

controlling; logistics; wholesale company; retail chain;  
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## WHOLESALE TO RETAILER GOODS FORWARDING CONTROLLING

**Summary.** The modern trends in the development of the 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 analyzed. The key transportation processes have been identified and the reliance on transportation drivers - forwarders on 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 проведения 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 internationalization and globalization 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 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 goods circulation system reliability increase, 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 organization of goods forwarding in the wholesale industry contributes to the logistics services level increase for retailers. The logistics controlling is one of the goods delivery management elements. At the same time, the vehicles operation management provision, the business transactions effectiveness criteria application determination with their subsequent development on the basis of the controlling system results in wholesalers or transportation providers goods forwarding activities efficiency enhancement.

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 control and accounting of the operations related to the transportation process, the evaluation of their quality and timeliness.

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

The 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;
- vehicles efficiency increase due to the nonoptimal haulage and idle hours reduction;
- 10-20% shipping costs reduction due to the fuel and lubricants savings;
- labor productivity increase;
- drivers' discipline improvement;
- prevention of vehicles misuse;
- reduction of loss risks caused by theft of cargo and vehicles [1].

Rational planning and control over the expenditures can significantly reduce the costs related to the organization 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 organization of their activities, enhance their organizational, material and technical base as well as to make maximum use of their human resources [2, 3].

The analysis of the causes of failure and their level of importance in the business activities allows to identify four main reasons [4]: the absence of clearly identified goals (26%), the lack of proper monitoring of the business processes (35%), the unreasonable allocation of the resources (26%), individual specific 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 optimization of cargo transportation process from a wholesaler to retail chains by means information flows optimization.

To achieve this goal it is necessary to perform the following tasks:

- to make a review of current trends in logistics controlling;
- to analyze the nature and structure of the transportation of goods from a wholesaler to retailer;
- to identify the key processes in cargo transportation from a wholesaler to retailer;
- to identify the employees who have a direct impact on the efficiency and effectiveness of cargo transportation from a wholesaler to retailer;
- to identify cause-and-effect relationships of inter-operational cooperation in the delivery of goods;
- to formulate a mathematical model of the information flow within the system of goods delivery;
- to offer a software-mathematical approach to controlling automation in relation to the goods delivery;
- to create a simulation model of the logistics operations volume accounting in relation to the goods forwarding to a retail chain;
- to choose (develop) the appropriate software;
- to develop 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 modeling.

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 specialized software were characterized 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. 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 logistics chain is a complex system and requires the implementation of effective planning, accounting and control of flow processes. In any business there are a number of flows and therefore indicators characterizing 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 [5 - 7]. 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 [8 - 10].

The use of controlling in a logistics supply chain encompasses both internal and external logistics processes (transport, storage, distribution, etc.). The supply chain should be divided into several segments in order to refine its structure to improve its management efficiency.

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 large enterprises level and is used to coordinate activities of the enterprise subdivision and 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 visualization of discrepancies between actual and planned performance, which helps timely detect deviations and differences from the projected level of investment of time and finances [11 - 13].

According to [14] «controlling is considered to be support 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 of the company (management of its logistics processes).

Some authors believe that controlling is a function identical to management. In [15, 16] controlling is determined as a managerial function equal to planning, organization, human resource management, and administration. Its main purpose is called coordination of managerial decision-making and coordination of people who make these decisions.

In [17 - 19], the authors distinguish the concept of logistic controlling which is based on 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 one 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 the their systems [20, 21]. At the same time a special case of the logistic controlling is the controlling of transport delivery systems [22]. One important aspect of the transportation companies or transport departments of the enterprise controlling is the level of the logistics costs.

There are three levels of logistics controlling: operational, tactical and strategic [23].

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 [23].

The tactical controlling is intended for a business processes group and suggests the control of indexes characterizing multiple operations during a short time interval [23]. 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.

The strategic management is carried out at the level of the structural scheme of the process. It involves monitoring of parameters related to a long-term period and the changes in the scheme in case when the first and second levels of management can no longer provide the goals achievement or when a dramatic change of business conditions occurs [23]. With regard to the organization of cargo shipment from a wholesaler to a retailer the strategic controlling turns into the evaluation process 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.

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 labor 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. ALGORITHMIZATION 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 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, 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, 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 formalization 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.) [24].

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 [25, 26]. Thus, the shipment is done either directly to the retail chain (if it has sufficient space for storage) or to its warehouse facilities.

The organization 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 as well as the costs of transportation that occupy a large share in 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 their 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, in the process of goods transportation by wholesalers to retailers there occurs a number of additional operations along with the necessity of the goods control and accounting.

A wholesaler on a daily basis collects applications from retail sales points using sales representatives assigned for particular areas. In order to provide a 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 sales point 1-2 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 a 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 have been 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 next in order etc. until at least 88% of the vehicles 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 delivery hands the goods supporting documents over to the merchandize specialist. When the goods are being unloaded, the representative of the retailer examines the goods, the packaging integrity, and checks the positions indicated in the supporting documents. Immediately 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 [27].

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 retailers indicates that in there are three main stages in the process of the formation of the transportation process controlling system:

- preparation of goods for shipment and loading (including documents);
- transportation of goods from the wholesaler to retail sales points;
- unloading of vehicles and paperwork.

The creation of the goods transportation controlling system by 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 labor intensity and costs (per kilometer traveled, the sales point served, the loading performed, the box or pallet delivered, the fact of unloading, etc.). The monthly-issued detailed calculation printout with indication of the drivers specific actions and the amounts paid to him might become an effective tool for the drivers motivation.

At the first stage the control over the delivery drivers' 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 vehicles 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 optimize the drivers 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 visualization 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, monitor the actual mileage, the idle time and speed); monitor the status of the installed sensors; ensure the safety of the goods transported; improve the overall safety of the vehicles [28].

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, indicated are 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. 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 organize 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.

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 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 [29 - 33], we proposed a simulation model of the information flow formation in relation to goods transportation by a wholesaler to retailer (Fig. 1).

Figure 1 shows the block diagram of the simulation model of the information flow formation in relation to goods transportation by a wholesaler to 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 goods, the delivery routes, the types of vehicles, etc.

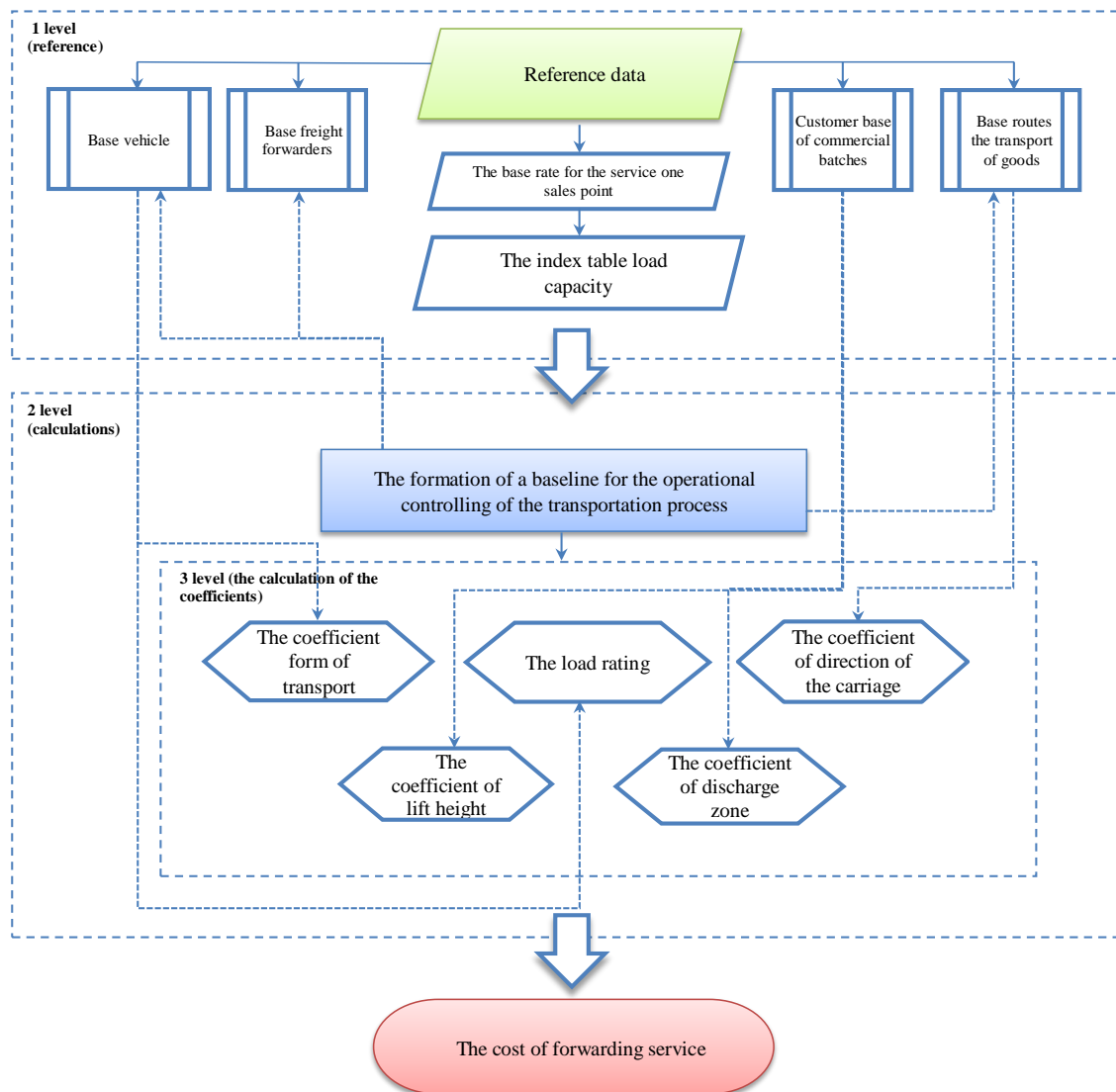


Fig. 1. The block diagram of the simulation model of the information flow formation in relation to goods transportation by a wholesaler to a retailer

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

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

$$S = \begin{cases} \sum S_i, & \sum S_i \leq B \\ \sum S_i k, & \sum S_i > B \end{cases} \quad (1)$$

$S_i$  – the forwarding service cost of the  $i$ -th consumer in rubles;

$k$  – the correction coefficient for the budget limit used in the case of expenditures excess in relation to forwarding service over the budget-specified figures (calculated as the ratio of  $B$  to  $\sum S_i$ );

$B$  – the budget expenses for forwarding service, rubles.

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

$$S_i = S_{\text{base}} k_{\text{mp}} k_{\text{3p}} k_{\text{en}} k_{\text{H}} k_{\text{2p}}, \quad (2)$$

$S_{\text{base}}$  – the base wage rate of the forwarder's work with the area's specificities taken into account, rubles;

$K_{\text{vtc}}$  – vehicle type correction coefficient;

$k_{\text{ua}}$  – the goods unloading area correction coefficient;

$k_{\text{lh}}$  – the goods lift height correction coefficient;

$k_{\text{fd}}$  – the goods forwarding direction correction coefficient;

$k_{\text{lc}}$  – the vehicle loading capacity correction coefficient.

All correction coefficients are variable and can be customized to the specific requirements of the organization. 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).

Tab. 1

The characteristics of the vehicle type coefficient values

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

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

Tab. 2

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

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

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



Tab. 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).

Tab. 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).

Tab. 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 formalization of the obtained dependences of logistics operations accounting issues resulted in their use in the specially-designed software, namely, the AWS Forwarder.

### 4.3. AWS Forwarder Software Interface

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

Shown below is the AWS Forwarder software interface.

General tab is designed to provide general information on the transportation network (Fig. 2).

Settings: The calculation of the cost of forwarding | About the program

Date: 10 октября 2010 г. Save

Name freight forwarder: Suleimanov, A. P.

Type of transport: Truck Cargo weight, kg: 11000

The transporting direction: City/Region

**Route of delivery**

	trade point	cost
▶	Shop No. 1	353
	Our shop	453
	Hypemarket	353
*		

The estimated cost of forwarding, RUB Calculate

Fig. 2. AWS Forwarder interface. The General tab

Forwarders tab is designed to provide information on the forwarders (Fig. 3).

Settings: The calculation of the cost of forwarding | About the program

General | **Forwarders** | Modes of transport | Sales points | Branches | Load capacity

	full name	date of birth	residential address	Phone
▶	Suleimanov, A. P.	22.10.1981	Omsk, St. Irkutskaya, D. 3, square 4	8-983-114-0081
	Pupkin I. P.	30.01.1976	Omsk, Tara street, apartment 2	8-984-113-2323
*				

Fig. 3. AWS Forwarder interface. The Forwarders tab

The Modes of Transport tab is designed to provide the information on the vehicles (Fig. 4)

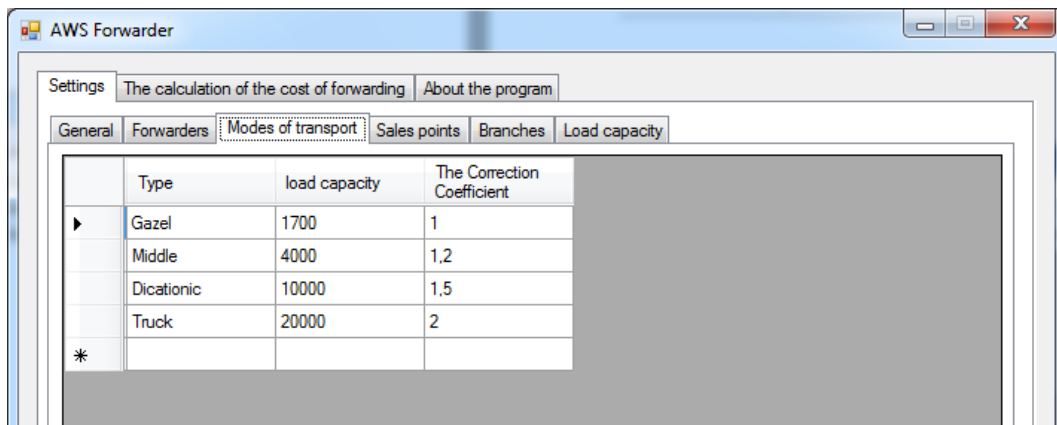


Fig. 4. AWS Forwarder interface. The Modes of Transport tab

Sales points tab is designed to provide information on all sales points the goods might be forwarded to Fig. 5. Every point has the name, the delivery address, the unloading area and the goods lift height.

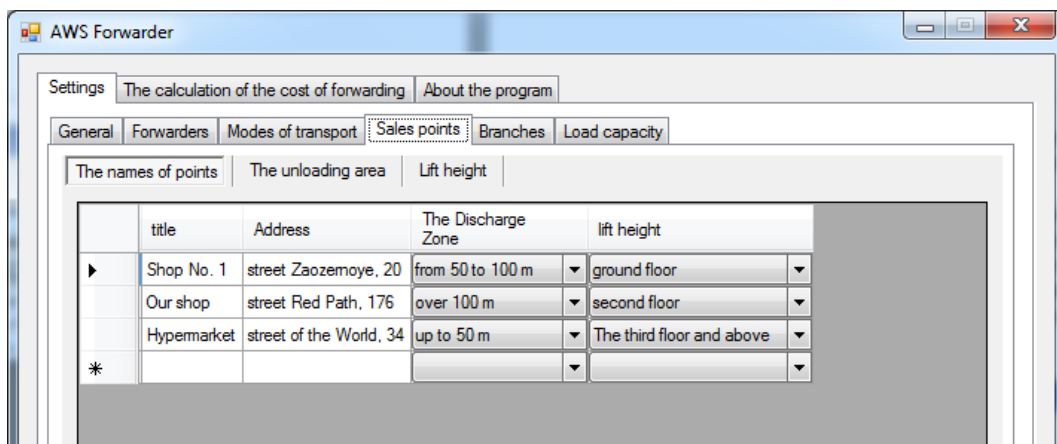


Fig. 5. AWS Forwarder interface. The Sales points tab

The data on the unloading areas is provided in the Unloading Area subtab (Fig. 6). Each unloading area has the name and the correction coefficient to the basic forwarding rate. The user can add new values to the list, the delete or edit the existing ones.

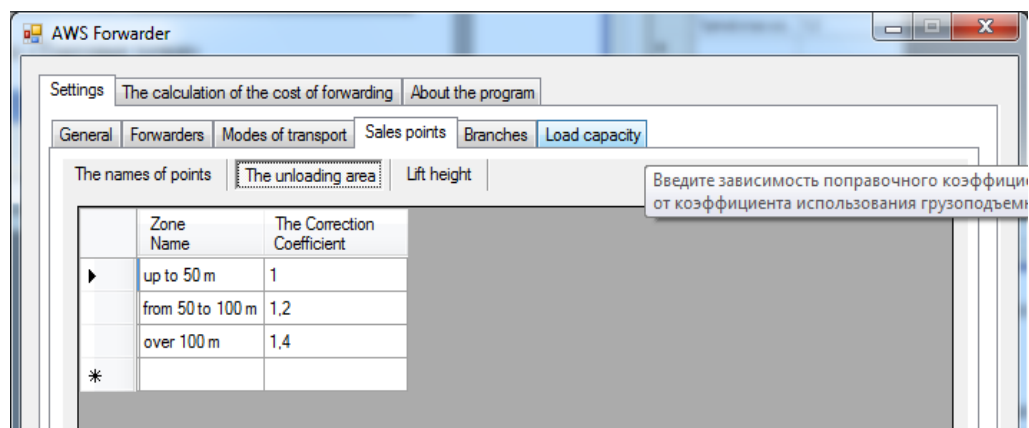


Fig. 6. AWS Forwarder interface. The Unloading Areas sub-tab

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 forwarders wage system.

The complexity of the unloading operations is defined in the Lift height sub-tab (Fig. 7). The lift height has a description and the correction coefficient.

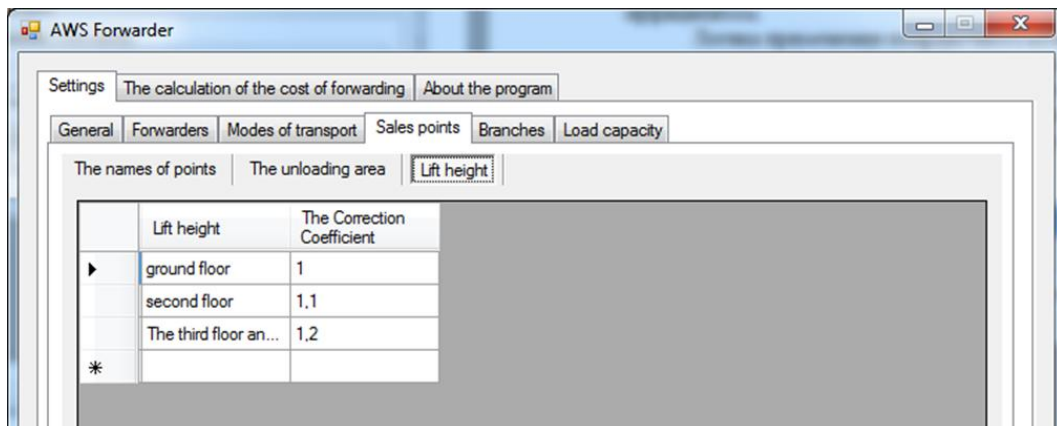


Fig. 7. AWS Forwarder interface. The Lift Height sub-tab

The logic of the correction factor is associated 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 is associated with greater difficulties in comparison to the ones in the regions because of the speed limits, maneuvering and parking issues. Consequently, the remuneration for the work in the city has to be higher than in the suburbs (Fig. 8).

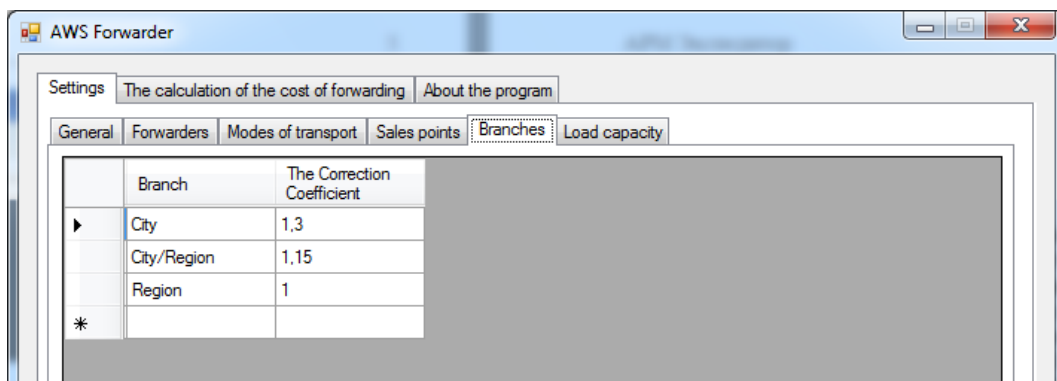


Fig. 8. AWS Forwarder interface. The Branches sub-tab

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 utilization rate (Fig. 9).

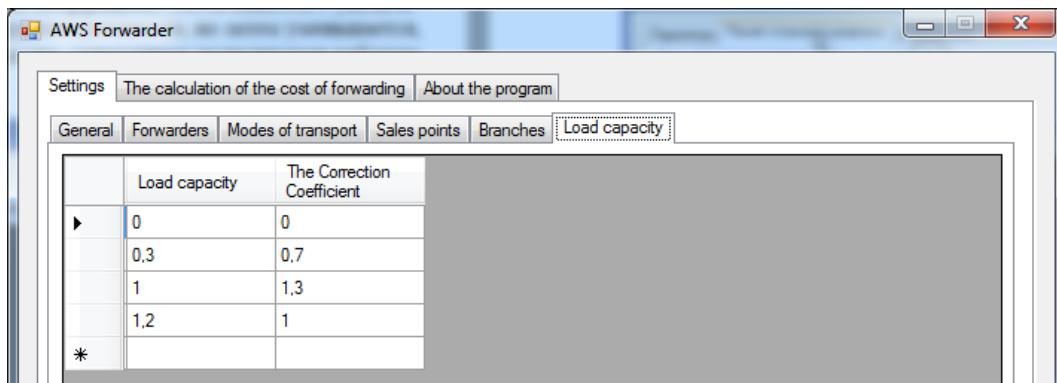


Fig. 9. AWS Forwarder interface. The Load Capacity tab

The reason of this dependence is caused by the fact that the more fully the load capacity of the vehicle is used, the lower transport costs per an item are. Consequently, the profit increases. At the same time, the 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 utilization ratio, but decreases afterwards (in 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 retailer.

Source data input. After the calculation parameters in the Settings tab have been entered, the forwarding costs calculation is done in the Calculation of the cost of forwarding tab (Fig. 10).

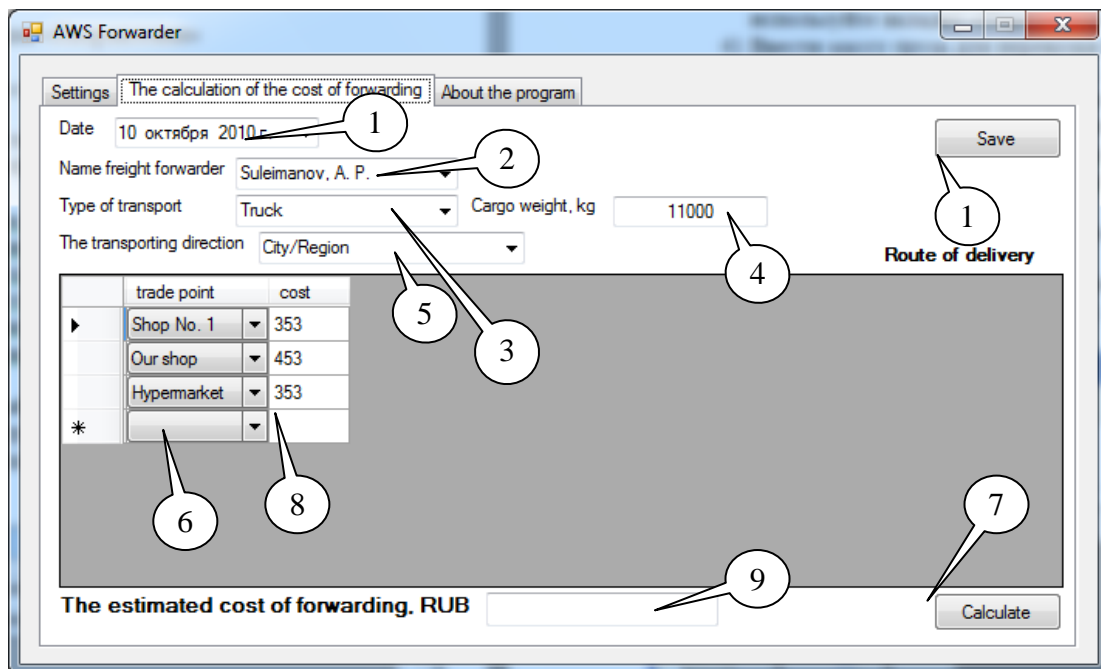


Fig. 10. AWS Forwarder interface. The Calculation of the cost of forwarding tab

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. 10).

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 (Fig. 8) and the estimated cost amount will be displayed.

Position 12. To save the entered parameters and calculation results lick on the Save button (pos. 12).

## 5. SUMMARY AND CONCLUSIONS

Based on the above it can be concluded that the forwarding process controlling provides 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 responsibility for the reliability and timeliness of logistical operations in the delivery of goods to 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 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 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 of 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 formalization of the process.

The simulation model of the logistic 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, and summary information on the volume of operations carried out during the transportation process; the program-mathematical operations automation of the controlling activities. The practical application of the formalized models has been embodied in the specialized 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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