THE RATIONAL SCOPE OF USING DIRECT AND MULTILEVEL LOGISTICS CHANNELS FOR MATERIAL FLOW DISTRIBUTION (CASE STUDY IN UKRAINE)

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ABSTRACT

Constant raising the requirements for logistics service of end-consumer expand sales markets and economic relationships that are formed under conditions of uncertainty and instability of the environment, leading to the need to consider not only the logistics system of internal factors but also external. This issue is especially important for Commonwealth of Independent States that rebuilt to a market economy. Nowadays, the grocery logistics network distribution system that would fit for end-consumer and logistics systems owner simultaneously have not fully developed. On the one hand, consumers are looking for minimal cost, which can be provided by direct logistic channels, but minimal cost do not give flexibility in quantity and volumes or other services. On the other hand, the multilevel system provides high level of service and diversity in channel, but products are more expensive in it.

Finding the balance between rational price and level of service for end-consumer and logistics system profits in period is been up-today issue in consumer-oriented logistics. The development of mechanisms makes it possible to assess the scale of the rational use of direct and multi-level logistics for the distribution of material flows, which was demonstrated with the numbering of participants in the logistics system in the current situation (external and internal factors). The paper considers the functioning of the system for delivering goods on a direct and multilevel distribution channel. An integrated approach to evaluate the efficiency of the functioning of the logistics system and the consumer had been used.

Keywords: material flow, end-consumer, channel, participant, urban, integrate

1. INTRODUCTION

Delivering products to the consumption sphere is one of the important trade functions that take place in commercial companies. Rational management of these processes plays an important role in the distribution of goods. A logistics tools affect the choice of delivery mechanism distribution. At the current stage of development of the state's economy, the ability of one or another subject of enterprise activity to compete with nation-al and foreign similar enterprises takes great significance.

Therefore, an increasingly widespread application in practice is acquiring a logistic approach to organizing the work of enterprises and supply chains, which, based on principles such as consistency, flexibility, rhythm, allows for the maximum reduction of costs and losses in the activities of economic entities.

The paper investigates the change of the main indicators of the functioning of the logistic system, depending on the organization of movement of the material flow. The purpose is to determine the feasibility of changing the existing organization of supply of products in supply chain «Manufacturer – Retailers». To achieve the purpose, existing approaches to determining the efficiency of the supply chain functioning were analyzed, a mathematical model of the supply chain functioning was constructed, studies were conducted to determine the effect of parameters of participants in the supply chain on their performance and the chain as a whole, and recommendations were developed for improving the efficiency of the supply chain.

The supply chain is formed by independent participants of the market of pure competition at the distribution stage, namely: manufacturer, wholesaler, retailers and participants who transport goods to the areas: manufacturer - wholesaler and wholesaler - retail

chain. The developed models of the functioning of the participants and the supply chain reflect the transport-technological and economic features of their interaction, consider the tax component and the conditions for attracting financial resources. As a criterion for evaluating the performance of the supply chain proposed net present value (NPV), which characterizes the excess of total cash receipts over total costs in the supply chain.

2. REFERENCES ANALYSIS

2.1. Analysis of the work of logistics systems

Logistic activity is based on the concept of integration of all components of the logistics system and the search for optimal solutions in general throughout the material flow (MF) movement (RUSHTON; CROUCHER; BAKER, 2010). In the works (CAMPAGNA; FILIPPI, 2009; TANIGUCHI; THOMPSON; YAMADA, 2016) logistics activities are considered as a combination of the following activities: customer service; forecasting demand; stockpile management of work in progress; order processing; cargo processing; packaging; supply of spare parts and assisting consumers in servicing; selection of places of allocation; logistics of return flows; management of transportation and transporting of cargoes; warehousing and storage.

The implementation of «Just-in-time» approach in the industry and its extension to traditional distribution systems of material flows in combination with information technologies has allowed reducing inventory and optimizing the supply chain. The development of the retail market requires improvements in the methods and models of the efficiency of the logistics systems operation with the consideration of consumers. This leads to the need for the logistics system to adapt to changing requests conditions and to effective met the demand (GALKIN; DOLIA; DAVIDICH, 2017).

The literature most widely and in detail covers the application of logistic methods to the formation of logistics channels, management of transport and warehouse functions and means of production. At the same time, the use of logistic approaches to the study of consumer goods markets, especially at the stage of their movement from retail to households, is not given enough attention. They require further consideration, since the consumer market is in the stage of development and reform.

Participants in the channels that create the logistics system are aware of the influence of buyers and regard them as their assets. On the other hand, every logistics system learner has its own goals and interests (GALKIN, 2015). Modern theories examine the different indicators

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as indicators of the efficiency of the logistics system: costs, cost, profit, safety, quality, agrarian indicators, time and performance (MAKAROVA; SHUBENKOVA; PASHKEVICH, 2017). Recent studies point to the adoption of managerial decisions in the logistics system, considering purchasing interests. Participants in the logistics system are aware of the influence of buyers and consider them as their assets.

The references analysis indicates about insufficient attention has paid to the management of material flows in logistics systems, especially at the stage of distribution among end users. The following types of logistic activity are considered: customer service (GAJEWSKAN; ZIMON, 2018); forecasting of demand (BOWERSOX; CLOSS; COOPER, 2002); fright distribution (SAKAI, et. al,.2018); processing and execution of orders (KUSH, et. al, 2018); supply and provision of ancillary services to consumers during maintenance; the choice of distribution center location (ŻAK; WĘGLIŃSKI, 2014); revers flow management (BAJDOR; BRZEZIŃSKI, 2018); management of production processes (ŻAK; HADAS; ROSSI, 2017), transportation management (DE GIOVANNI, et. al., 2017) and others (TANIGUCHI; THOMPSON; YAMADA, 2016).

Simultaneously, the movement of material flows in logistics systems from the participant in the retail network to the end consumer remains not fully investigated, Figure 1. Modern methods offer a macro model of consumer evaluation in Information and communications technology platform for urban freight distribution (PLC – participant of logistic channel) (CAMPAGNA; FILIPPI, 2009). In fact, the methods and patterns of the distribution of material flows in logistics systems at the micro level, considering final consumers, require further consideration.
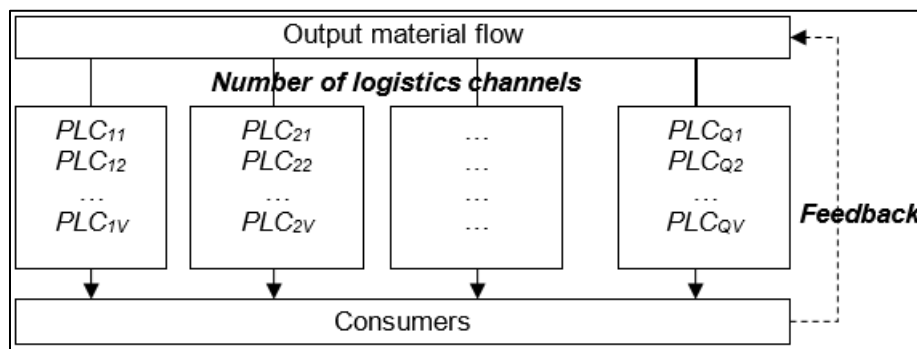

Figure 1: Distribution of material flows to consumers: PLC_{QV} – V-th participant of logistic system, Q-th logistics system

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It is known that changing the parameters of the logistics system can lead to a redistribution of the volumes of material flows realized in them at different times (CRAINIC; RICCIARDI; STORCHI, 2009). At the same time, the influence of the consumer on this indicator is not sufficiently studied (Figure 2).
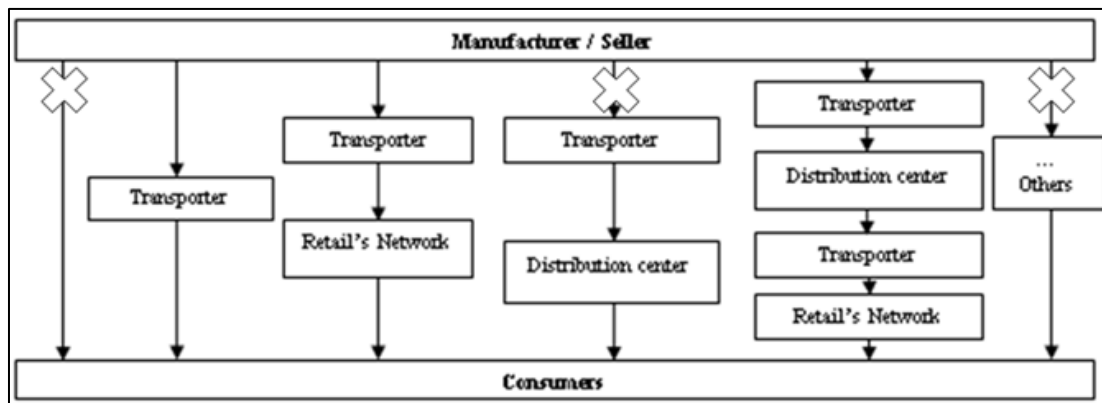

Figure 2: Material flow's distribution channels scheme, (X – logistic channel under certain conditions does not exist)
Source: Based Litomin, et al., (2016)

The number of intermediate levels between the producer and the consumer characterizes distribution channels of goods. In fact, they consist of independent participants in the promotion of material flows. Each member of the channel is a separate unit that seeks to secure maximum profit. This approach contradicts the system approach, since none of the channel participants has full or sufficient control over the activities of the rest of the participants. The maximum logistics efficiency of the logistics channel organized less than with the system approach.

2.2.   Analysis of the transport operations in logistics systems

The nature of the effective functioning of the intermediary, the conditions for its emergence and the transformation of the logistics system from a lower hierarchical system to a higher hierarchy system remain to be studied. It can be assumed that a situation arises in the market when the number of transport participants (TP) selling their services for various logistic systems reaches a critical value. In this case, it is expedient to use the mediator. The use of transport in the logistics system can be represented in three directions:

1. Transport is the property of the logistics system and is fully aimed at serving the needs of the system.

2. Transport is the property of the logistics system and, in addition to the needs of the system, performs functioning in other logistics systems.

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3. Transport needs of the logistics system are met by external transport, which is not the property of the system.

The use of this or that direction concerns the assessment of the effectiveness of transport. It can be assumed that in these directions the values of the transport performance indicators can be different. Therefore, it may be necessary to have a system to bring transport performance indicators in these areas into a single assessment system.

The cost of transportation affects final costs from the point of view of logistics. Very often, the cost of transportation is not taken into special consideration and as a result, the cost of goods increases precisely because of transportation. When we assume that the work of the transport is auxiliary and is aimed at ensuring the work of other participants in the logistics system, then we can draw the following conclusion: the assessment of the work of transport should be based on the values of indicators located in the zone of «logistic expediency». The term «logistic expediency» is proposed to mean the values of transport performance indicators, which are in the range from the minimum to the maximum possible values (meaning the physical capability of the indicator), as well as between the minimum and maximum values of the efficiency of the logistics system (KAZHAEV, et. al., 2018).

The current state of economic and political relations between the states of Europe is characterized by the preservation of disproportions in the functioning of transport, which complicates the development of integration processes and national economies (ALMETOVA, et. al., 2018), in the Ukrainian economy. In this regard, it becomes of importance to ensure the functional and economic stability of the modules of the transport complex, as well as the development of logistics management.

One of the problems of increasing the efficiency of the transport complex is the problem of assessing the efficiency of various modes of transport. The existing approach to assessing the efficiency of transport in terms of the volume of scheduled traffic became the main reason that the transport had unjustified overloads and the necessary increase in traffic volume was provided mainly due to extensive factors (LOBASHOV, et. al., 2018). Therefore, it is important to develop a methodology for assessing the transport operations of development of economic relations. It is necessary to design a logistic system or increase its operational efficiency considering all possible external and internal.

3. RESULTS

3.1. Determining the boundaries of the system and the calculation of performance indicators of its participants

The task of identifying the characteristics of the system can be considered as a dual (connected) in relation to the task of managing the system (CRUIJSSEN, et. al., 2007). You cannot manage the system if it is not identified either in advance or in the management process. For example, it is impossible to drive a car until the procedure of familiarization with its reaction to the steering, accelerator or brake pressing, that is, until acquaintance with the properties of the vehicles (ESPER; WILLIAMS, 2003; ROSSOLOV, et. al., 2017), occurs. Identification consists of three stages:

1. The choice of model structure based on a priori information about the investigated process and qualitative characteristics of the process and model.

2. The choice of the criterion of proximity of the object and the model, based on net specifics of the problem.

3. Determination of the parameters of the model, optimal in terms of the chosen criterion of smoothness (identification of the parameters of the model).

In the existing sources for identifying model parameters, the mathematical approach predominates (OLKHOVA, et. al, 2017). Simultaneously, the identification of parameters in logistics systems can take place in two fundamentally different approaches: the heuristic and mathematical (ALHO; SILVA, 2017).

Further, let's dwell on each of the approaches. Existing methods of constructing mathematical models of technological processes (the functioning of transport can be considered as a set of technological processes) can be divided into two approaches (COMI et. al., 2012):

1. Physical and mathematical analysis of phenomena that determine the dynamics of the process.

2. Experimental identification, in which the basic information about the process is obtained by direct measurements.

The most suitable are the experimental methods of identification (the consideration of physical and mathematical regularities turns out to be ineffective because of the complexity and variety of processes occurring in complex systems, and also because of the large number of their constituent elements) (TAVASSOLI; FARAMARZI; SAEN, 2015). An analysis of the existing state of sites is carried out using a model that is based on the determination of a net

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cash flow (HALKIN, et. al, 2016), according to which the objective function of the model of the system under study is as follows:

$$NPV_{sys} = F(NPV_{tpm}, NPV_{dc}, NPV_{tpdc}, NPV_r) \rightarrow \max, \tag{1}$$

where $NPV_{tpm}, NPV_{dc}, NPV_{tpdc}, NPV_r$ – respectively, the net present value of the TP project in the section «manufacturer - distribution center», distribution center, TP in the link «distribution center - retail network» and retailer, which is considered, UAH.

The income of the transport participant depends on the tariff for transportation. The tariff is determined by the transportation costs, which depend on the parameters of the selected route. The studies conducted by the authors showed that the probability of a driver choosing the i-th route for movement between pick up and deliveries bays can be formalized as follows:

$$V_{er_i} = f(\frac{V_i}{V_{krat}}, \frac{L_i}{L_{krat}}, TN, AD), \tag{2}$$

where $\dfrac{V_i}{V_{krat}}$ - the ratio of the speed along the i-th route to the speed along the shortest route; $\dfrac{L_i}{L_{krat}}$ - the ratio of the length of the i-th route to the length of the shortest route; TN - individual characteristics of drivers, which are determined by the type of nervous system; AD – driver's age.

Net present value is defined as the ratio:

$$NPV_{sys} = \sum_{t=1}^{k} \frac{NCF_{sys}}{(1+i)^t}, \tag{3}$$

where NCF_{sys} – net cash flow at selected intervals of the total calculation period t; i – discount rate; k – total calculation period.

The cost component of each participant has certain differences, but the main components are the current costs of organizing production, the basis of taxes and fees, payments on borrowed capital and capital investments (Table 1).

Table 1: Scheme of costs of participants in the supply chain for the existing organization of the system under consideration

Participants	Current costs	Basic taxes and fees
Distribution center	rent; expenses for the maintenance of a TP; expenses on wages of employees; maintenance and repair costs of the equipment; fuel costs for loaders; general expenses.	- income tax; - VAT.

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Transport company	wage costs; maintenance and repair costs of vehicles; fuel and lubrication costs; general expenses.	- income tax; - VAT; - tax on owners of vehicles.
Retail participant	expenses for the purchase of products; expenses on wages of employees; maintenance and repair costs of the equipment; general expenses and others.	- income tax; - VAT.

Calculations are made for a period of 5 years, which is divided into quarters 3of three months. In this paper, it is proposed to consider not a supermarket as an independent entity, but a chain, the initial link of which is manufacturers or other suppliers. Material flows in individual areas relative to the object being examined, are depicted in Figure 3. In this case, two separate sections of the existing system within the city are being investigated, namely the «Distribution center of alcoholic beverages «Obolon» in Kharkiv city (in the paper – the distribution center) – Limited Liability Company «Rost» (hereinafter in the paper – the retail participant) and Manufacturer of non-alcoholic beverages «Private enterprise «Vela» (manufacturer) in Kharkiv city – «Limited Liability Company «Rost» (Figure 4).

The total area of the supermarket, including the parking area, is approximately 10,000 square meters. The total area set aside for construction is approximately 5,000 square meters. The area of the supermarket premises, including the administrative building, warehouses, is approximately 8,500 square meters. The supermarket is essentially a warehouse-store, most of all products are stored directly in the premises of the trading hall, the rest - in warehouses. The initial data are given in table 2. It was obtained according economic-planning department and logistics department od considering supply chain.

Table 2: Scheme of costs of participants in the supply chain for the existing organization of the system

№	Name of factor	Units of mesurments	Value
1	The average value of the daily sales volume of the enterprise of production is 1 (distribution center)	tonn	0,08
2	The average value of the daily sales volume of the enterprise products - 2 (manufacturer)	tonn	0,048
3	Proportion of products - 1 (distribution center), which is considered, in the total sales of products by the enterprise	%	0,075
4	The share of production - 2 (manufacturer), which is considered, in the total sales of products by the enterprise	%	0,029
5	The value of the area's retail network storage	m^2	425
6	The value of space by retail chain	m^2	6050
7	The average height of storage space among members of the retail network	m	5,5
8	The average value of the bulk cargo	ton/ m^3	0,7
9	Number of days a retailer works in a month	unit	30
10	Average markup for retailer products	%	34
11	The average markup on the products of the distribution center	%	40
12	Average cost of production of one tonne of material flow 1 (distribution center) at manufacturer's selling price	UAH	3600

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13	Average cost of production of one ton of material flow 2 (manufacturer) at the manufacturer's selling price	UAH	3200
14	The total number of staff required for a retail network participant, as required by the approved staffing schedule	units	483
15	Average monthly salary per unit of retailer's staff according to staffing	UAH	11960
16	Rate of deductions for repair and maintenance of equipment and maintenance of premises of the retail participant	%	2
17	Income tax rate	%	25
18	Value added tax rate	%	20
19	Discount rate, to adjust net cash flow	%	17

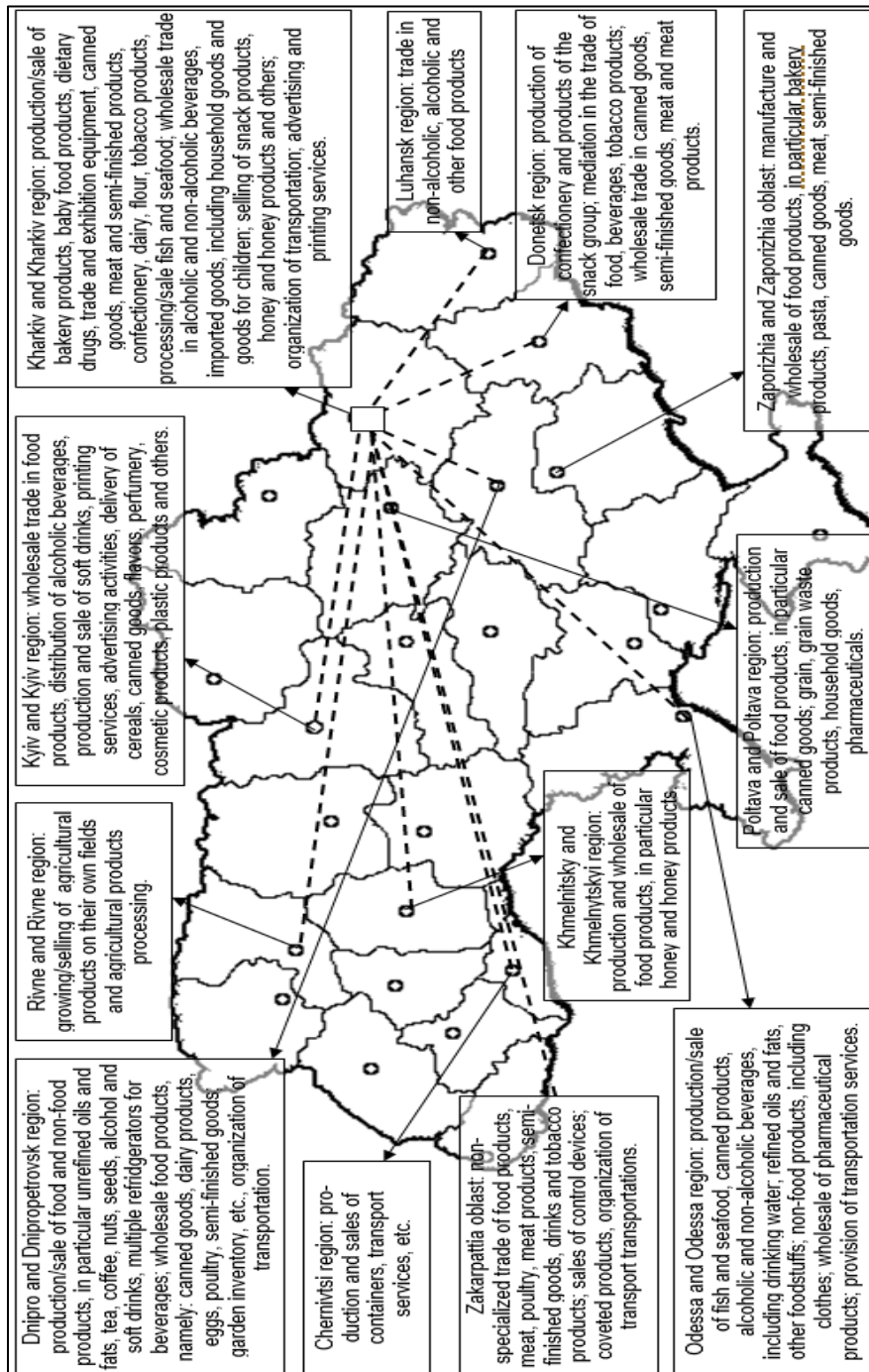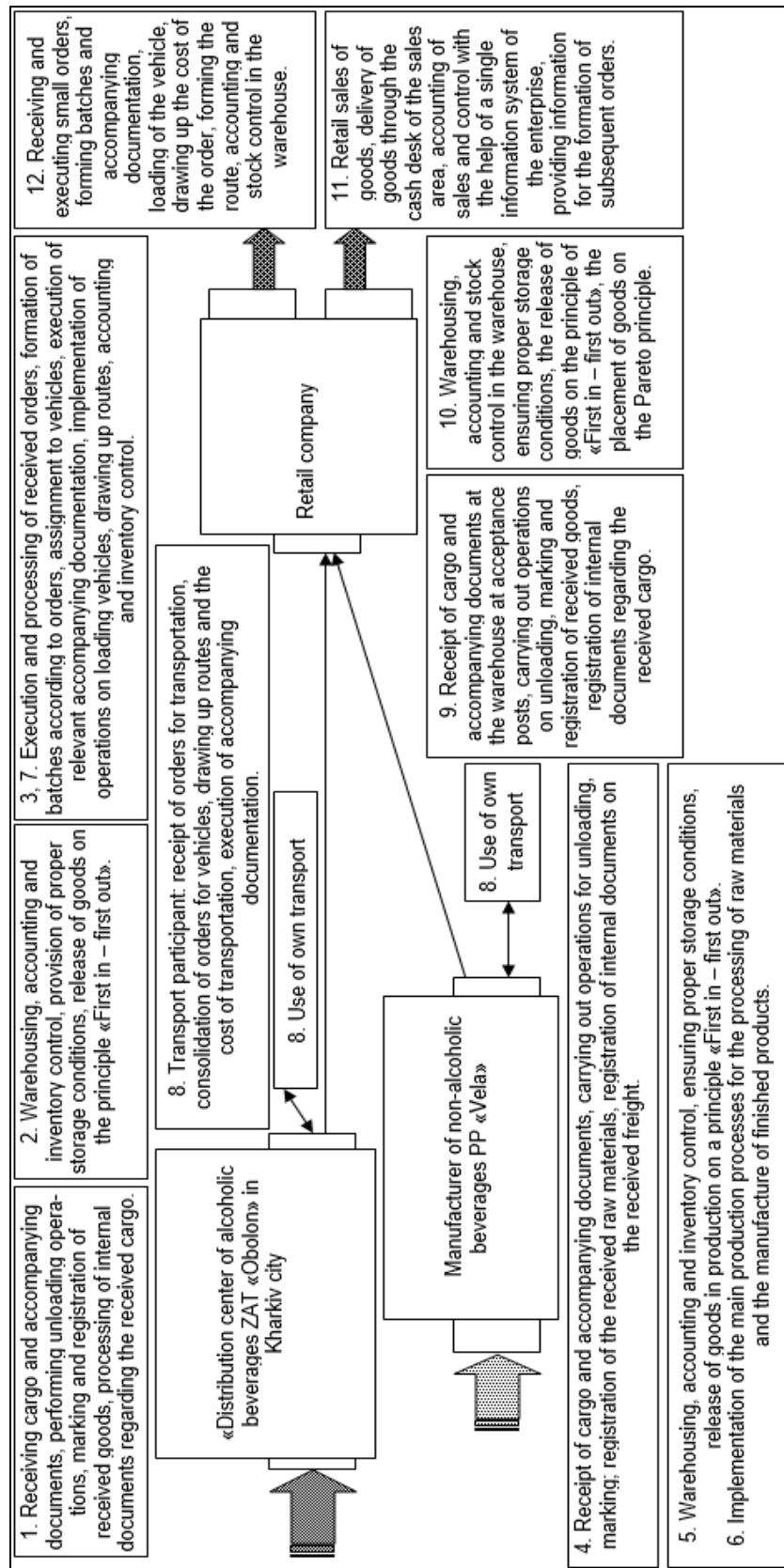Figure 3: Existing organized supply chain

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Figure 4: Description of the movement of products flows

3.2.   Characteristics of projected changes

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The collaborative approach allows its participants to gain more profit, operate based on equal partnership and in a high degree of trust, delegate powers and delegate responsibilities, co-solve problems, and focus their attention and strength not on their own operations, but on existing and potential consumers. In this case, the terms of contracts are more flexible. In this case, the combination of the work of two separate supply chains, which are considered in the second section of the study, is investigated. Thus, the following scheme is proposed for organizing the movement of material flows (Figure 5) in comparison with the existing one (Figure 6).
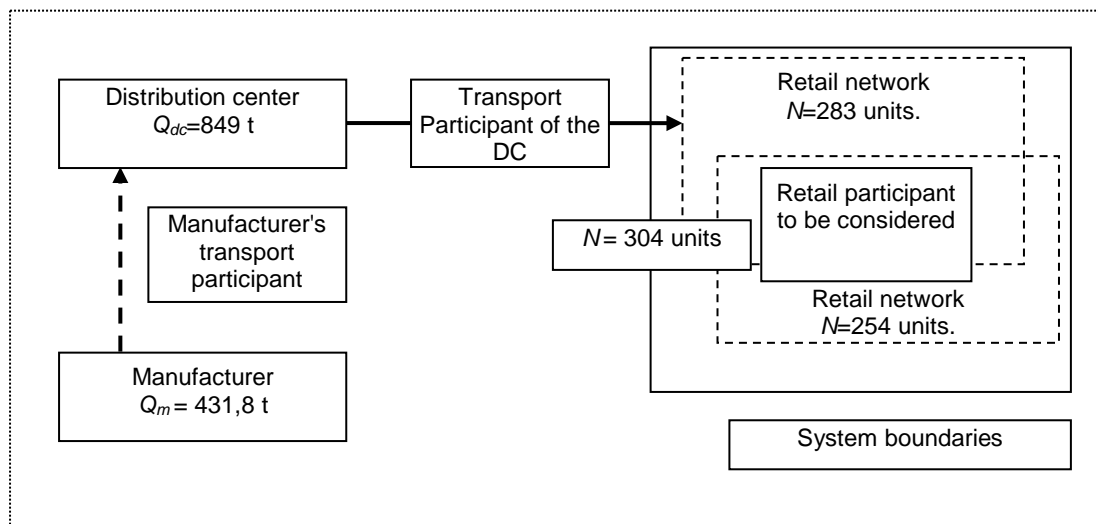

Figure 5: Existing scheme of organization of movement of material flows (direct channel)
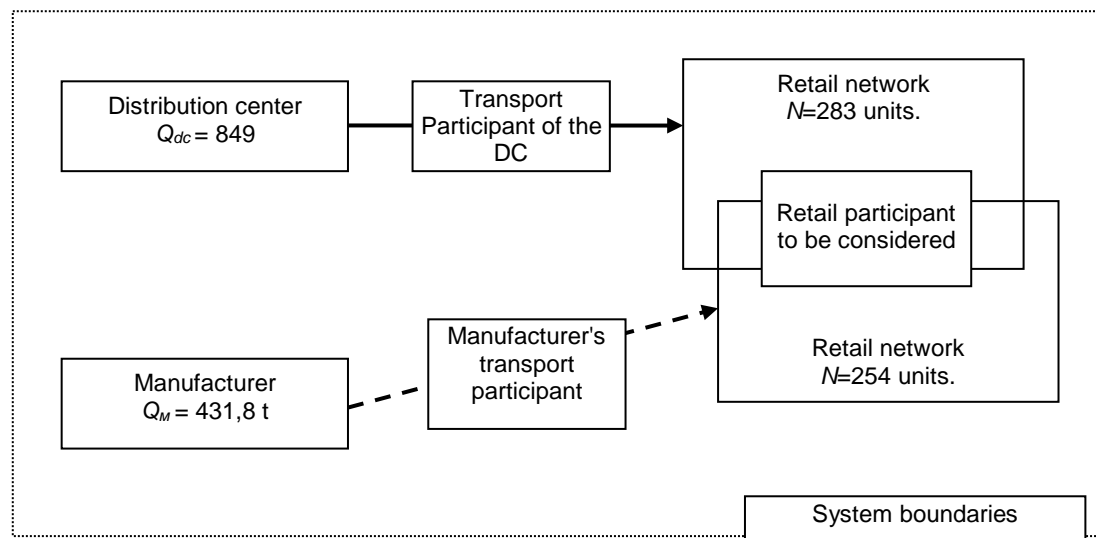

Figure 6: Proposed scheme of organization of movement of material flows (multilevel logistic channels)

The terms of such an organization are the change in the trajectory of the material flow of the manufacturer to the retail network, which will cause the corresponding changes in the main technical and economic indicators in the work of participants. Other source data remain

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unchanged. Thus, the total volume of products serviced by the latter is increased by 431.8 tons and is 1280.8 tons.

It is proposed to accept such surcharges for the main material flow of the distribution center and the manufacturer's products separately for each participant (Table 3).

Table 3: Extras of the system participants in the conditions of the proposed changes

Material flow	Manufacturer, %	Distribution center, %	Retail participant, %
The main material flow of the distribution center	-	40	34
Manufacturer production, which is considered	50	10	22

It should be noted that the mark-up of the distribution center on the products of the manufacturer under consideration cannot exceed the corresponding existing margin of the retail participant. There is also a need to recalculate the following system performance indicators (Table 4).

Table 4: The parameters of the participants of the logistics system that will change

Participant	Parameter	Participant	Parameter
Distribution center	Number of loaders in the supply service area	Transport participant in the link «Distribution Center - Retail Network»	The number of turns and the number of points of arrival on the route
	Number of loaders in the retail service area		The average travel time of one vehicle and the average length of the route
	The number of working staff at the site		
	Warehouse area		Required number of vehicles and drivers and other employees
	The number of places of storage in the racks		

For a TP in the link «Manufacturer – Distribution Center» the model for calculation of the main indicators of functioning was changed. Appendix A and Table. 5 show the calculated performance of the DC and TP in the section «Distribution Center – Retail Network».

Table 5: Calculated indicators of the monthly demand for the number of storage places in the racks and the required area of the warehouse of the distribution center

Monthly need for storage places in the racks for a distribution center, units.		
The monthly volume of the main products of the distribution center, 849 tons.	233	351
Monthly production volume of the manufacturer involved, 431,8 tons	118	
Required area of the distribution center, sq. m.		
The monthly volume of the main products of the distribution center, 849 tons.	203	306
Monthly production volume of the manufacturer involved, 431,8 tons.	103	

According to the obtained results, the proposed changes provide for the introduction of 1 loader into the DC to the service area for manufacturers and 118 additional storage locations in the racks; One additional vehicle to the TP in the section «Distribution center - Retail network». The results of the calculations are presented in Table. 6.

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Table 6: Comparison of the received indicators of the proposed organization of the transport participant in the section «Manufacturer - Distribution Center» with the existing ones

№	Name of the indicator	Multilevel logistic channels	Direct channel
1	Monthly sales volumes of material flows, tons	431,8	431,8
2	Load time of one vehicle in the warehouse of the manufacturer, h.	0,71	0,93
3	Idle time under unloading at the distribution center warehouse on site «Manufacturer - Distribution Center», h.	0,71	1,53
4	Accounting number of vehicles, units	2 (0,36)	4
5	The maximum possible number of turns of the vehicle per month, units	286	90
6	The duration of the return trips at the site «Manufacturer - Distribution Center», days, h.	0,10	4,73
7	Total rest time of driver, h.	0	-
8	Total number of drivers on the site, units	3	5
9	Number of engineering staff, units	2	3

The proposed changes to this logistics system participant contribute to the reduction of indicators that characterize its capacity, in particular, the reduction of the average length of the route to 10 km and the supply to one customer allows reducing the number of existing vehicles to 2 units, which in turn will affect the traffic of the site, the cost of servicing vehicles, including key employees, and the amount of depreciation deductions by reducing the value of vehicles.

3.3. Comparison and analysis of the results

The emergence of a DC on the way of promoting the manufacturer's products to the retail network caused changes in the main performance indicators of each of the participants in the system under study. Such a redistribution was reflected in the figures for the total NPV of each participant in such an organization (Table 7).

Table 7: Comparison of the obtained indicators of NPV for 5 years, UAH

Participant	NPV for direct organization of the logistics system, UAH.	NPV for Multilevel logistic channels, UAH.
Manufacturer	X	« + 715108,45 »
Manufacturer's transport member	556924,32	230324,36
Distribution center	10468392,36	11454077,86
TP in the section «Distribution Center – Retail Network»	1051385,59	1690495,94
Total *NPV* of the system (excluding the relevant indicator of the retailer being considered)	12076702,28	14090006,61
Retail participant	28696355,47	28685298,53

In Figure 7 and Figure 8 graphically according to Figure 5 and Figure 6 are presented the existing system and system with considering the proposed changes in the organization, indicating the NPV indicators of each of the participants.
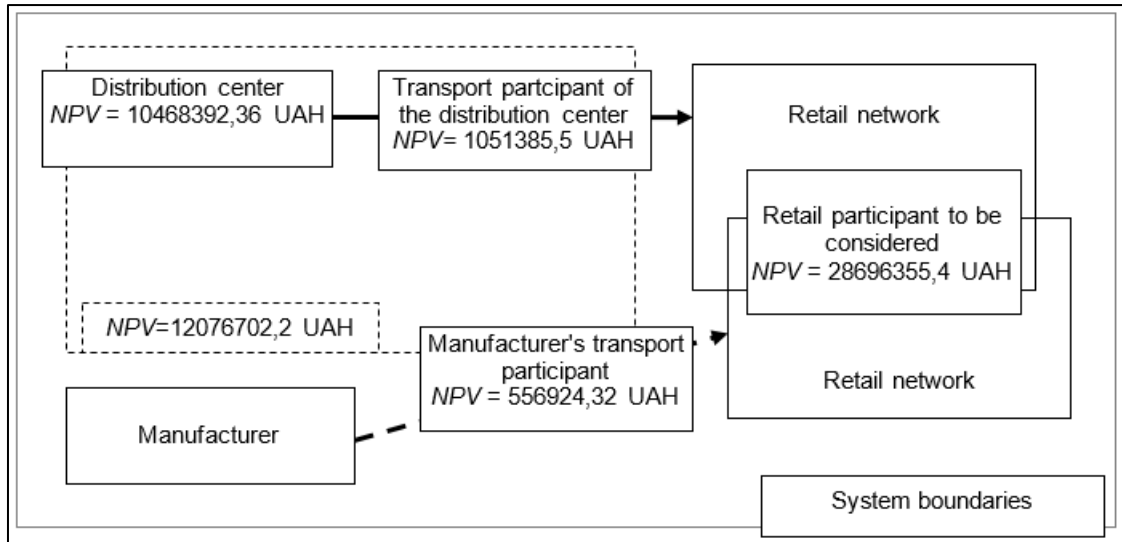
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Figure 7: Existing scheme of organization of movement of material flows (direct)
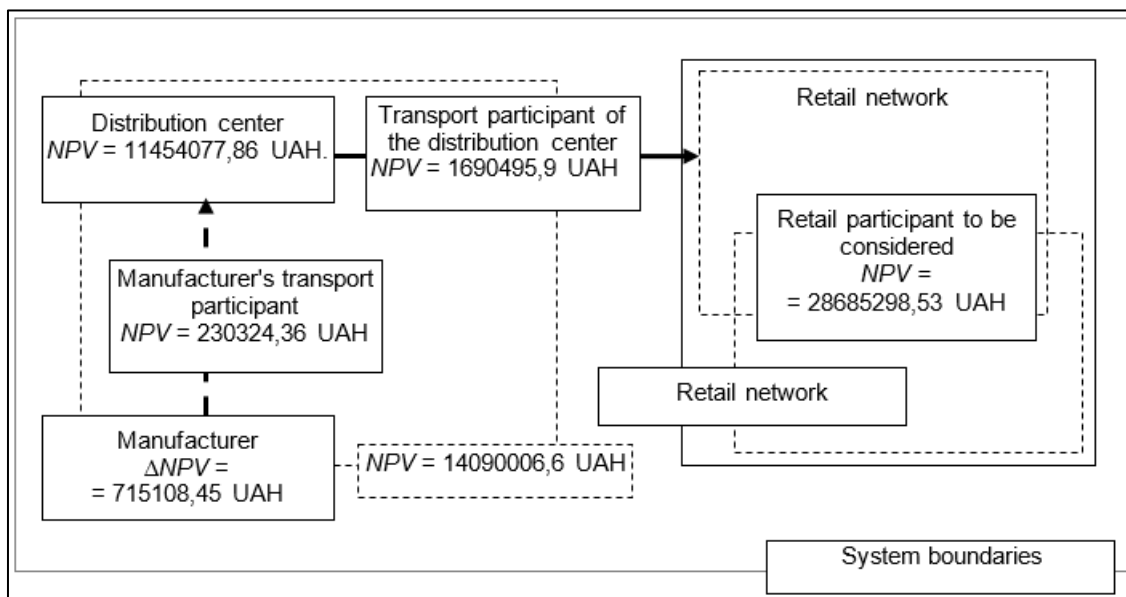

Figure 8: Proposed scheme of organization of movement of material flows (throw DC)

Provided, the DC and the manufacturer use their own vehicles for the transport of products. Therefore, the income of TP constitutes the corresponding item of expenditure in their work. In the case of the manufacturer, the new organization of the movement of the material flow allows to reduce these costs. Since the main means of generating income for a distribution center and a retail participant is an extra charge per unit of sales, an increase in its value by one participant requires a reduction in the corresponding for another. This dependence can be represented graphically (Figures 9, 10).

Comparison of the costs of the existing and proposed organization of the movement of material flow is carried out using Figures 11-13, where: «1» is the sum of the profits of the enterprise, «2» is the sum of depreciation deductions, «3» – the total sum of taxes from the

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participant, «4» – current expenses. The average amount of profit per unit of current member's expenses under the existing organization of the system is UAH 0,36, in the conditions of the proposed organization – UAH 0,50. The indicator of profitability of the participant under the existing organization of the system under consideration is UAH 0,30. per unit of current expenses for the calculated period, under the conditions of the proposed organization – 0,29.
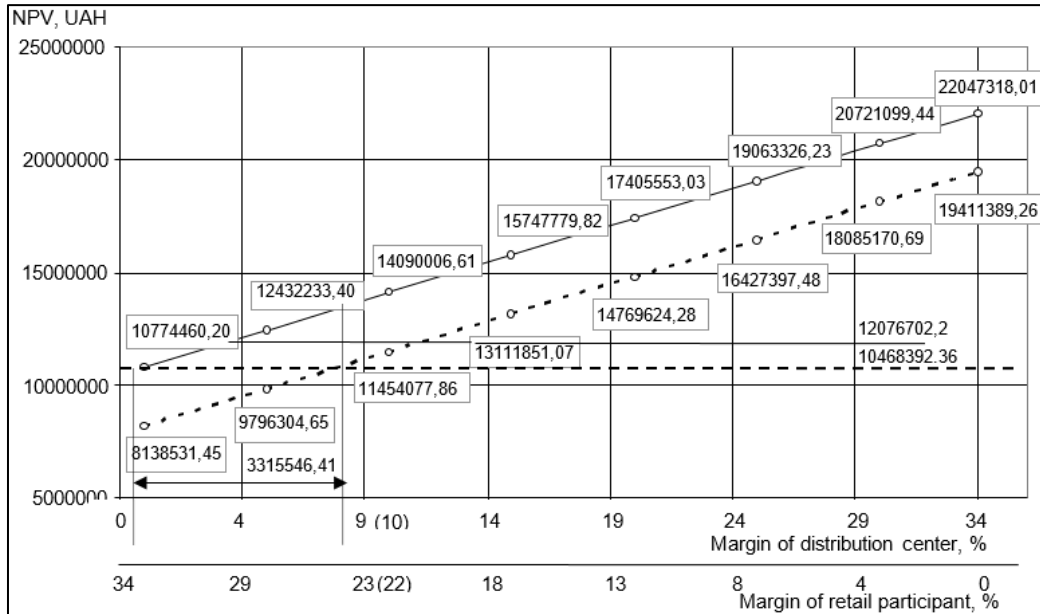

Figure 9: Dependence of the NPV of the DC and the system depending on the change in the margin of the DC in the price of the unit of material flow considered without the NPV of the retail network:
--o-- - *NPV* of the considered system; ——— - *NPV* of the distribution center; —o— - *NPV* of the considered system under the existing working conditions (direct channel); - - - - *NPV* of the distribution center under the existing working conditions.
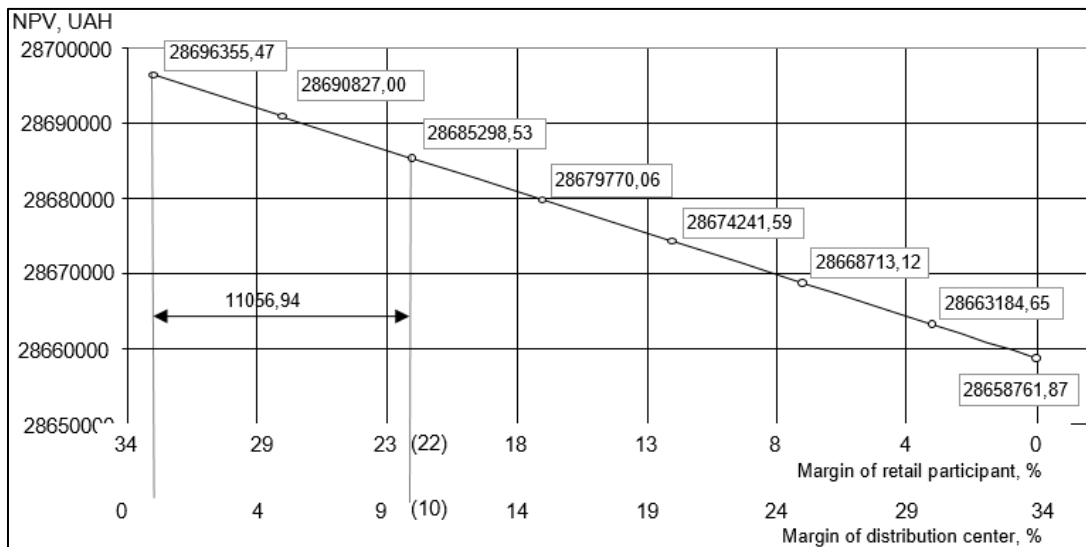

Figure 10: The dependence of the NPV of the retail participant depending on the change in the margin of the distribution center in the unit price of the material flow: - NPV of the retail participant.
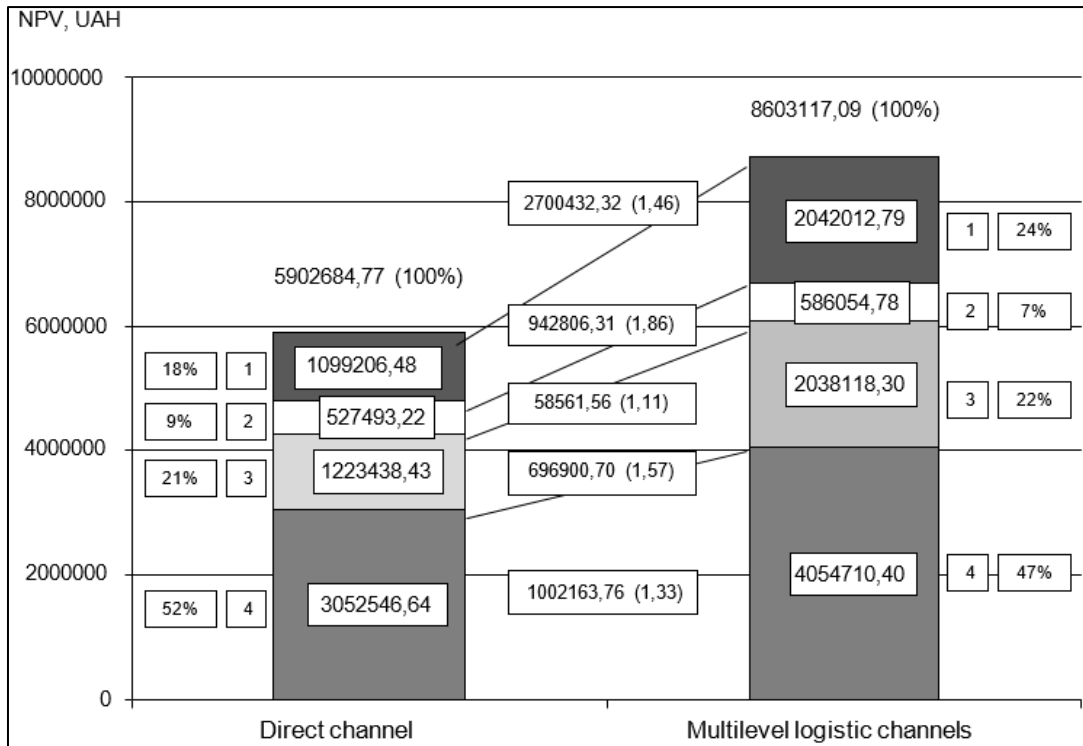
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Figure 11: Income components of revenue for a TP in the existing organization of the system
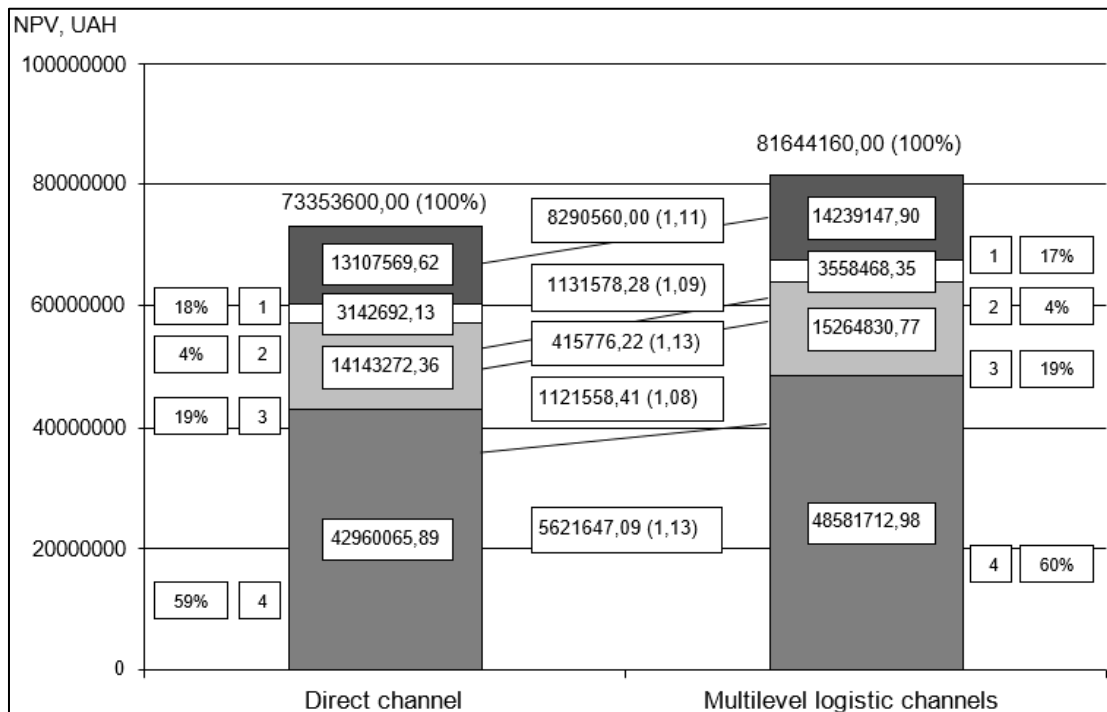
and considering the proposed changes

Figure 12: Income components of revenue for distribution center in the existing organization

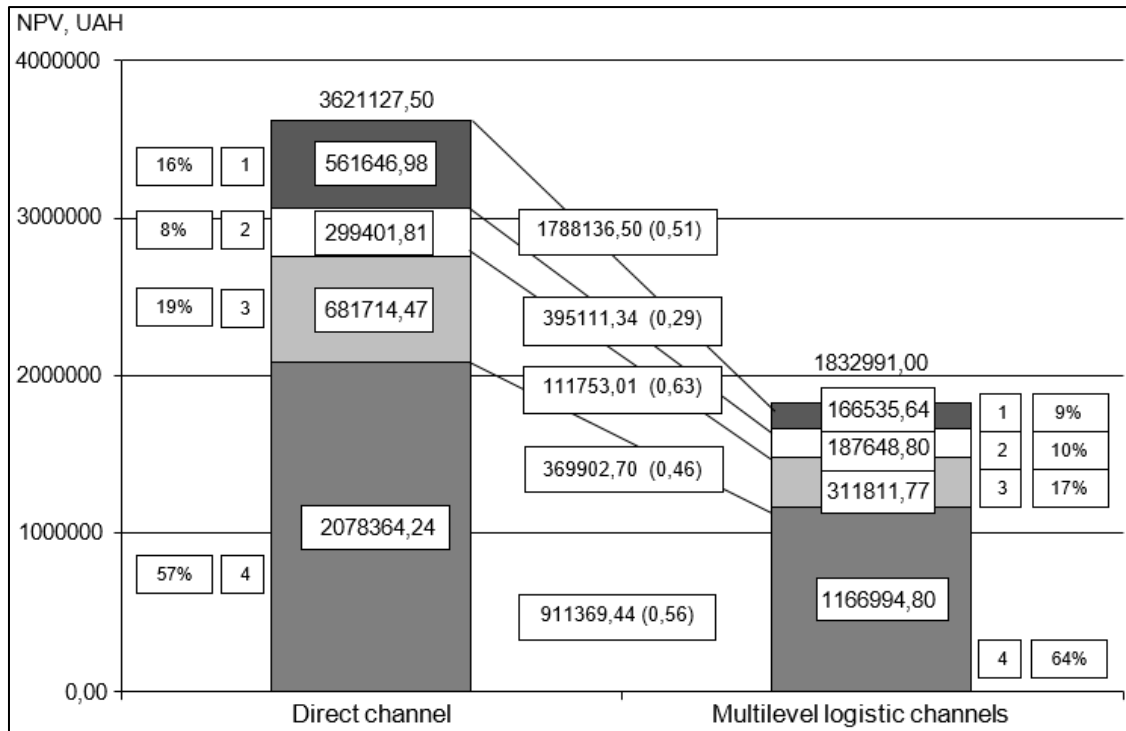of the system and considering the proposed changes

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Figure 13: Income components of revenue for a TP from the manufacturer in the existing organization of the system and considering the proposed changes

For a TP, the average amount of profit per unit of current expenses of a participant for an existing organization in the accounting period is UAH 0,27, under the conditions of the proposed organization – UAH 0,14. Changing the organization of the movement of material flow requires the appropriate costs from the parties to ensure its promotion in the supply chain.

According to the calculations performed under the current operating conditions of the system under consideration, the net present value for: the distribution center is UAH 10468392,36 (at current expenses UAH 42960065,89, the total amount of income for the estimated period is UAH 73353600,00), for TP in the section «Distribution Center – Retail Network» – UAH 1051385,59 (at current expenses UAH 3052546,64, total amount of income for the estimated period – UAH 5902684,77), for TP in the section «Manufacturer – Distribution Center» – UAH 556924,32 (at current expenses UAH 2078364,24, the total amount of income for the estimated period is UAH 3621127,50), for the retail participant is UAH 28696355,47. As a result, a larger indicator of the total net present value for the system is obtained, minus the corresponding for the retail network. Profitability of a TP in the link «Distribution Center – Retail Network» has been increased from UAH 0,36 per unit incurred expenses up to UAH 0,50, profitability of the distribution center reduced by 1%, profitability of the TP included in the manufacturer – reduced by 13% due to reduction of work volume. At

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the same time, in such an organization, in the conditions of the constant retail price for the retail network for end users, each of the participants in the retail network on average loses UAH 211 profit in a month due to the appearance of an additional link in the channel of promotion of the material flow of the manufacturer under consideration.

4. CONCLUSION

The basic conceptual idea of logistics is the need to adapt the company to an ever-changing market situation, while spending a minimum of funds in these conditions. The concept of logistics is a system of views on the rationalization of economic activity by optimizing material flows. Each company develops its own concept of logistics – a system of views on improving the efficiency of the enterprise. It relies on the long-term goals of the enterprise and ensures the coherence of the actions of all units. The complexity of the logistics system lies in the fact that it should match two areas of activity: the demand put forward by the intermediary (consumer) and the proposals put forward by the manufacturer, which is based on relevant information (KUSH, et. al, 2018).

An intermediary can be represented as a market participant acting as a connecting element between different systems. Therefore, it is difficult to attribute an intermediary to one or another logistics system. An intermediary can also be represented as the regulator of the effective functioning of the logistics systems of any market. From this side, the definition of the modalities of the development of intermediaries will allow us to approach the solution of the problem of assessing the efficiency of transport in the logistics system.

Considering amount of sales of non-alcoholic products of the manufacturer, the total amount of loss for the entire retail network is UAH 8290560,00 in the form of income, UAH 3315546,41 – in the form of NPV. That is, on average, one member of a retail network loses UAH 211 profit in a month per such organization. In the case of a manufacturer, changing the trajectory of the movement of its products allows to free up the funds in the amount of UAH 715108,45 in the form of profit for the accounting period due to a decrease in the workload of transport serving the material flow. Thus, the possible reduction of the manufacturer's margin is up to 47,4% and the increase in the average retail margin by 2%. In this case, one representative of the retail network, on average, loses about UAH 165, which is significantly lower than the previous result.

The article presents an approach to determining the consumer's influence on the distribution option (with or without DC). The obtained results can be used in planning and

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organizing the functioning of the logistics and system, as well as estimating the amount of material flows in it.

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APPENDIX

Table A1: Results of calculations performed and comparison with existing ones

№	Indicator	Value		Difference
		Existing organization (direct channel)	Organization considering the proposed changes (multilevel logistic channels)	
1	Average volume of one delivery, tons	1,5	2,1	0,6
2	Number of revolutions, units	189	304	115
3	Number of arrival points on the route, units	3	2	-1
4	Average turnover time of vehicle, h	3,72	3,37	-0,35
5	Average length of the route, km	35,2	32,2	-3
6	Loading time of 1 vehicle in a warehouse of the distribution center, h.	0,94	0,91	-0,03
7	Number of loaders in the distribution center in the retail network service area, units.	2	2	-
8	Maximum daily volume of material flow at the section «Distribution center - Retail network», tons	424,5	638,4	213,9
9	The required number of load posts in the warehouse of the distribution center in the retail network service area, units.	1	1	-
10	The number of loaders in the distribution center in the service area of the retail network, which simultaneously serves 1 post load, units.	2	2	-
11	Idle time during unloading of the vehicle when servicing the retail network, h.	1,35	1,26	-0,09
12	Number of vehicles, units	10	11	1
13	Maximum number of revolutions per day by vehicle, units.	4	4	-
14	Number of truck drivers in the distribution center, units.	8	10	2
15	Number of engineering and technical workers of the distribution center, units	18	27	9
16	Number of drivers of vehicles, units.	6	9	3
17	Number of engineering and technical workers of the TP, units	6	6	-
18	The average number of retail participants serviced per day, units	19	21	2
19	The required number of loaders in the distribution center on the site of service of manufacturer, units	2	3	1
20	The required number of load posts for the warehouse of the distribution center at the service area of the manufacturer, units	1	1	-
21	The number of loaders in the distribution center at the service area of the manufacturer, which simultaneously serves 1 post load, units.	2	3	-