

*Uliana Andrusiv*¹, *Anzhela Cherchata*²

¹ Ivano-Frankivsk National Technical University of Oil and Gas

² Prydniprovsk State Academy of the Civil Engineering and Architecture
– SHEE

Improvement of the logistics chain of the enterprise: practical aspects

Poprawa łańcucha logistycznego przedsiębiorstwa: praktyczne aspekty

Abstract. The article is devoted to application of distributive logistics at an enterprise. For determining peculiarities of functioning of the logistic chain, an analysis of each of its components has been made. On the basis of the obtained results, the necessity of creating a distribution center at an enterprise in the context of improving its logistics chain has been substantiated. As a priority direction for determining the variant of location of a distribution center for an enterprise the method of determining of the weight center has been proposed.

Key words: logistics, logistics chain, distribution center

Synopsis. Opracowanie dotyczy zastosowania logistyki dystrybucyjnej w przedsiębiorstwie. W celu określenia specyfiki funkcjonowania łańcucha logistycznego dokonano analizy każdego z jego elementów. Na podstawie uzyskanych wyników potwierdzono konieczność stworzenia centrum dystrybucyjnego w przedsiębiorstwie w celu usprawnienia jego łańcucha logistycznego. Jako priorytetowy kierunek dla określenia wariantu lokalizacji centrum dystrybucyjnego dla przedsiębiorstwa zaproponowano metodę wyznaczania środka ciężkości.

Słowa kluczowe: logistyka, łańcuch logistyczny, centrum dystrybucji

Introduction

Fundamental to the success of any supply chain is the management of both the material flow of product and the information flow. For any supply chain to be effective, these flows cannot be interrupted or distorted without incurring waste and consuming management time in correcting problems. In addition, the procurement of materials, manufacturing and distribution of products accounts for the majority of the overall cost and is key to customer service and overall competitiveness. Therefore, the development of a supply

chain management capability for modern businesses is a means of contributing to business efficiency, effectiveness, and competitive advantage over rival producers [Holweg and Rich 2004].

Successful management of material flows at a separate enterprise is possible only in case of allocation of the corresponding function. In connection with the increased competition and increased requirements for the quality of the organization of processes at enterprises, the issues of logistics management are becoming increasingly actual. At the present stage of development of management science, logistics is a means of achieving strategic goals through functional integration and coordination of material flows. This mainly concerns distribution logistics, which covers the whole range of tasks in management of material flows on the way from a producer to a consumer. Efficient distribution allows you to solve a problem of supply, production, marketing in terms of formation of an economically viable reproduction cycle, and consequently, development of an organization by ensuring and maintaining competitive advantages.

The works of such scholars, as: D.J. Bowersox, N.I. Chukhrai, D.J. Closs, Yu.V. Ponomareva, A.V. Tkachova, T.O. Zahorna, M. Wasylko, were devoted to the questions of logistics, use of logistic approaches in which the authors focus on the use of logistics in certain industries.

Thus, Tkachova and Zahorna [2012] stresses on application of the supply chain strategy established on the basis of cooperation of organizations that carry out successive phases of production and logistics processes from raw materials to final products in the forestry complex.

The theory and methodology of formation and development of distributive logistics in the last years was in the sight of such prominent economists, as: B. Anikin, V. Bobkova, N.V. Chornopyska, N.I. Chukhrai, V.K. Gubenko, A. Hadzhynskyy, Ye.V. Krykavsky, V.T. Lozynsky, I. Strutinskaya, I. Fechner and others.

In particular, the functions of distributive logistics have been considered, positive and negative factors that influence management of supply chains have been substantiated by Gubenko [2007]. Lozynsky [2010] analyzes existing approaches to substantiate the feasibility of formation of modern distribution systems of goods. Strutynskaya in her article [2012] considered the analysis of classification of logistic centers in the context of rethinking the requirements and methods of organizing logistics at enterprises. Attention was paid to the functional use of logistics center services.

In spite of the wide field of available research, there is a need to highlight the issues connected with distribution logistics and logistics chain improvement. Therefore, the outlined problematics in the article is very relevant and it needs to be further explored.

Aim and research methods

The aim of the article is to determine the significance and role of distribution logistics at an enterprise and to improve the logistic chain by forming a distribution center. To achieve the set goal, the following tasks have been defined:

- to consider the essence of distributive logistics;

- to reveal the peculiarities of functioning of the logistics chain on the example of a certain enterprise;
- to substantiate the introduction of a distribution center at an enterprise as one of the important measures for improvement of the logistics chain.

The theoretical basis of the research have become developments of domestic and foreign scientists on the application of distributive logistics, materials of international and domestic scientific and practical conferences.

The general scientific and special research methods are used in the work. For interpretation of the essence of logistic categories, the methods of theoretical generalization and analysis are applied. The method of determining the center of gravity is used for scientific substantiation of introduction of the distribution center.

This method is based on the calculation of the center of gravity of the distribution center to certain consumers, that is, the distribution center will be located at a certain point – closer to large buyers. To apply this method, it is necessary to map the coordinate axis of the service area and find the coordinates of the points where the consumers of the material flow are located. Coordinates of the center of gravity of freight flows are the points at which the distribution center can be located.

Presentation of the main material of the research

To date, there are different approaches to the definition of distributive logistics. Kostoglodov and Harysova [1997] define distribution logistics as a process for managing commercial, channel and physical distribution of finished products and services in order to meet consumer demand and profit. Hadzhynskyy [2013] considers distribution logistics as a set of interrelated functions implemented in the process of distributing material flow between different wholesale buyers, that is, in the process of wholesale sales of goods.

However, having defined the object (material flow at the stages of movement from a supplier to a customer) and the subject of distribution logistics (organization of an effective process of product promotion to a consumer), one can draw the following conclusion: the functions of distributive logistics should not be limited by the distribution of material flow. A wider understanding of distribution logistics is presented in the work of Ponomareva [2003] according to which distribution logistics is the management of transportation, warehousing and other material and nonmaterial operations which are carried out in the process of bringing the finished product to a consumer in accordance with the interests and requirements of the latter, as well as transmission, storage and processing of relevant information [Ponomareva 2003]. Otherwise, it is also called marketing or marketing logistics.

However, we agree with the opinion, the difference in distribution logistics from traditional selling and sales lies in subordination of the process of management of material and information flows to the goals and tasks of marketing; systematic interconnection of the process of distribution with production processes and procurement; systemic interconnection of all elements of the logistic chain [Voronkova et al. 2007].

The logistic chain is a linearly arranged totality of individual and legal entities (producers, distributors, warehouses of general purpose), which carry out logistics operations for bringing material flow from one logistics system to another or to another consumer, and through which the commodity and information flows from supplier to customer pass [Krykavsky et al. 2006].

For the effective functioning of the logistics chain it is necessary to consider each of its components separately. Each link in the logistics chain includes its elements, which collectively form the material basis of logistics and combine the following elements: vehicles and equipment, warehousing, communication and management facilities, etc.

Let us consider the formation of the practical principles of improvement of the logistics chain on the example of the LC Interplyt Nadvirna Ltd.

The main elements of the logistics chain are the scope of supply, production, distribution, intermediate storage and transportation. To determine the peculiarities of functioning of the logistics chain of the LC Interplyt Nadvirna Ltd., we will examine each component (Fig. 1). The scope of supply covers various suppliers. The suppliers of the first level (wood) are the Bystrytsya, the Zelena, the Prykarpatlis, the Volynsklis logging enterprises. The suppliers of the second level are the Oriana (Kalush) concern, the Zorya (Rubizhne) chemical enterprise. The suppliers of the third level are the Alkor company, which is engaged in manufacture of self-adhesive sticker, which is used for chipboard laminating.

The connecting link between the elements of the chain is transport and warehouse logistics. Transport logistics is a branch of logistics that deals with organization and planning of cargo transportation. Delivery of raw materials is carried out by the Transportlis company and the Ukrzaliznytsya railway company. The Transportlis company supplies timber to the LC Interplyt Nadvirna Ltd. enterprise by automobile timber carriers. The Ukrzaliznytsya railway company supplies timber from the Volynsklis company by special railway goods wagons. Carbamide-formaldehyde resin, ammonium chloride, carbamide and chemicals necessary for the production of chipboard are supplied by the Ukrzaliznytsya railway company using specially designed tanks for this purpose.

The logistic process in the warehouse assumes optimal placement of cargo in a warehouse and rational management of it. The warehouse is a special stationary or mobile space or other place of concentration of material values. The LC Interplyt Nadvirna Ltd. has the following in its disposal: The Nyzhniy warehouse – warehousing and sorting of raw materials by sorts and breeds; chips warehouse; raw chips; dry chips warehouse; The Verkhniy warehouse is the warehouse of finished products.

Industrial logistics investigates management of material flows within an enterprise in relation to production processes involved in production of separate products or semi-finished products. Industrial logistics is based on formation of intraproductive logistic systems at the LC Interplyt Nadvirna Ltd. These systems include: automated processes for supplying wood to production sites; automated process of production of chipboard; automated systems of transportation and storage of material resources at production sites.

The LC Interplyt Nadvirna Ltd. uses a complex of technological, power, transport and other types of equipment, tools and fittings, buildings and structures necessary for the production process.

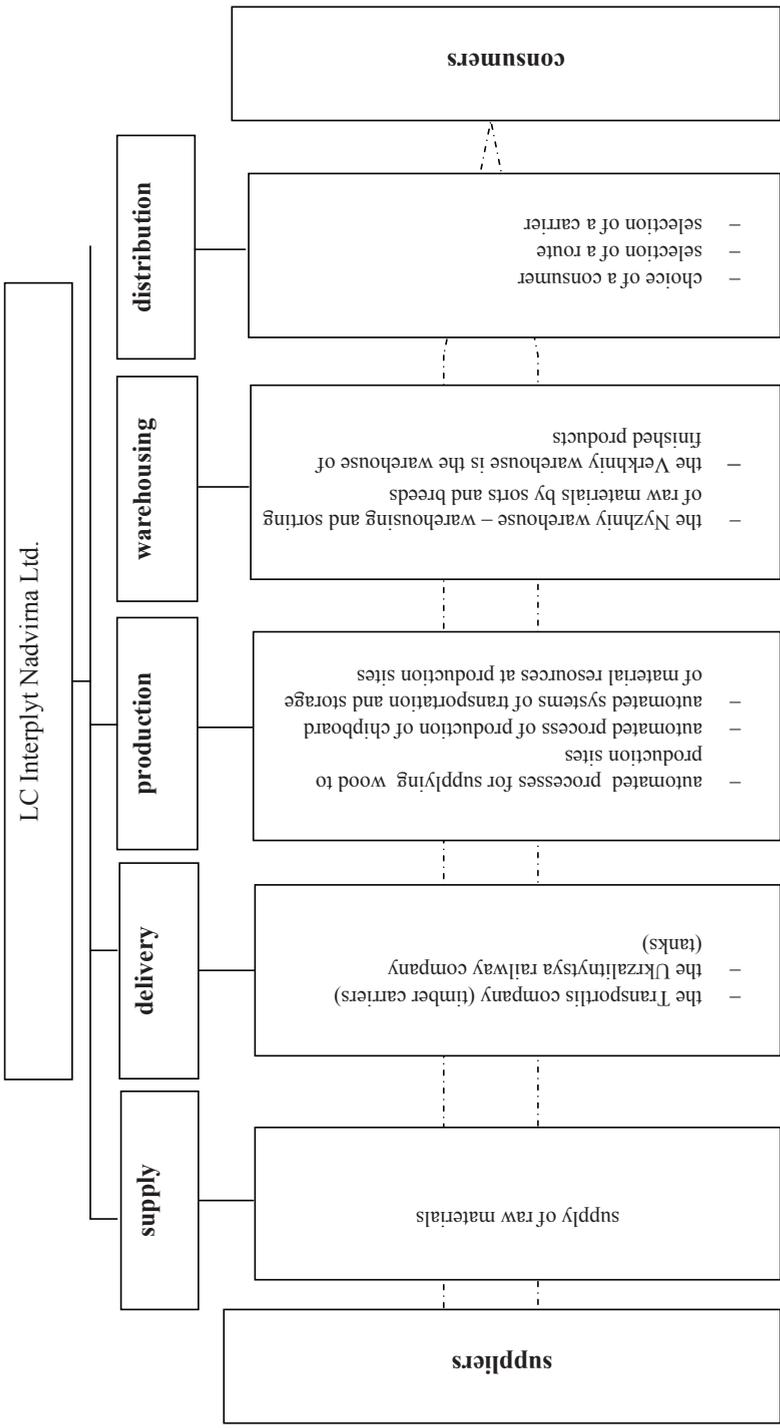


Figure 1. Functioning of the logistics chain of the LC Interplyt Nadvirna Ltd.

Source: own study.

Chipboards are produced from different types of wood, which in most cases comes from the western regions of Ukraine and with the use of carbamide-formaldehyde resins, ammonium chloride, carbamide and chemicals. Chipboard is used for manufacture of furniture, interior decoration inside houses, etc. [Krykavsky 2005].

The task of distribution logistics requires solving of the following issues: choice of a consumer; selection of a route; selection of a carrier. The LC Interplyt Nadvirna Ltd. applies radiant transportation system. This means that the company provides several consumers with a product. The carriers of products which carry out export are the Euro-Trade Ltd., the Ukrzaliznytsya railway company. On the domestic market, the products are supplied by the Transportalis company. The main consumers of the products are (Fig. 2):

1. Export: Poland, Moldova, Hungary, Romania.
2. Domestic market: the Azovstal company, Mariupol, the Kherson shipbuilding company, the Opal plant Rivne, the Vitas Ltd. (Kyiv), the Domeks company (Kharkiv) and others.

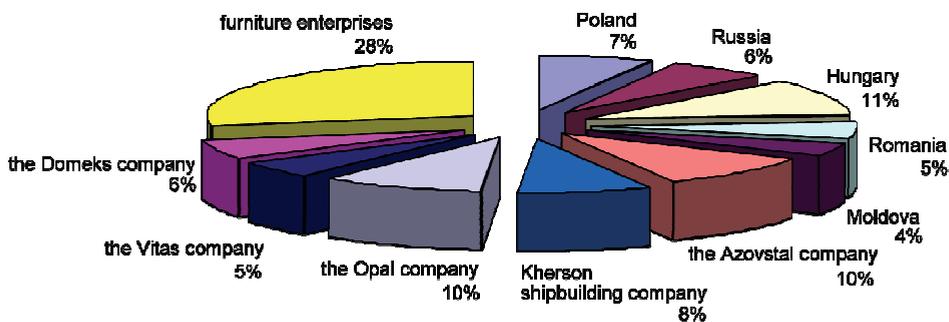


Figure 2. Distribution of annual volumes of work by segments of the market
Source: based on the own study.

Retail network belongs to the second level consumers. It includes a network of construction supermarkets and a network of furniture stores. The network of construction supermarkets includes: the Epicenter; the Bud-service, the Vash dim, the Budmaterialy, the Vse dlya budivnytstva. The furniture stores network: the Mebli dlia domu, the Mebli dlia ofisu, the Mriya, the Kukhnya na vash smak wardrobes. Consumers of the third level are end users. These include firms and households.

One of the conditions for improving the logistics chain is designing of distribution systems based on the choice of the variant of distribution center location.

Distribution center is a wholesale warehouse the task of which is to optimize the sales process in geographically distant markets.

Some scholars believe that the distribution center is a wholesaler whose task is to optimize the sales process in geographically distant markets [Bobkova 2009, Razgulyaev 2011].

However, agreeing with the opinion of other scholars [Gubenko 2007, Holste 2011], we consider that it is not necessary to identify the distribution center only with the

warehouse, because the main distinctive characteristic of the distribution center's activity, in comparison with a usual warehouse composition, is satisfaction of the needs of consumers.

In this case, Fechner [2010] deserves special attention who considers the logistics center as a distribution center, as a distribution center and he considers that this is a spatial object of the outlined functionality with the corresponding infrastructure and organization of activity through which the logistic services related to acceptance, warehousing, distribution and dispatch of goods, as well as related services which are provided independently concerning a sender or a recipient of economic entities.

For determination of a variant of placing of the distribution center for the LC Interplyt Nadvirna Ltd. we will use the method of determining the center of weight. It is used to determine the location of a single distribution center.

The coordinates of the center of weight of freight flows (X; Y), that is, the point at which the distribution warehouse may be located, is determined by the formulas [Andrusiv 2017]:

$$X_{\text{warehouse}} = \frac{\sum_{i=1}^n B_i \times X_i}{\sum_{i=1}^n B_i} \quad (1)$$

$$Y_{\text{warehouse}} = \frac{\sum_{i=1}^n B_i \times Y_i}{\sum_{i=1}^n B_i} \quad (2)$$

where:

B_i – cargo turnover of the total consumer;

X_i, Y_i – coordinates of the total consumer;

n – number of consumers.

Table. Cargo turnover and coordinates of large domestic market consumers

| Consumers | X (km) | Y (km) | Commodity turnover (thous. packs) |
|-----------|--------|--------|-----------------------------------|
| Azovstal | 1 014 | 168 | 11 |
| Kherson | 664 | 265 | 12 |
| Vitas | 448 | 194 | 15 |
| Domeks | 903 | 165 | 9 |

Source: based on the own study.

$$X_{\text{warehouse}} = \frac{1,014 \cdot 11 + 664 \cdot 12 + 448 \cdot 15 + 903 \cdot 9}{11 + 12 + 15 + 9} = 722.7$$

$$Y_{\text{warehouse}} = \frac{168 \cdot 11 + 265 \cdot 12 + 194 \cdot 15 + 165 \cdot 9}{11 + 12 + 15 + 9} = 200.5$$

The distribution center according calculations made should be located in Alexandria. The chipboard and laminated plates go directly by rail transport to the Opal plant Rivne).

Logistics of supply at the enterprise should work on: research of demand; forecasting of changes in demand; search for other supply channels.

The reserves for improving production of logistics for the woodworking industry are [Andrusiv and Cherchata 2018]:

1. The increase of the working time of the active part of fixed assets. This can be achieved by: liquidation of unscheduled and intershift downtime; the reduction to a minimum of maintenance of equipment in repair based on improvement of organization of repairs and equipment operation; the increase in the inter-repair period of operation of equipment through its efficient service; the putting into operation of uninstalled equipment and the increase in the share of operating equipment in the total of all available.
2. Optimal loading of equipment. If the increase of the extensive load has an objective limit in the form of calendar time, then the opportunities for growth of intensive use of equipment are practically unlimited. The main ways to increase the intensive use of equipment at an enterprise are: elimination of bottlenecks; high-speed methods of work; more complete supply of raw materials, resources and necessary materials; application of optimal modes of work of equipment; rational use of production space.
3. In distribution logistics it is necessary: to allocate funds on pre- and after-sales service; expand sales channels; to encourage consumers to buy a plate of this particular company.
4. It is necessary to improve the information logistics system at an enterprise. The following is necessary for doing it: organization of communications with clients for achieving the desired level of logistics service; coordination of logistics activities in time and space in order to optimize the work of subsystems of the logistic chain; control over fulfillment of orders and organization of monitoring for moving of chipboard and laminated plate.

Conclusions

Decisions related to supply chain management and logistics are important for any enterprise, since they can affect business efficiency and increase competitiveness of enterprises.

It is obvious that the theoretical and methodological substantiation of the use of distributive logistics in the practical activity of an enterprise is not complete in the work, and the problem is far from ambiguous, but its ignoring leads to an overestimation of insurance reserves, and, accordingly to the cost of their maintenance.

Thus, the process of applying distribution logistics is converted into a tool for coordination of interaction of both functional areas (production, marketing, finance), and improvement of the logistics chain. Concentration of attention on the formation of the distribution center contributes to a significant increase in the efficiency of a company, which determines the development of organization and is a factor in shaping the company's success in the market.

In their activities, distribution centers have more opportunities than conventional warehouses. The peculiarity of the work of the modern distribution center is the orientation towards satisfying the needs of consumers, which manifests itself in providing them with a wider range of additional services.

Consequently, we can conclude that the creation of distribution centers to date is one of the most effective ways to improve the system of distribution logistics at enterprises.

References

- Andrusiv U., 2017: Rozpodil'chyy tsestr yak umova vdoskonalennyya lohistychnoho lantsyuha v antykrizovomu upravlinni pidpnyemst [Distribution center as a condition for improvement of the logistics chain in the crisis management of the enterprise], *Priazovsky Economic Herald* 1 (01), 38–42.
- Andrusiv U., Cherchata A., 2018: Innovative Aspects of Logistics Systems Development in the Region “Modern Management Technologies in the Transformation of Socio-Economic Relations”, [in:] *Materials of the All-Ukrainian Scientific and Practical Conference, Ivano-Frankivsk*.
- Bobkova V.M., 2011: Lohistyka dystrybutsiyi [Distribution logistics], SPbGIEU, St. Petersburg.
- Fechner I., 2010: Centra logistyczne i ich rola w procesach przeplywu w systemie logistycznym Polski, *Prace Naukowe Politechniki Warszawskiej. Transport* 76, 19–32, [electronic source] <https://www.wt.pw.edu.pl/index.php/content/download/540/2848/file/fechner.pdf> [access: 25.09.2018].
- Gubenko V.K., 2007: Lohistychna tsentralizatsiya material'nykh potokiv: teoriya i metodolohiya lohistychnykh raspredytel'nykh tsestr [Logistical centralization of material flows: theory and methodology of logistics distribution centers], IEP, Donetsk.
- Hadzhynskyy A.M., 2013: Lohistyka [Logistics], Dashkov & K, Moscow.
- Holste C., 2009: Logistics News: Warehouse or Distribution Center: What Is It – Really?, *Supply Chain Digest Home* [electronic source] http://www.scdigest.com/assets/Experts/Holste_09-12-16.php [access: 05.09.2018].
- Holweg M., Rich N., 2004: Managing the Flow of Materials Across the Supply Chain, [in:] *The Internet Encyclopedia*, H. Bidgoli (Ed.), doi: 10.1002/047148296X.tie113 [electronic source] <https://onlinelibrary.wiley.com/doi/abs/10.1002/047148296X.tie113> [access: 15.09.2018].
- Kostoglodov D., Harysova L., 1997: Raspredytel'naya lohystyka [Distributive logistics], Expert Bureau, Moscow.
- Krikavsky Ye.V., 2005: Lohistychnye upravlinnya [Logistic management], Lviv Polytechnic, National University Publishing House, Lviv.
- Krykavsky Ye.V., Chukhrai N.I., Chornopyska N.V., 2006: Lohistyka: kompendium i praktykum [Logistics: compendium and workshop], Kondor, Kyiv.

- Lozynsky V.T., 2010: Formation of modern distribution systems of goods: problems of theory and practice, Logistics, the collection of scientific papers, Publishing House of Lviv Polytechnics, Lviv.
- Ponomareva Yu.V., 2003: Lohistyka [Logistics], TsNL, Kyiv.
- Razgulyaev V.Yu., 2011: RC kak ynstrument optymyzacyy [RC as an optimization tool], Distribution and Logistics 1 (78), 18–21.
- Strutinskaya I., 2012: Klasyfikatsiyni oznaky v diyal'nosti lohistychnykh tsentriv [Classification signs in the activity of logistic centers], Scientific Journal Socio-Economic Problems and the State 2 (7), 299–307 [electronic source] <http://sepd.tntu.edu.ua/images/stories/pdf/2012/12sivdlc.pdf> [access: 05.09.2018].
- Tkachova A.V., Zahorna, T.O., 2012: Management of the logistics activities of industrial enterprises, Noulij, Donetsk.
- Voronkova A.E., Kozachenko A.V., Ramazanov S.K., Khlapenov L.E., 2007: Suchasni tekhnolohiyi upravlinnya promyslovym pidpryemstvom [Modern technologies of industrial enterprise management], Libra, Kyiv.

Corresponding address:

PhD in Economics, Associate Professor Uliana Andrusiv
(<https://orcid.org/0000-0003-1793-0936>)
Ivano-Frankivsk National Technical University of Oil and Gas
Department of Theory of Economics and Management
Carpathian str., 15
Ivano-Frankivsk-76018, Ukraine
tel. (+38) 067 72 46 694
e-mail: andrusivu@ukr.net

PhD in Economics, Associate Professor Anzhela Cherchata
(<https://orcid.org/0000-0002-6753-2891>)
Prydniprovska State Academy of the Civil Engineering and Architecture – SHEE
Department of Management, Project Management and Logistics
Chernyshevs'kogo str., 24a
Dnipro-49600, Ukraine
tel. (+38) 066 610 10 67
e-mail: acherchataya@gmail.com