the transportation process controlling system:
1. preparation and loading of goods for shipment (including paperwork);
2. transportation of goods from the wholesaler to retail sales points;
3. unloading of vehicles (including paperwork).

The creation of the controlling system for transportation of goods from wholesalers to retailers has to be linked with the motivation of the participants in the transportation process. To achieve this, the fair, clearly understandable and transparent system of payroll, which involves the payment for each process, the implementation of which is provided by a delivery driver, is vital. The payment has to correspond to the invested labour intensity and costs (per kilometre travelled, the sales points served, the loading performed, the box or pallet delivered, the fact of unloading, etc.). The monthly-issued detailed calculation printout with indications of the driver's specific actions and the amounts paid to him might become an effective tool for the driver's motivation.

At the first stage the control over the delivery driver's activities is carried out directly at the company and causes no difficulty. At the second stage the route of the vehicle is effectively monitored by the vehicle control systems and the built-in GPS equipment.

To date, the main tool to ensure the safety of vehicles as well as to control and optimise the driver's routes is the automated system of dispatching and monitoring (ASDM). This system is widely used in all spheres of activities combining location technologies, processing and visualisation of data, and modern wireless communications means.

ASDM for vehicles allows you to quickly and easily locate the vehicles and control their routes and movements by means of the dynamic maps; prevent the misuse of cargo or transport, consumables and expendables (namely, to lower fuel consumption as well as monitor the actual mileage and the idle time and speed); monitor the status of the installed sensors; ensure the safety of the goods transported; and improve the overall safety of the vehicles [39].

The logistics specialist of a wholesaler on a monthly basis keeps the record of the tonnage, mileage and days in haulage for each driver (the mileage is determined in accordance with the information provided in the transport work ticket or according to the GPS data). In the same way, the type of the vehicle and the number of days the driver actually operated it, in case the driver used different vehicles during the given month, are also indicated. The combined data array for the last month is handed over by the logistics specialist to the company economists for further payroll calculations at the beginning of each month.

As for the third stage (unloading of vehicles and paperwork), the possibilities of automatic identification of the work fulfilled are limited. At the same time, it is at the last stage that the problems, which can result in lower customer satisfaction, may occur. Therefore, to ensure a high level of logistical service, it is vital to organise the control and accounting of logistics operations

implementation directly at retail sales points. One solution to this problem is using specially designed software.

For this purpose, the "AWS Forwarder" software, which is designed to calculate the drivers-forwarders wages based on the accounting of the number of sales points the goods are delivered to, the weight and size characteristics of the goods, the delivery route, the type of vehicles, and the restrictions on the wage fund, is offered.

In order to automate the forwarding services cost calculation, it is expedient to connect the AWS Forwarder Software to the "1C Enterprise" system. All the necessary initial data are stored in the file called "Baza.mdb", which allows you to organise a direct connection from "1C Enterprise" to "AWS Forwarder" [40]. The connection takes place on the basis of OLE-Automation technology.

Since the basic "1C Enterprise" has no module that allows forwarding services costs calculating, the above-described method is very relevant and allows you to extend a functionality of the existing enterprise information system (in the case of "1C Enterprise" system usage) [41, 42].

This software is capable of solving the main issue, i.e. the motivation of forwarders in relation to the cargo-specific vehicles, the routes and the cargo. The calculations are based on the basic rate of pay of the forwarder per one sales point with the application of the correction coefficients system.

4.2. Building a Simulation Model for Accounting the Volume of Logistics Operations in the Delivery of Goods to Retail Chains

Taking into account the performance criteria of logistics supply chains in the selection of vehicles and taking into account the results of the studies [43-45], we proposed a simulation model of the information flow formation in relation to goods transportation by a wholesaler to a retailer.

The basis for the calculations is the standard reference information that permeates all stages of calculations, including the plurality of sales points, where the goods are delivered to, the weight and size characteristics of the goods, the delivery routes and the types of vehicles.

Let us carry out the mathematical formalisation of the simulation model of the information flow functioning in relation to goods transportation by a wholesaler to a retailer.

The forwarding service cost estimation is calculated by means of the following formula:

$$S = \begin{cases} \sum S_i, \ \sum S_i \leq B \\ \sum S_i k, \ \sum S_i > B \end{cases} \tag{1}$$

where: S_i - forwarding service cost of the i-th consumer in rubles; k - correction coefficient for the budget limit used in the case of expenditure excess in relation to forwarding service over the budget-specified figures (calculated as the ratio of B to ΣS_i); B = budget expenses for forwarding service, in rubles.

The cost of the forwarding service for i-th consumer calculated by means of the formula (2):

$$S_i = S_{base} k_{vtc} k_{ua} k_{lh} k_{fd} k_{lc}, \tag{2}$$

where: S_{base} - the base wage rate of the forwarder's work with the area's specificities taken into account, in rubles; k_{vtc} - vehicle type correction coefficient; k_{ua} - the goods unloading area correction coefficient; k_{lh} - the goods lift height correction coefficient; k_{fd} - the goods forwarding direction correction coefficient; k_{lc} - the vehicle loading capacity correction coefficient.

All correction coefficients are variable and can be customised to the specific requirements of the organisation. Let us consider their default characteristics and values contained in the "AWS Forwarder" software.

The vehicle type correction coefficient (vtc) depends on the brand of the vehicle used and is connected primarily with the level of responsibility and the complexity of different vehicle brands operation (Tab. 1).

Table 1

The characteristics of the vehicle type coefficient values

Vehicle loading capacity, kg	K_{vtc}
1,700	1
4,000	1.2
10,000	1.5
20,000	2

The goods unloading area correction coefficient (k_{ua}) takes into account the complexity of unloading in relation to a particular customer (Tab. 2).

Table 2

The characteristics of the unloading area coefficient values per a load unit

Area size, m.	K_{ua}
> 50	1
50 - 100	1.2
> 100	1.5

The goods' lift height correction coefficient (k_{lh}) takes into account the labour costs for the goods lifting efforts to the customer (Tab. 3).

Table 3

The characteristics of the unloading complexity coefficient values

Unloading complexity levels	K_{uc}
One	1
Two	1.1
Three	1.2

The goods forwarding direction correction coefficient (k_{fd}) takes into account the geography of shipment for the vehicle direction (Tab. 4).

Table 4

The characteristics of the forwarding direction coefficient values

Directions (Branches)	K_{fd}
City	1.3
City/Region	1.15
Region	1

The vehicle loading capacity correction (k_{lc}) takes into account the vehicle loading capacity usage and stimulates the forwarder to use it to the maximum (Tab. 5).

Table 5

The characteristics of the vehicle loading capacity usage coefficient values

Loading capacity usage	K_{lc}
0	0
0.3	0.7
0.7	1.3
1	1

The formalisation of the obtained dependences of logistics operation accounting issues resulted in their use in the specially-designed software, namely, the AWS Forwarder.

4.3. AWS Forwarder Software Interface

In order to optimise the process of goods transportation controlling by wholesalers to retailers and on the basis of the study conducted, we have developed the specialised software product titled AWS Forwarder. With the development and introduction of information technologies for successful business operation, the application of specialised software is one of the ways to improve the efficiency of a business, thereby increasing its productivity, competitiveness and profitability.

The AWS Forwarder software interface includes such tabs as a general tab (designed to provide general information on the transportation network), a forwarders tab (designed to provide information on the forwarders), a tab "Modes of transport" (designed to provide information on the vehicles), etc. Shown below are the AWS Forwarder software interface examples.

Sales points tab is designed to provide information on all sales points the goods might be forwarded to (Fig. 1). Every point has the name, the delivery address, the unloading area and the goods lift height.
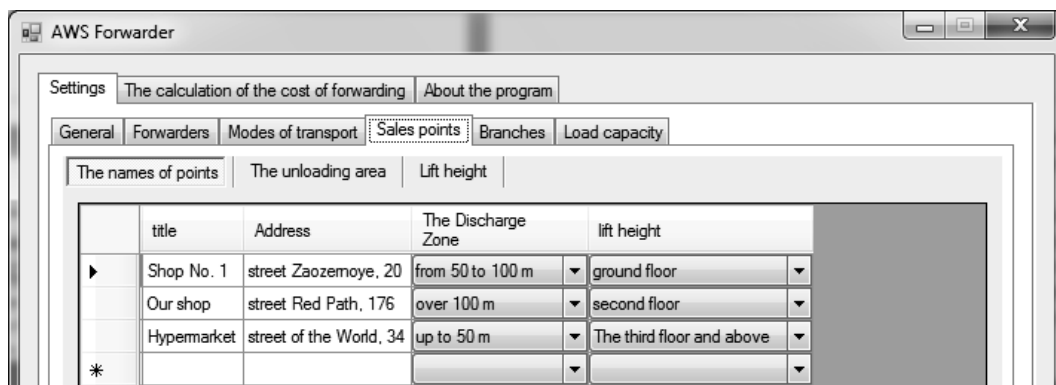

Fig. 1. AWS Forwarder interface. The Sales points tab
Рис. 1. Интерфейс АРМ Экспедитор. Закладка Пункты продажи

The data on the unloading areas is provided in the Unloading Area subtab. Each unloading area has the name and the correction coefficient to the basic forwarding rate. The user can add new values to the list and the delete or edit the existing ones.

The logic of the correction factor application is associated with the work volume increase that might occur if the unloading area is located farther than the forwarding destination, and, therefore, the forwarder's wage increases accordingly.

The names of the categories and the correction coefficients can be modified by the user in accordance with the particular forwarder's wage system.

The complexity of the unloading operations is defined in the Lift height sub-tab. The lift height has a description and the correction coefficient.

The logic of the correction factor is associated with the work volume increase that might occur if the lift height is bigger than the forwarding destination, and, therefore, the forwarder's wage increases accordingly. The names of the categories and the correction factors can also be modified by the user in accordance with the particular forwarders wage system.

The Branches tab contains categories of forwarding geography, which may also influence the wages since the deliveries to the outlets within the city limits are associated with greater difficulties in comparison to the ones in the regions because of the speed limits as well as manoeuvring and parking issues. Consequently, the remuneration for work in the city has to be higher than in the suburbs. The branches and the correction coefficients can be modified by the user in accordance with the particular forwarders wage system.

The Load Capacity tab shows the dependence and correction coefficients on the vehicle capacity utilisation rate. The reason for this dependence is the fact that the more fully the load capacity of the vehicle is used, the lower the transport cost per an item is. Consequently, the profit increases. At the same time, overloading the vehicle cannot be considered normal since it causes rapid wear and tear of the vehicle and increases the cost of repairs. As a result, the correction coefficient initially grows with the increase of the capacity utilisation ratio but decreases afterwards (in the case of the vehicle overloading), stimulating the forwarders to avoid overloading.

Let us consider the cost calculation process of the goods forwarding from a wholesaler to a retailer.

Source data input. After the calculation parameters in the Settings tab have been entered, the forwarding cost calculation is done in the Calculation of the cost of forwarding tab (Fig. 2).
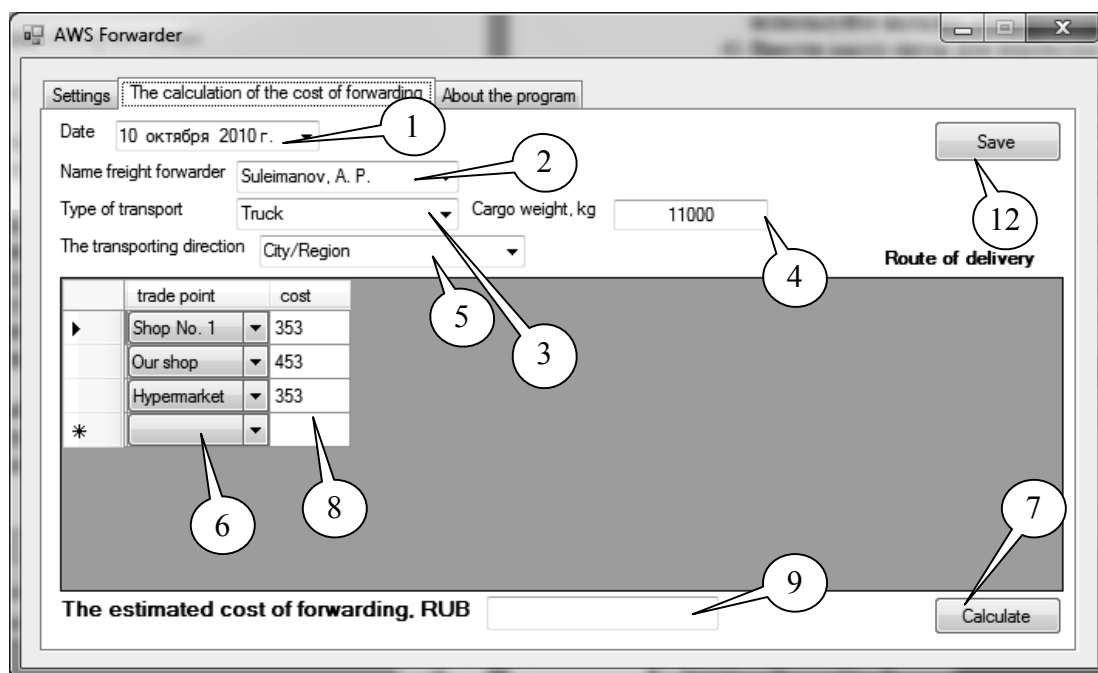

Fig. 2. AWS Forwarder interface. The calculation of the cost of forwarding tab
Рис. 2. Интерфейс АРМ Экспедитор. Закладка расчета стоимости экспедиции

Let us consider the algorithm for calculating the cost of the goods forwarding from a wholesaler to a retailer with the interface on the Calculation of the cost of forwarding tab (Fig. 2):

Position 1. Type in the calculation date.

Position 2. Select the forwarder from the list (to enter new employees use the Settings—Forwarders tab).

Position 3. Type in the type of transport (to enter new types use the Settings—Types of transport tab).

Position 4. Type in the cargo weight (kg).

Position 5. Type in the transporting direction (to enter new direction use the Settings—Directions tab).

Position 6. Type in the sequence of outlets (trade points).

Position 7. Click on the Calculate button so that the column gets filled in Position. 8 and the estimated cost amount will be displayed.

Position 12. To save the entered parameters and calculation results, click on the Save button.

5. CONCLUSIONS

Based on the above, it can be concluded that the forwarding process controlling enhances the quality of the managerial decision-making while reducing or preventing communication barriers in the wholesaler-driver-forwarder-retailer chain.

The effective operation of the freight forwarding company or a transport division of a wholesaler depends on the skills, professionalism and productivity of each employee. The analysis of the goods transportation by wholesalers to retailers has revealed that most of the responsibility for the reliability and timeliness of logistical operations in the delivery of goods to the retailer is to be borne by the delivery drivers. In turn, the volume of properly executed orders affects not only the wages earned by the forwarders but also the financial profit gained by the wholesalers. The above leads to the need for effective forms and methods of motivation of the delivery drivers employed by wholesalers and the forwarding-logistics service providers as well. The system of controlling the transportation process in the wholesale trade in addition to technical and technological issues must be complemented by the employees' incentives related to each forwarding business operation fulfilled by them.

The urgency of the controlling system in the wholesale trade is also associated with the need to ensure an adequate level of customer service, which requires additional cost, including the development and introduction of the related software. In turn, the cost reduction in logistics services today can result either in an increase or decrease in the level of customer loyalty tomorrow.

The identification of the goods forwarding operations by wholesalers to retailers allowed us to determine the causal relationships of the inter-operation interaction and identify the need for the formalisation of the process.

The simulation model of the logistics operations volume accounting for the goods forwarding to retail chains developed by the paper authors includes the reference data, the input data for operational controlling of the transportation process, summary information on the volume of operations carried out during the transportation process, and the program-mathematical operations automation of the controlling activities. The practical application of the formalised models has been embodied in the specialised AWS Forwarder software developed by the authors. The use of the software in practice will allow the rapid collection and processing of the information on the transportation process and, as a result, increase its effectiveness.

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