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AND SUPPLY CHAIN MANAGEMENT**

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## INTRODUCTION

We are happy to invite you to get acquainted with the first issue of the new scientific and practical publication "Intellectualization of Logistics and Supply Chain Management".

We strongly believe that the launch of this magazine indicates the objective need to rethink a wide range of issues related to the development of theory and practice in logistics and supply chain management, awareness of the need to unite the scientific community and logistics practitioners, dissemination of modern knowledge and best practices for innovative development of the logistics services market.

The first issue of the magazine is published at a difficult time. The global coronavirus pandemic and the deep economic crisis have significantly worsened business activity in the world. Currently, global supply chains are collapsing, international trade is declining, and competition between global and regional logistics operators is intensifying. The most common thesis is that the world will never be the same again. Industry experts predict the emergence of new, more flexible and adaptive supply chain management strategies and approaches to logistics business process management. The trend towards collaborations, cooperation and unification of services is emerging, comprehensive proposals for clients are being developed. There is increasing talk about the need to build bimodal supply chains, which involves the development of different decision-making scenarios: the traditional approach - cost-effective efficiency, low risk, high predictability; a new approach "second mode" - rapid recognition of opportunities, adaptability, willingness to solve unexpected problems and look for new opportunities.

Radical transformations of the global and national markets for logistics services require appropriate scientific support. Logistics science has a special role to play in this process. Initiating the emergence of a new journal, we decided to focus on its coverage of problematic aspects of the formation and development of logistics systems at the micro, mezo and macro levels, supply chain management, digitization of logistics, methods and tools for optimizing processes in logistics and supply chains, sociopsychology relations and network interaction of enterprises using cloud technologies, artificial intelligence, e-learning, neural business process management systems, etc.

Therefore, we invite scientists, researchers and business representatives, as well as our colleagues from abroad, to cooperate and present the results of scientific research, to discuss and debate on them, to work together to develop the scientific theory of logistics and promote mutual intellectual enrichment.

We hope that the new scientific publication will become a theoretical guide for young researchers and representatives of other fields.

**HRYHORAK Mariia**  
Chief Editor

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## IMPLEMENTATION OF THE LOGISTICS CONTROLLING CONCEPT IN THE MANAGEMENT OF TRANSPORT ENTERPRISES

**Nadiya Perederii, Oksana Ovdiienko, Volodymyr Marchuk.** *"Implementation of the logistics controlling concept in the management of transport enterprises". The article considers the peculiarities of the logistics controlling practice in managing transport enterprises. The depth of the logistics controlling implementation helps to analyze the functioning of logistics controlling and identify opportunities for further improvement. To determine it at the transport company, it is necessary to evaluate and analyze the performance of the logistics controlling tasks and the use of its tools. To carry out such an assessment, 20 indicators of the depth of logistics control implementation are used.*

*Determining the depth of the logistics controlling implementation for transport enterprises goes through three stages: organizational, content-technological, and practical. The goal of the organizational stage is to create a group of experts and prepare relevant materials for the survey. The goal of the content-technological stage is an expert evaluation of the indicators of the depth of the logistics controlling implementation. The goal of the practical stage is to determine the depth of the logistics controlling implementation by experts. In the third stage, the analysis and discussion of the results of the assessment of the depth of the logistics controlling implementation are carried out, and further areas of improvement of logistics controlling are determined to increase the efficiency of the logistics processes management. Evaluation of the depth of the logistics controlling implementation was carried out at two transport enterprises; the results showed the intensity of the tools' use in their management.*



*The authors conducted an analysis that made it possible to determine directions for improving the logistics processes management for domestic transport enterprises based on logistics controlling, and to single out the stages of improving the management of transport industry enterprises. Mentioned steps are the following: assessment of the level and depth of the logistics controlling implementation, ensuring the functioning of logistics controlling as a continuous process based on Web-based and IT technologies, and using a wide range of primary and special logistics controlling tools.*

**Keywords:** logistics controlling, logistics activity, logistics processes, depth of logistics controlling, indicators of the depth of the logistics controlling implementation, transport enterprises.

**Надія Передерій, Оксана Овдієнко, Володимир Марчук. «Реалізація концепції логістичного контролінгу в управлінні транспортними підприємствами».** У статті розглянуто особливості використання логістичного контролінгу на практиці в управлінні транспортними підприємствами. Для аналізу функціонування логістичного контролінгу та виявлення можливостей його подальшого удосконалення визначають глибину реалізації логістичного контролінгу. Для її визначення на транспортному підприємстві потрібно оцінити та проаналізувати виконання завдання логістичного контролінгу та використання його інструментів. Для проведення такого оцінювання використовуються 20 індикаторів глибини реалізації логістичного контролінгу.

Визначення глибини реалізації логістичного контролінгу для транспортних підприємств проходить три етапи: організаційного, змістово-технологічного та практичного. Ціль організаційного етапу є створення групи експертів та підготовка відповідних матеріалів для проведення опитування. Ціль змістово-технологічного етапу - експертна оцінка індикаторів глибини реалізації логістичного контролінгу. Ціль практичного етапу - визначення експертами глибини реалізації логістичного контролінгу. На третьому етапі проводиться аналіз та обговорення результатів оцінки глибини реалізації логістичного контролінгу, визначаються подальші напрями удосконалення логістичного контролінгу для підвищення ефективності управління логістичними процесами. Оцінювання глибини реалізації логістичного контролінгу було проведено на двох транспортних підприємствах, результати якого показали інтенсивність використання інструментів в їх управлінні. Оцінювання глибини реалізації логістичного контролінгу було проведено на двох транспортних підприємствах, результати якого показали інтенсивність використання інструментів в їх управлінні.

Проведений аналіз дав можливість визначити напрями удосконалення управління логістичними процесами для вітчизняних транспортних підприємств на основі логістичного контролінгу, виокремити стадії удосконалення управління підприємствами галузі: оцінка рівня та глибини реалізації логістичного контролінгу, забезпечення функціонування логістичного контролінгу як безперервного процесу на основі Web-базованих та IT-технологій, використання широкого спектру основного та спеціального інструментарію логістичного контролінгу.

**Ключові слова:** логістичний контролінг, логістична діяльність, логістичні процеси, глибина логістичного контролінгу, індикатори глибини реалізації логістичного контролінгу, транспортні підприємства.

**Introduction.** The processes taking place in the economy, and in particular in the transport sector of Ukraine, are characterized by high instability and uncertainty. High dynamics of the external environment and rapid scientific and technical development

pose many challenges to transport enterprises and force them to implement modern practical management tools.

More and more complex tasks are faced by transport enterprises, which can be solved only under the conditions of comprehensive

management of flow processes. Current business conditions require significant transformations from transport enterprises, the application of new modern concepts, and innovative management methods. In recent years, the role of controlling in the management of logistics processes has increased.

Implementation of the concept of logistics controlling will make it possible to increase the efficiency of management of logistics processes, as well as to optimize logistics costs and increase the profitability of the enterprise. Managers will receive the necessary information to make economically justified management decisions.

**Recent research and publications analysis.** A wide range of issues related to logistics controlling are insufficiently researched and have a fragmented nature or use separate logistics and controlling tools. Because of this, problems arise regarding the practical use of logistics controlling in the management of enterprises of various industries, in particular, transport.

The toolkit of logistics controlling by Ukrainian scientists is insufficiently researched. Therefore, special attention was paid to researching the works of foreign scientists: S. Abt, H. Blum, Y. Weber, J. Herold, I. Hopfert, J. Cole, G.-U. Küpper, V. Mennel, V. Prumper, G.-K. Pfol, T. Reichman, G. Fandel, T. Fermast, M. Haberek, M. Christopher, E. Schiffers, K. Schult, W. Kersten, C. Martin, M. Kummer, K. Schwarz, C. Lennertz, S. Wadhva.

A significant unsolved problem is the creation of transparency in the use of logistics controlling in practice and the possibility of assessing the depth of its implementation in order to determine the degree of application of logistics controlling tools and improve the efficiency of enterprise management as a whole.

**The aim of the article.** The purpose of the study is to generalize the theoretical aspects of logistics controlling and to develop applied provisions for its implementation in the management of transport enterprises.

**The main material.** In order to comprehensively assess the functioning of logistics controlling and identify opportunities for its further improvement at the enterprise, it is suggested to evaluate the depth of its implementation [1]. For this purpose, an algorithm for determining the depth of the logistics controlling implementation for transport enterprises was developed.

The first stage is organizational. It covers the creation of an expert group to conduct the survey. The expert group should consist of 5-10 persons sufficiently competent in the logistics activities of the transport enterprise. The number of experts depends on the enterprise's size and is determined by the head of the expert group. The more interviewed experts, the more reliable results of the analysis. At this stage, the team's work is organized and relevant materials are prepared, periods are set. The result of the evaluation depends on the competence and professionalism of experts, and their attitude to the elements that form logistics controlling at the enterprise. An essential factor in this process is the motivation of experts for deep and thorough analysis.

The second stage is content-technological (expert assessment of indicators of the depth of the logistics controlling implementation). Based on the vast volume of the analyzed literature, the main tasks of logistics controlling and its tools, 20 indicators were singled out, outlining the theoretical types of activities within the framework of logistics controlling and characterizing the depth of its implementation (Fig. 1). All indicators are divided into three groups depending on the factors that are influenced by logistics controlling: revenue, costs and essential tools that ensure the management of logistics activities of transport enterprises (Fig. 1). Experts can make changes to the presented base of indicators.



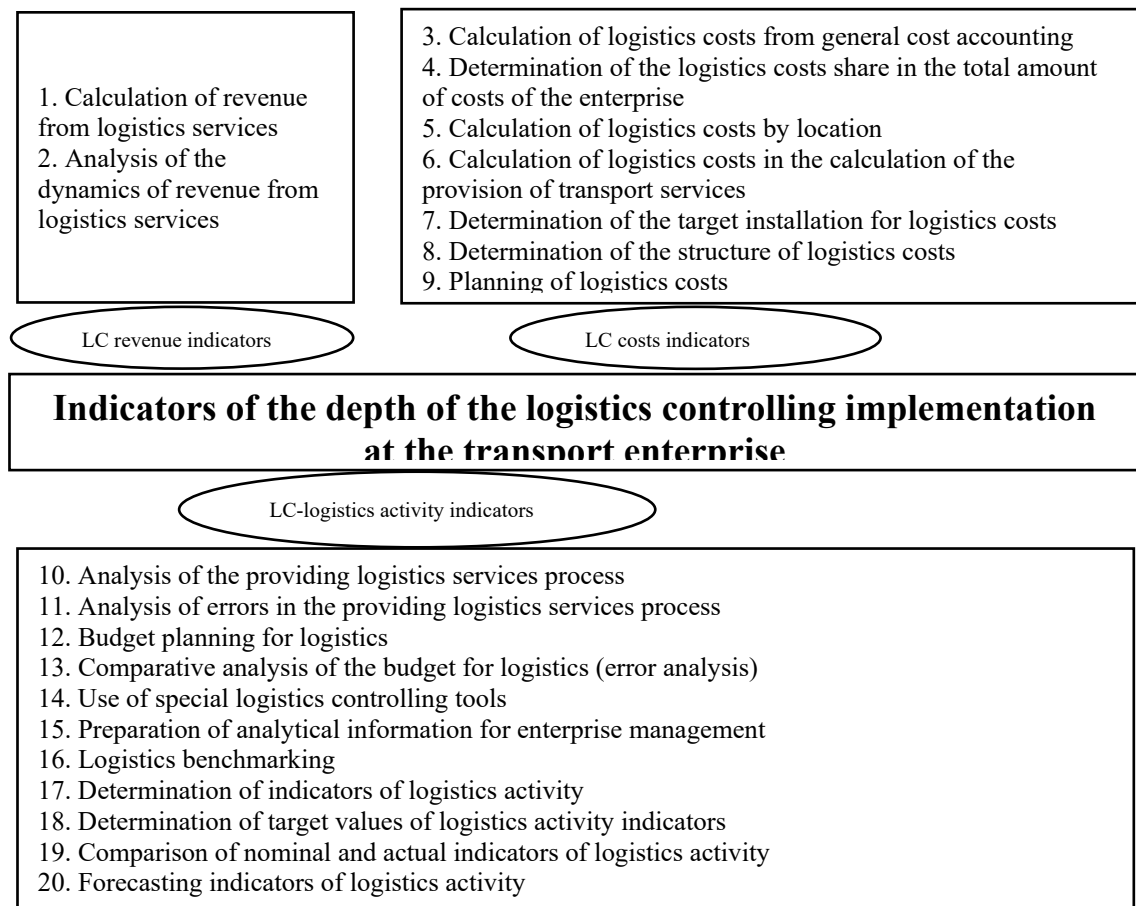


Figure 1 – Indicators of the depth of the logistics controlling implementation at the transport enterprise

In particular, an expert assessment of each indicator is carried out by filling out the corresponding questionnaire on an adapted Likert scale. The Likert scale is a psychometric scale often used in questionnaires and survey research [2, p. 85]. When working with the scale, the expert evaluates the degree of his agreement or disagreement with each judgment (indicator).

Experts, based on their own opinion, evaluate indicators that are simple and clear. A three-point gradation is used for evaluation: absent, partially present, and fully present. Experts should form an answer depending on the indicators' content. One means that this indicator is not used, is not calculated; two - this indicator is used, is partially calculated; three - this indicator is fully used, and is calculated in the logistics processes' management at the transport enterprise. The

proposed scale provides relative reliability even with a small number of judgments, while the obtained data are easy to process.

The third stage is practical (determination by experts of the depth of logistics controlling implementation). Expert analysis of each indicator, in particular, will make it possible to assess the depth of individual tools and components of logistics controlling use. It is essential to discuss the results of the evaluation by a team of experts. The result of the assessment is obtaining objective information for the strategic and operational management of logistics processes and determining directions for their improvement.

In order to improve the level of logistics controlling for all transport enterprises, the possibility of an in-depth analysis of the logistics controlling implementation in

practice is critical. The proposed algorithm to estimate the depth of logistics controlling implementation was conducted at two enterprises.

Eight experts formed an expert group at enterprise #1. They assessed each indicator, in

particular, independently, filling out a questionnaire on a three-point scale. The results of the expert assessment of the depth of the logistics controlling implementation of are presented in fig. 2.

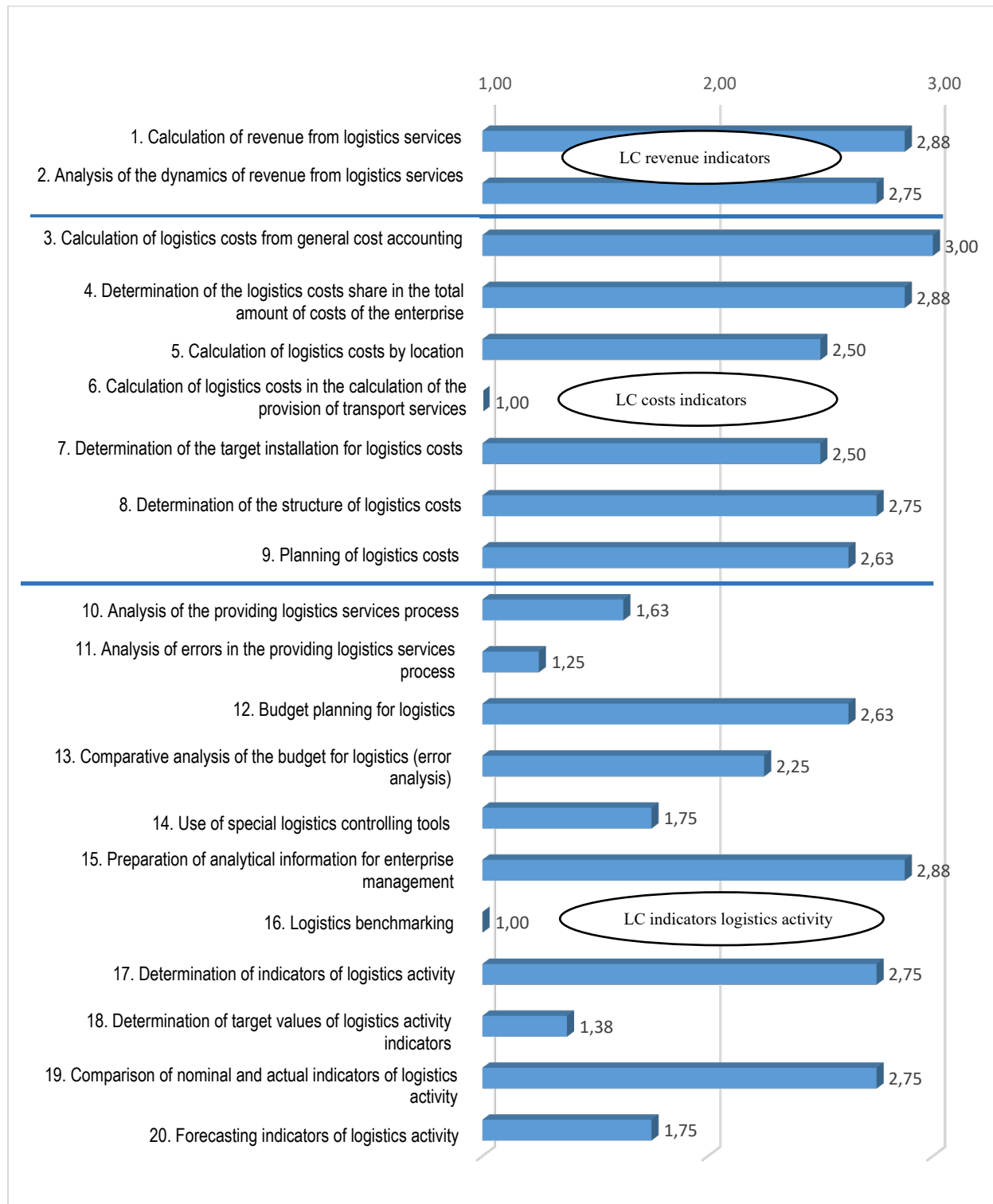


Figure 2 – The depth of the logistics controlling implementation on enterprise #1

Logistics controlling (LC) indicators are grouped into three blocks: "LC-logistics activity indicators", "LC-cost indicators", and "LC-revenue indicators". The most often used indicator in the block "LC-logistics activity indicators" among 11 existing is "preparation of analytical information for the management of the enterprise" (2.88). It requires quick access to the necessary information and the basis of using Web-based and IT technologies. According to the results received on enterprise #1 the priority used tools are the following: determination of logistics activity indicators (2.75) and comparison of their nominal and actual values (2.75). To obtain objective information, special attention should be paid to the target values of logistics activity indicators (1.38) and their forecasting (1.75). An essential instrument of logistics controlling is budget planning for logistics (2.36) and, accordingly, its comparative analysis for a certain period (2.25).

Indicator "use of special logistics controlling tools": analysis of deviations, analysis of bottlenecks, ABC analysis, XYZ analysis, analysis of logistics chains, analysis of logistics cost factors, business simulation, SWOT analysis, PEST analysis, profitability analysis, logistics portfolio, strategic maps, enterprise logistics profile analysis, modeling, etc. is relatively low (1.75), and logistics benchmarking is not used at all (1.0). In the case of benchmarking and special tools, this can be explained by their irregular use, the lack of appropriate practical skills in their use, and the lack of relevant reliable information. The use of the tools analyzed above has significant reserves for increasing the efficiency of enterprise management based on the adoption of economically sound management decisions.

Particular attention should be paid to the low values of the indicators "analysis of the providing logistics services process" (1.63) and "analysis of errors in the providing logistics services process" (1.25). Analysis of errors in the process of providing logistics

services will make it possible to identify problem areas in order to eliminate them.

All the values of the "LC-cost indicators" block, with the exception of indicator "calculation of logistics costs in the calculation of the provision of transport service", are in the range of 2.5 to 3.0 and are relatively high, which shows the depth of their application. The enterprise calculates logistics costs by their place of occurrence (2.5), determines logistics losses from the total accounting of costs (3.0), the share of logistics costs in the total amount of costs of the enterprise (2.88), the target set for logistics costs (2.5), the structure of logistics costs (2.75), planning logistics costs (2.36). The smallest value from this block gives the calculation of logistics costs in the calculation of the provision of transport services (1.0). Analysis of logistics costs and their optimization through the implementation of logistics controlling will allow reducing the total costs of the enterprise as a whole.

Revenue from logistics services (2.88) and analysis of its dynamics (2.75) are essential for enterprise #1. Finding new customers and providing them with a full range of transport and logistics services will increase the revenue of the enterprise as a whole.

Based on the conducted analysis and assessment of the depth of the logistics controlling implementation, directions were developed for improving the management of the logistics processes of enterprise #1, taking into account their priority:

1. Use of Web-based and IT technologies.
2. Quick and easy exchange of information between users, convenient administration.
3. Ensuring the functioning of logistics controlling as a continuous process.
4. Search for individual logistics solutions for the client.
5. Transparency and relevance of reported information.
6. Continuous control of all critical parameters and indicators and their optimization.

7. Use of particular logistics controlling tools.

8. Implementation of logistics benchmarking projects.

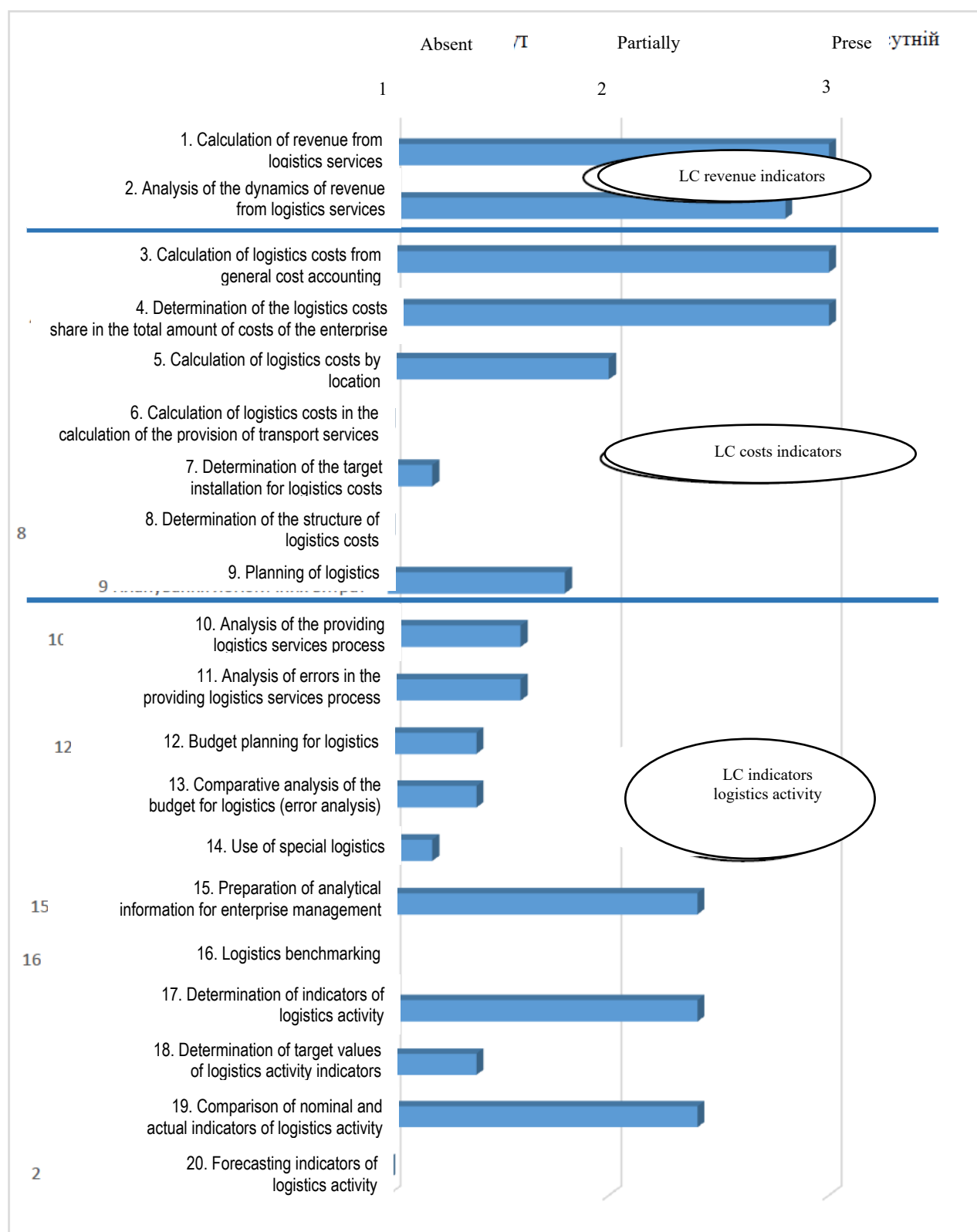


Figure 3 – The depth of the logistics controlling implementation on enterprise #2

Similarly, such a study was conducted at enterprise #2. The group consisting of five experts determined the depth of the logistics controlling implementation. The results of the assessment are presented in fig. 3.

The values of most indicators are in the range of 1.0 to 2.0. This indicates a relatively low depth of the logistics controlling implementation at enterprise #2. Analysis of the "LC-logistics activity indicators" shows that the most important thing for the enterprise is the preparation of analytical information for the management of the enterprise (2.4), the determination of logistics activity indicators (2.4), and the comparison of nominal and actual indicators of logistics activity (2.4). Using the analysis of logistics activity indicators, it is necessary to take into account the target values of logistics activity indicators (1.4) and carry out their forecasting (1.0).

Particular attention should be paid to budget planning for logistics (1.4) and, accordingly, to its comparative analysis for a certain period (1.4). The formed budget allows organization and control of the financial flows of the logistics system. Insufficient attention is paid to the analysis of the providing logistics services process (1.6) and the analysis of errors in the providing logistics services process (1.6). Such instruments as conducting logistics benchmarking (1.2) and using particular logistics controlling tools (1.0) are almost not used at all. However, it is essential to use these tools to obtain objective information for making management decisions. The analysis of the indicators related to the group of the "LC-costs indicators" showed the different intensities of application of these tools in practice. At enterprise #2, logistics costs are determined from the total accounting of costs (3.0), the share of logistics costs in the total amount of costs of the enterprise (3.0), the calculation of logistics costs by their places of occurrence (2.0), planning of logistics costs (1.8).

Calculation of logistics costs in the counting of the provision of transport services (1.0), determination of the target set for logistics costs (1.2), and determination of the structure of logistics costs (1.0) are not carried out at the enterprise.

The provision of a full range of transport and logistics services is important for the enterprise, as evidenced by the high assessment of the "revenue from logistics services" indicators (3.0) and the analysis of its dynamics (2.8). Expert analysis of the depth of the logistics controlling implementation at enterprise #2 introduced significant reserves for improving the efficiency of logistics process management through their improvement and implementation at the enterprise. Proposed directions for improving the management of logistics processes at enterprise #2, taking into account the priority of implementation, are the following:

1. Increasing the automation of the accounting sphere through the implementation of IT solutions adapted to the enterprise's business processes.
2. Increasing the automation of the calculation base by routes with the help of modern Web technologies.
3. In-depth analysis and monitoring of logistics costs.
4. Logistic services accounting and analysis of their errors.
5. Budget planning for logistics.
6. Monitoring of logistics and control indicators using the software.
7. Use of particular logistics controlling tools.
8. Implementation of logistics benchmarking projects.

Transport companies that do not recognize their weaknesses in logistics activities are at a competitive disadvantage. Therefore, the proposed evaluation model is important for transport enterprises, as it helps to determine the level of logistics controlling implementation and the possibilities of its improvement. It is aimed at identifying weak points in logistics management and

preparing objective information for making effective management decisions.

The analysis of the depth of the logistics controlling implementation gave an opportunity to evaluate which tools are used in the management of the enterprise. This

made it possible to determine priority directions for improving the efficiency of logistics process management at transport enterprises (Fig. 4).

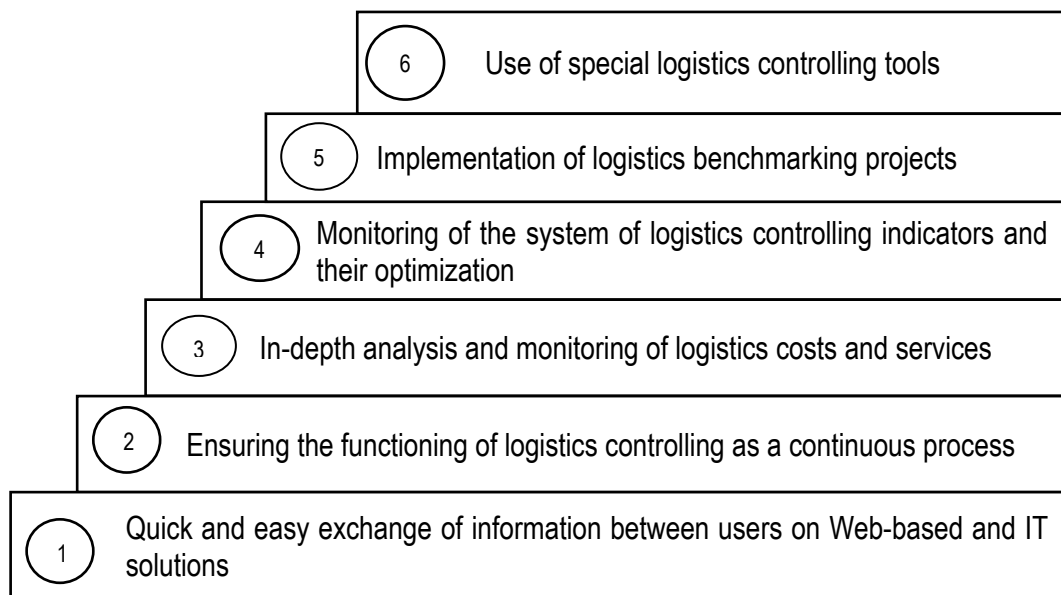


Figure 4 – Directions for improving the logistics processes management based on logistics controlling

The enterprise needs to implement new modern solutions, borrowing the experience of successful global companies in the transport services market to deepen the use of logistics controlling tools.

Business development planning is important for success in the market. The development plan has a structure depending on the directions of each element [3]:

- a plan for the development of new products and services types;
- an automation plan and implementation of new equipment and technologies;
- a plan to improve the organizational structure and management;

- a plan to improve work organization;
- a plan for the introduction of measures regarding the economical use of raw materials, fuel, materials, and energy;
- plan of social development of employees;
- a plan of environmental protection measures.

Taking into account the experience of foreign transport and logistics companies and based on the results of the analysis of successful domestic companies, the main ways to improve their management based on the concept of logistics controlling are proposed (Fig. 5).



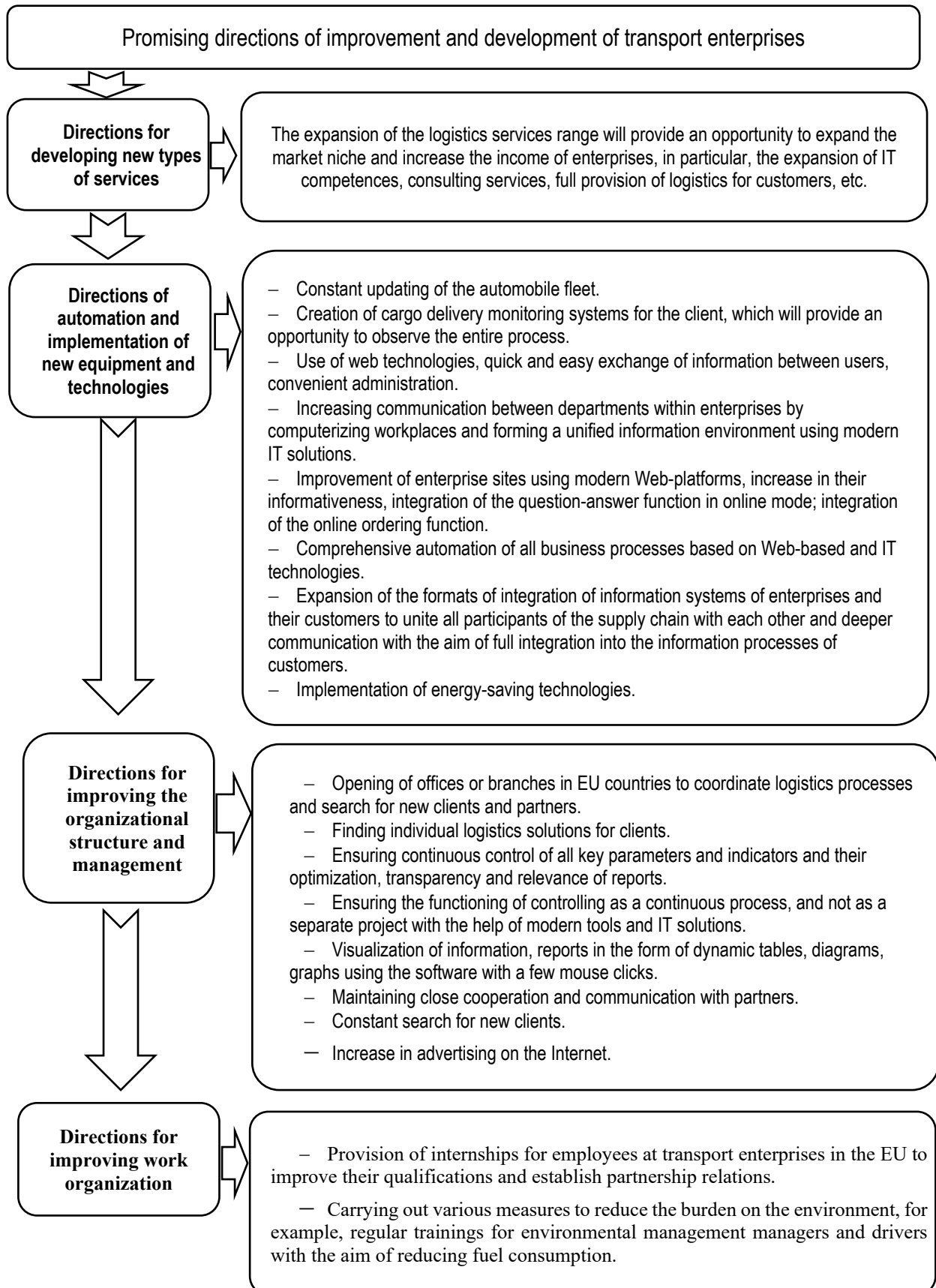


Figure 5 – Perspective directions for transport enterprises to improve and develop

The proposed directions were grouped according to individual elements of the enterprise's development plan. The main ones include the development of new types of services, automation, the introduction of new equipment and technologies, improvement of organizational structure and management, and improvement of work organization. In particular, it is possible to highlight such promising areas as the expansion of the logistics services range (outsourcing, contract logistics), the constant search for new customers, and the development of individual logistics solutions for them. It is also fair for improving communication between divisions within enterprises by using modern Web-based and IT technologies to form a unified information environment and quick, simple exchange of information between users, convenient administration and deeper integration with clients; improvement of enterprise websites, increasing their informativeness to improve advertising on the Internet. Recommended worth directions are as well the integration of online ordering functions and the function of receiving answers for customers online; staff training in the use of software; opening of offices or branches in the EU to deepen integration and more effective coordination of logistics processes with customers.

Provided that the proposed directions are implemented, it is possible to maximize the efficiency of business processes, accounting and planning activities, and the functioning of controlling in the future, which is a necessary step on the way to the development of transport enterprises in conditions of instability of the external environment and fierce competition.

That is why enterprises in the transport industry need to pay special attention to modern IT solutions that are able to provide all the accounting, planning, and controlling needs of the enterprise and, at the same time,

fully automate the management of all logistics processes.

**Conclusions.** To analyze the functioning of logistic controlling and identify opportunities for further improvement, a methodological toolkit for assessing the depth of its implementation was used. For this purpose, an algorithm was applied, which consists of three stages: organizational, content-technological, and practical, and their essence was examined in detail in practice. Evaluation of the depth of the logistics controlling implementation was carried out at two enterprises, the results of which showed the intensity of the use of tools in their management.

The study of the depth of the logistics controlling implementation at enterprise #1 showed the intensity of the tools' use by the enterprise's employees. Similarly, the analysis of the depth of the logistics controlling implementation was carried out at enterprise #2. The obtained evaluation values are on average 1 point lower than the obtained values at enterprise #1. Considering obtained analysis result, the authors determined the degree of application of the logistics controlling tools, proposed the directions for improving strategic and operational management of logistics processes, and developed individual recommendations for deepening the use of logistics controlling tools.

Based on the results of the research, directions for improvement and development of the activities of transport enterprises have been developed, which relate to individual elements of the enterprise development plan. The purpose of the developed measures is the implementation and use of logistics controlling based on innovative technologies focused on a continuous improvement process.

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## PROSPECTS OF USING CRM SYSTEMS IN UKRAINE UNDER MODERN CONDITIONS

**Olga Karpun, Tetiana Kisera, Diana Soloviova. "Prospects of using CRM systems in Ukraine under modern conditions".** CRM, or Customer Relationship Management, is a set of tools and strategies that businesses use to manage their relationships with existing and potential customers. It has become an integral part of business operations for many organizations since its introduction in the early 1990s. With recent technological advancements, CRM systems have seen a significant transformation over time. This article has explored how these changes have occurred, explored the features offered by today's CRM systems, and identified some of the key challenges along the way.

The growth of competition, the development of the goods and services market has led to changes in approaches to customer service, as well as to the need to involve the latest IT solutions in the customer service process. In addition, after the beginning of the Russian-Ukrainian war, the issue of changing the vector to domestic providers of CRM systems became relevant.

Today, CRM systems have also begun to change as a result of the use of artificial intelligence (AI) and machine learning (ML). The increasing availability of data, the need to automate repetitive operations, and the need to offer personalized experiences at scale are the trends driving this movement. Personalization and predictive analytics help identify potential growth opportunities, improve the efficiency of tasks such as sales forecasting or lead scoring through automation that reduces human error, and provide valuable insights into customer behavior and preferences that can be used to personalize the customer experience, which leads to increased customer loyalty.

*Customer relationship management systems are necessary for Ukrainian enterprises to be competitive. CRM solutions simplify sales processes, facilitate better teamwork and offer a deep understanding of customer behavior.*

**Keywords:** CRM systems, business operations, artificial intelligence, machine learning, cloud solutions, personalization.

**Ольга Карпунь, Тетяна Кісера, Діана Соловійова.** *«Перспективи використання CRM систем в Україні в сучасних умовах».* CRM або управління взаємовідносинами з клієнтами – це набір інструментів і стратегій, які компанії використовують для управління своїми відносинами з існуючими та потенційними клієнтами. З моменту свого впровадження на початку 1990-х років вона стала невід’ємною частиною бізнес-операцій для багатьох організацій. Завдяки останнім технологічним досягненням CRM-системи з часом зазнали значної трансформації. У цій статті було розглянуто, як відбувалися такі зміни, проведено дослідження функцій, які пропонують сучасні CRM-системи, а також виявлені деякі ключові виклики, що виникали на цьому шляху.

Зростання конкуренції, розвиток ринку товарів та сфери послуг призвели до зміни підходів до обслуговування клієнтів, а також до необхідності залучення в процес обслуговування клієнтів новітніх IT-рішень. Крім того, після початку російсько-української війни актуальним стало питання зміни вектора на вітчизняних провайдерів CRM-систем.

Сьогодні CRM-системи також почали змінюватися в результаті використання штучного інтелекту (AI) і машинного навчання (ML). Зростаюча доступність даних, потреба в автоматизації повторюваних операцій і потреба пропонувати індивідуальний досвід у великих масштабах є тенденціями, що спонукають цей рух. Персоналізація та прогнозна аналітика допомагають виявити потенційні можливості для зростання, підвищити ефективність таких завдань, як прогнозування продажів або підрахунок потенційних клієнтів, завдяки автоматизації, що зменшує кількість людських помилок, і надають цінну інформацію про поведінку та вподобання клієнтів, які можна використовувати для персоналізації досвіду клієнтів, що призводить до підвищення лояльності клієнтів.

Системи управління взаємовідносинами з клієнтами необхідні українським підприємствам для того, щоб бути конкурентоспроможними. Рішення CRM спрощують процеси продажів, сприяють кращій командній роботі та пропонують глибоке розуміння поведінки клієнтів.

**Ключові слова:** CRM-системи, бізнес-операції, штучний інтелект, машинне навчання, хмарні рішення, персоналізація.

**Introduction.** The relevance of the topic is due to the fact that in recent years the concept of customer relationship management (CRM) has undergone a revolution and has become important for companies that want to increase their customer base. CRM systems are powerful software solutions that provide organizations with a centralized hub to capture and store data on customer interactions and manage customer relationships by using automated processes that are tailored to individual company needs. By using CRM system companies can develop more effective

strategies on how best they should engage with existing customers while also efficiently targeting new ones. Companies can also improve communication between employees and increase efficiency within business operations.

Many studies by Ukrainian and foreign scientists have been devoted to the issue of introducing CRM systems into the activities of companies. However, the development of the latest technologies, the emergence of artificial intelligence, cloud technologies, etc. require a study of the influence of these



tendencies and prospects for the development of CRM systems in new realities.

**Problem statement (formulation of research purposes).** The object of the research was the process of customer relationship management using the latest technologies. The purpose of this article is to study the state and prospects for the development of CRM systems using the latest technologies. The market analysis method and the statistical method were used for the scientific justification of the results of the research on the development of CRM systems, which helped to summarize the existing information and, based on this, to make forecasts for the future.

Over the past few years, there has been an increase in the interest of companies in the use of CRM systems to improve interaction with customers in Ukraine. In 2017, only 6% of Ukrainian enterprises actively used CRM systems [13].

One of the recent studies on the prospects for the development of CRM systems was conducted by Grand View Research. In the report [2] Grand View Research investigated the CRM market-systems in different segments. The research has shown that the CRM systems market will grow at a high rate between 2023 and 2030 as more companies from various industries understand the importance of CRM systems to increase business efficiency and improve customer interactions. And also, other studies show that there is growth in this field [3].

Research in the area of CRM systems so suggests that the market for these systems is

active and expanding annually. This is because more businesses are becoming aware of CRM systems.

The purpose of this article is to define the term, main functions, principles, and features of implementation and functioning of CRM systems in Ukraine. Analysis of the state of development and prospects of the Ukrainian CRM market.

**The main material.** CRM system has become an integral part of business operations for many organizations since its introduction in the early 1990s. With recent technological advancements, CRM systems have seen a significant transformation over time. Now CRM is complex software for collecting information at the company's divisions, in-depth analysis of the client's needs, and implementing solutions to optimize the process of interaction between the company and consumers. The main approaches to definition are represented at Fig. 1.

In modern conditions, the CRM system is used not only in trade, it can be useful in various fields of activity: agriculture, service industries, industry, construction, etc.

The goal of implementing a CRM strategy is to manage customer relationships. It means using tools for working with clients to simplify and speed up the sales process, form a contact base, and set up communication channels with clients. The task of the CRM system is to create a single customer base on one carrier, which reduces the risk of information loss.

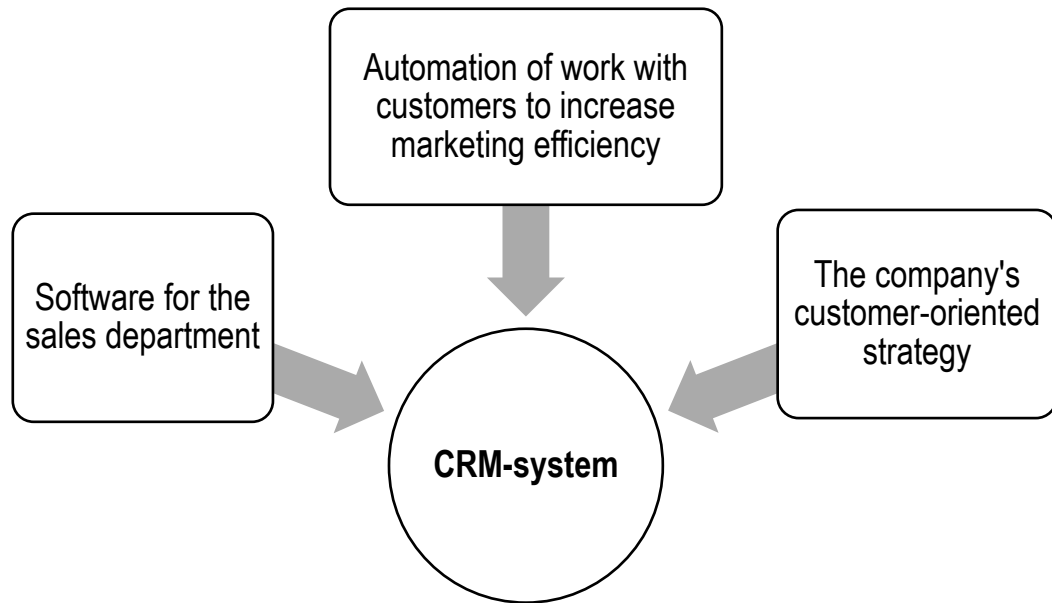


Figure 1 – Key definitions of CRM-system

The main capabilities that are the basis of the system are indicated on Fig. 2



Figure 2 – The main capabilities of the CRM system

In general, the CRM system acts as an intermediary between the client and the company and is a profitable solution for both

parties. The general scheme of using CRM systems is shown on Fig. 3.

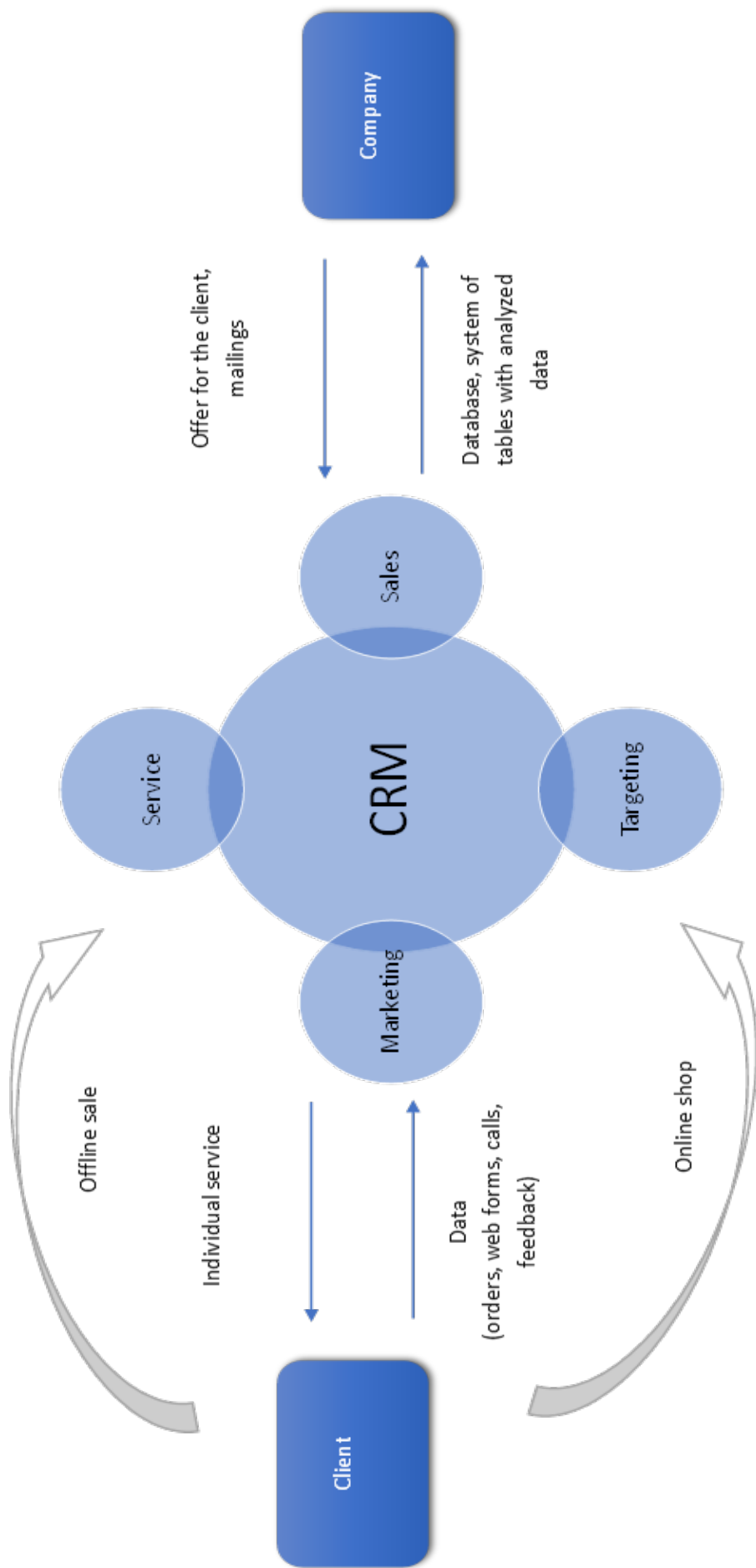


Figure 3 – The depth of the logistics controlling implementation on enterprise

The growth of competition, the development of the market of Ukrainian goods and the sphere of services, led to the need to change the approach to customer service and the involvement of IT solutions. The problem was and remains the low level of knowledge in the field of new technologies among entrepreneurs. The reason is the use of outdated business input methods. In particular, Excel, 1C, and paper documentation are used for reporting.

However, only a small number of entrepreneurs preferred Ukrainian

developers of CRM systems. Instead, they exploited the software of developers of such countries as, for example, the USA and Russia. Below are the names of CRM systems that Ukrainian businesses should not use: Bitrix24; Frontdesk24; NanoGym; Arnica; ClinicIQ; U-ON.Travel, etc.

However, after the beginning of the Russian-Ukrainian war in 2014, the issue of changing the vector to domestic providers became urgent. A list of the leading Ukrainian online CRM systems and an analysis of their services is given in Table 1.

Table 1 – Comparison of CRM systems widely used in Ukraine

Title of CRM system	Services	Type of customer	Size of business
KeyCRM [9]	Collecting leads/orders Communication with clients End-to-end analytics and reporting	Marketplace trade Instagram sales Online stores Services The sphere of beauty Consulting	Medium, small, large business
Firmao [8]	Automation of the sales process Comprehensive customer service Management of the work of the sales department	Service and sales companies	Medium, small, business
NetHunt [11]	Database organization Sales funnel Business process automation Tasks and team performance control	Marketplace trade Sales company Online stores	Medium, small, business
LP-CRM [10]	Data analysis Warehouse accounting Automation of business processes Creation of declarations	Landings Online stores Marketplaces	Medium, small, business
SalesDrive [12]	Full integration with Nova Poshta, Ukrposhta, Justin SMS Order by phone Storage Documentation management Check processing	Internet-shop Warehouse stores	Medium, small, business

Ukrainian developers most often cooperate and provide services to medium and small businesses. Functional purpose: automation of business processes, outsourcing of marketing tasks, control of online payment.

The basis of the process is the exchange of information between the parties, its analysis and sorting. The primary goal of the CRM system is the client base, which is automatically formed from various sources and significantly reduces time consumption.

The audience can be classified according to certain characteristics (for example, a new, repeat or regular customer, etc.). This allows to provide personalized offers with greater value and customize targeted advertising. As a result, the company receives more orders for the same number of requests.

For today the move toward cloud-based solutions is one of the most important developments in the CRM industry. In 2020, the worldwide CRM software market is expected to increase by 13.7%, with cloud-based CRM accounting for roughly three-quarters of this growth, per Gartner's research [7]. Furthermore, according to research by Market Research Future (2022), the worldwide cloud-based CRM market would expand by \$54.4 billion between 2022 and 2027, growing at a CAGR of 10.16%. The

adaptability, scalability, and affordability of cloud-based solutions are what is driving this trend [5].

Nowadays, CRM is also changing as a result of artificial intelligence (AI) and machine learning (ML) and is progressively being improved (Fig. 4). According to a Gartner report, AI will manage 80% of customer support contacts by 2025 [4]. The rising availability of data, the need to automate repetitive operations, and the need to offer tailored experiences at scale are the trends driving this movement. By automating typical processes like lead scoring and client segmentation, for instance, these technologies enable sales and marketing teams to concentrate on more strategic initiatives [1].

Machine learning	Deep learning	Automation	Robotization
<ul style="list-style-type: none"> <li>• Organization of customer data</li> </ul>	<ul style="list-style-type: none"> <li>• Analysing of big amount of information</li> </ul>	<ul style="list-style-type: none"> <li>• Automation of processes that decrease necessity of employee's involvement</li> </ul>	<ul style="list-style-type: none"> <li>• Using robots for communication with customers</li> </ul>

Figure 4 – Changes in CRM systems under the influence of the latest technologies

It is logical to ask at which stages of customer interaction the introduction of artificial intelligence is effective. Below in the Table 2 some applications are shown.

Customer relationship management systems may offer individualized suggestions

and predictive analytics based on customer data by integrating AI and machine learning algorithms.

Table 2 – Application of AI in CRM systems

Business stage	Application of AI
Marketing	<ul style="list-style-type: none"> <li>– Analyzing of market</li> <li>– Analyzing of behavior of client</li> <li>– Content management</li> <li>– Personalization</li> </ul>
Sales	<ul style="list-style-type: none"> <li>– Forecasting</li> <li>– Automatization</li> <li>– Reporting</li> </ul>
Communication	<ul style="list-style-type: none"> <li>– Chatbot</li> <li>– Analyzing emotions of clients</li> <li>– Robotization of assistance</li> </ul>

As can be seen in the Fig. 5, the major elements are the database, AI/ML tools, and CRM system. The two main areas where AI/ML has an impact on the CRM system are personalization and predictive analytics. Personalization and predictive analytics help to identify potential growth opportunities, increase the efficiency of tasks like sales

forecasting or lead scoring through automation, which reduces human error rates, and provide valuable insights into customer behavior and preferences that can be used to personalize customers' experiences, leading to higher customer loyalty.

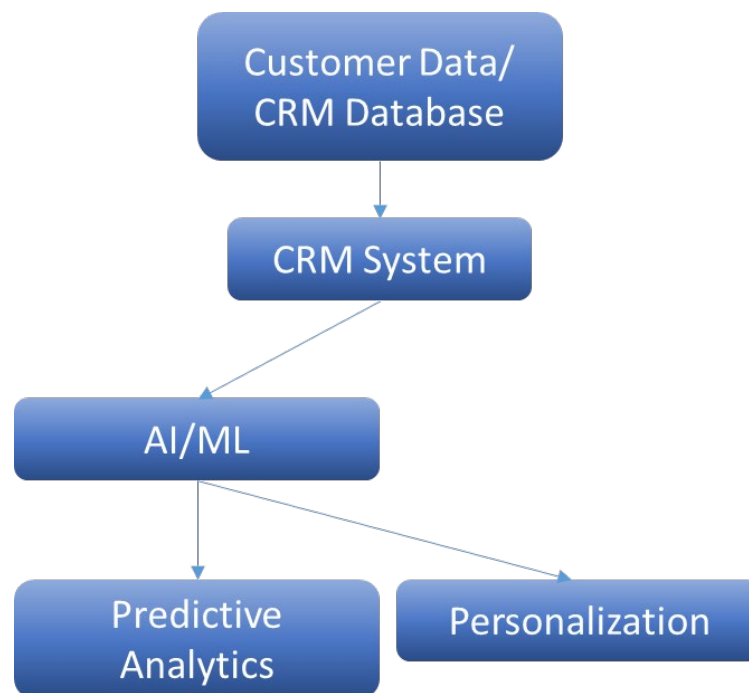


Figure 5 – Scheme of the influence of Artificial Intelligence (AI) and Machine Learning (ML) on the CRM system

Artificial intelligence-powered chatbots may be incorporated into a CRM platform to offer real-time help, answer commonly asked inquiries, and quickly resolve problems while

saving time for both parties communicating with it. Artificial intelligence and machine learning have significant impacts on CRM by gathering data from various sources like social



media or sales transactions for analysis to identify profitable customers' preferences using personalization algorithms leading towards automation in business processes with predictive analytics identifying potential opportunities for growth while chatbots offer real-time assistance to the customers resolving their queries quickly. AI/ML's impact on CRM can help streamline businesses efficiently by providing insights into consumer behavior & preference-driven goals empowering better strategic decision making resulting in greater success rates overall with an increased focus on personalized experience enhancing profitability levels.

Therefore, another significant development in the CRM industry is the growing significance of personalization, which is also becoming very important for

companies and their customers. Research by Accenture found that 91% of consumers are more willing to patronize firms that make useful offers and suggestions [6]. The rising need for personalized experiences and the accessibility of data-driven technologies that allow businesses to provide personalized experiences at scale are what are driving this trend. Customer relationship management systems that use customer data to build segments and offer customized suggestions depend on personalization, as can be seen in the Fig. 6. With tailored marketing efforts, product recommendations, and specialized content, personalized experiences boost consumer happiness and loyalty as well as propel sales growth.

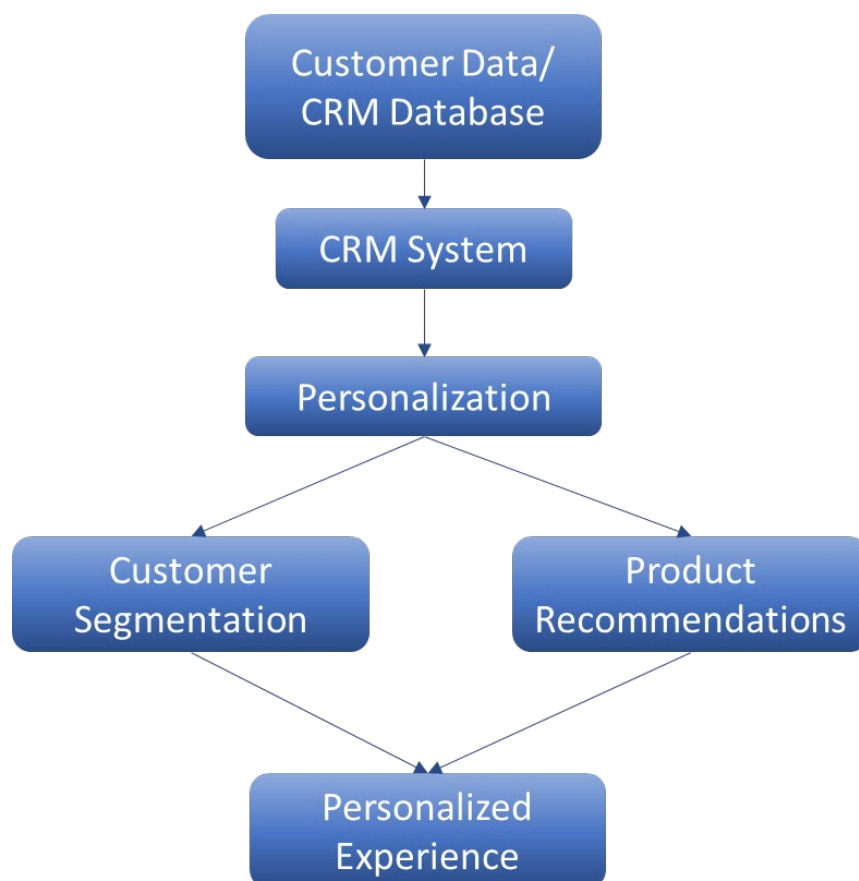


Figure 6 – Scheme of the influence of personalization on the CRM system

Customers' engagement and loyalty are increased when they receive tailored messages and offers that make them feel

valued. Businesses can target certain customer segments with personalized messages to increase the success of

marketing campaigns. Understanding each customer's preferences allows businesses to build stronger relationships, which in turn improve conversion rates, which in turn stimulate revenue growth. By implementing data-driven personalization techniques inside CRM systems, businesses are able to achieve tangible outcomes while creating value

propositions that are more alluring than ever before, leading to excellent business performance indicators across all industries.

Analyzing the schemes and information given above, let's create a general scheme for all the main trends and their impact on the CRM system (Fig. 7.).

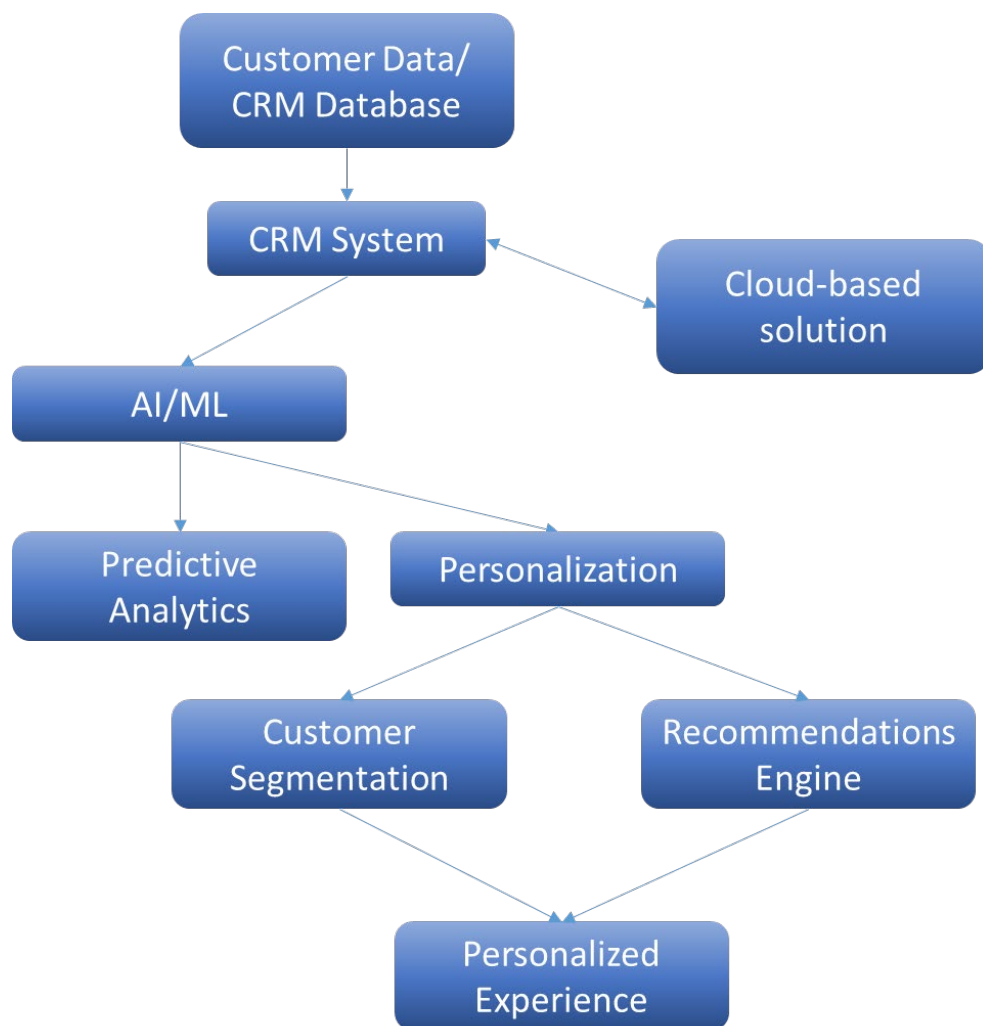


Figure 7 – Scheme of the influence of the main trends in the development of the CRM system

The information we need to understand using it in business and what's going on inside. Businesses may now store and access client data from any location thanks to cloud-based technologies. By examining their consumers' behavior and interests, they have been able to offer customized experiences. This data may be analyzed using AI and ML

algorithms to give insights into client behavior that can help firms customize their goods or services to satisfy particular demands.

CRM is placing more and more emphasis on personalization as customers demand more specialized experiences. Businesses may communicate with clients in real-time and

provide them with tailored suggestions based on their preferences by deploying AI-powered chatbots or virtual assistants.

Customer relationship management systems are necessary for Ukrainian enterprises to be competitive. CRM solutions simplify sales processes, facilitate better teamwork and offer deep insights into customer behavior.

Thanks to the increased flexibility, scalability and cost-effectiveness that cloud solutions offer. The importance of personalization features as customers expect a personalized experience. Efficiency achieved through automation with AI and machine learning algorithms that analyze customer data for predictive analytics leading to more informed sales/card decisions. The use of cloud solutions, personalization technologies, AI and ML is becoming more and more popular in the CRM industry of Ukraine.

By increasing productivity and offering a better customer experience, companies that implement these advanced solutions can gain a competitive advantage that will ultimately help them succeed in the long run.

To sum up, cloud-based solutions, personalization, AI, and ML are revolutionizing how companies manage their customer connections. Businesses may gain a competitive edge by enhancing operational efficiency and offering better customer experiences by utilizing these technologies to their full potential.

**Conclusions.** In conclusion, we can say that the emergence of the latest technologies has influenced the importance of system integration of data, and CRM solutions must also be able to link with a wide range of different systems and platforms in the connected corporate world of today. Effective CRM requires integration with other systems. Communication with other systems is necessary for effective CRM, because problems with integration can lead to inefficiency, data accumulation and poor customer experience. The drive to ensure seamless interactions with multiple touchpoints and the increasing complexity of the digital landscape are driving this trend.

CRM systems have already been effectively adopted by certain Ukrainian businesses, and their use has yielded fruitful results. Yet, compared to markets in wealthy nations, the Ukrainian market is still relatively new and underdeveloped. It should be highlighted that organizations from both domestic and foreign countries offer CRM solutions for the Ukrainian market. Customers may now select from a variety of options to get the best option for their company.

Overall, it can be argued that the Ukrainian market for CRM systems is favorable and has room for growth. Companies have just lately discovered how crucial CRM systems are to effectively working with customers, therefore we may anticipate a rise in demand for these systems in the future.

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## MODERN TRENDS IN GLOBAL SUPPLY CHAINS

**Sergiy Grytsenko, Anna Temchenko, Anastasia Polishchuk.** *"Modern trends in global supply chains". The article examines the existing global supply chains, which are an element of the world economy and allow companies to determine the most optimal ways of supplying and producing goods in different countries of the world. The features and problems of formation and functioning of global supply chains are identified. The factors that influenced global supply chains in Ukraine during the war are identified. The analysis of global supply chains reveals their sustainability and dependence on various factors, such as the economic and political situation in the participating countries, changes in technology and innovation, crisis situations such as the COVID-19 pandemic and military conflicts. It is proved that the priority of developing clusters and global supply chains is recognized as the most effective tools for the development of national economies.*

**Keywords:** Global supply chains, formation of supply chains, clusters, problems of global supply chains functioning.

**Сергій Гриценко, Анна Темченко, Анастасія Поліщук.** *«Сучасні тенденції глобальних ланцюжків постачання». У статті розглянуто існуючі глобальні ланцюги постачання, які є елементом світової економіки, що дозволяють компаніям визначати найбільш оптимальні шляхи постачання та виробництва товарів у різних країнах світу. Визначено особливості, проблеми формування та функціонування глобальних ланцюгів постачання. Виявлено фактори, що вплинули на глобальні ланцюги постачання в Україні під час війни. Проведений аналіз глобальних ланцюгів постачання дозволяє виявити їх стійкість та залежність від різних факторів, таких як економічна*

*та політична ситуація в країнах-учасницях, зміни технологій та інновацій, кризові ситуації, такі як пандемія COVID-19 та конфлікти військового характеру. Доведено, що саме пріоритетність розвитку кластерів та глобальних ланцюгів постачання визнані найефективнішими інструментами становлення національних економік.*

**Ключові слова:** Глобальні ланцюги постачання, формування ланцюгів постачання, кластери, проблематика функціонування глобальних ланцюгів постачання.

**Introduction.** Today, the formation of global supply chains is an integral part of business. Global supply chains are a system of interaction between businesses that supply various goods and services to the end user. These chains can span several countries and include manufacturers, intermediaries, logistics companies and other organizations.

The company's global strategy is based primarily on the perception of the world as a whole, i.e., the recognition that there are more similarities than differences in the system of consumer preferences of each country. Based on these references, providing the consumer with standardized goods of adequate price and quality carries competitive advantages that often exceed those obtained by highly adapted local companies [1, p. 67; 2]. The economy that is being formed at the present stage is focused on the priority development of clusters and global supply chains, which are recognized as the most effective systems.

**Analysis of recent research and publications.** Global economic shifts that characterize the current stage of development of the world economy actualize the study of objective dynamic processes of qualitative and quantitative nature that occur in global supply chains, which led to the choice of the research topic, its purpose and content focus. Actual problems of formation and implementation of international economic activity of cluster formations and global supply chains are covered in works [1-14]. To solve the tasks set in this paper, the methods of comprehensive analysis and synthesis were used.

**The article is aimed** at identifying current trends in global supply chains.

### **Main material and research results.**

Global supply chains are a necessary component in the modern economy, especially in the context of growing international trade and globalization, so it is worth considering the peculiarities of their formation for the better functioning of logistics supply chains. The features of formation include:

- Geographical distribution: Global supply chains can span several countries and continents. Communication between partners and the need to coordinate multiple processes can be problematic.

- Dependence on foreign suppliers: Global supply chains typically rely on many suppliers in different countries. This leads to an increased risk of supply disruptions due to political, economic, or social changes in those countries.

- The possibility of a standardization process: Processes and protocols must be standardized for global networks to work well. This is important to ensure consistent product quality and interoperability between chain members.

- Use of the latest technology: We use a variety of advanced technologies, such as automation, the Internet of Things (IoT) and artificial intelligence (AI), to streamline and optimize global supply chain processes.

- Security risk: Global supply chains can be subject to cyber attacks, loss of confidential information, terrorist attacks, etc. This requires additional security measures to protect against such risks.

- Environmental responsibility: Global supply chains can have a negative impact on the environment, so companies that form global supply chains should be responsible



for environmental issues and develop environmental measures [3].

Thus, the formation of global supply chains has its own peculiarities that require additional attention to ensure their efficiency and sustainability. It is important to pay attention to the geographical distance between chain participants, which can lead to delays in deliveries and increased costs for transportation and storage of goods.

Additionally, it is important to ensure that cultural and religious differences between chain participants are addressed, which can affect cooperation and understanding between them. Since global supply chains are a key element in the global economy, it is important to understand their specifics when forming and managing them.

Global supply chains are the backbone of the global economy, enabling companies to ensure continuous access to resources and markets around the world. However, the growing complexity and risks associated with managing global supply chains pose a number of challenges for companies operating in this sector. The most common problems of global supply chains today include the following:

- The COVID-19 pandemic. The pandemic has significantly complicated global supply chains. Restrictions on the movement of goods and people, interruptions in production and services, changes in demand for goods and services have all caused supply chain disruptions and disruptions in the supply of goods.

- The war in Ukraine. The war has created supply chain disruptions and reduced supply of goods for global supply chains. Almost every stage of the chain, including raw material extraction, production, transportation, and distribution, has been affected by the war. For example, the fighting has affected transportation routes, halted production and deteriorated infrastructure. The war has also led to a shift in the geography of supply chains and a reduction in the role of individual countries in them.

Thus, as a result of the war in Ukraine, some countries may refuse to cooperate with Ukrainian companies, which may lead to the transfer of production to other countries that do not have military conflicts [4].

- Uneven distribution of risks. In global supply chains, risk guarantees are distributed among all participants. However, in the end, most of the risks are mostly borne by less powerful participants, such as small and medium-sized enterprises. This can increase the uneven distribution of costs and risks in the system.

- Insufficient digital transformation. Many participants in global supply chains have not yet fully transitioned to digital technologies and processes. This can lead to insufficient automation and optimization of processes, difficulties in tracking supplies and interacting with stakeholders.

- Over-reliance on a few key suppliers. Many industries are highly dependent on a few key suppliers of raw materials or components, which can lead to the risk of production downtime and supply chain disruption in the event of a problem with suppliers.

All the above-mentioned supply chain challenges caused by the COVID-19 pandemic, port congestion during the pandemic recovery period, the Suez Canal blockade, and Russia's invasion of Ukraine have exposed inherent vulnerabilities in supply chains, causing a reshuffling of the global chain. Disruptions are commonplace and a major source of uncertainty for companies and investors [5].

To better understand the challenges faced by companies due to the COVID-19 pandemic and Russia's invasion of Ukraine, the European Bank for Reconstruction and Development (EBRD) conducted a short telephone survey between May and July 2022, interviewing 815 companies that are direct exporters and importers from 15 countries: Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Lithuania, Morocco, Poland, Romania, Serbia,

Slovakia, Slovenia, Tunisia, and Turkey (Figure 1) [5].

Sanctions, the war in Ukraine, COVID-19 disruptions with suppliers, etc., have become a serious challenge for global supply chains today. These factors have resulted in supply chain disruptions and reduced supply of goods, changes in the geography of supply chains and a reduced role of individual countries in them. They also affected the consumption of products and caused changes in global economic processes.

As a result, companies began to look for new ways to supply and produce goods, as well as to increase their redundancy and flexibility to meet the changes in the global environment.

Specifically, the formation of global supply chains allows companies to access new markets and increase their sales. Such supply chains allow companies to utilize resources and knowledge from different countries to improve the quality and efficiency of their products and services.

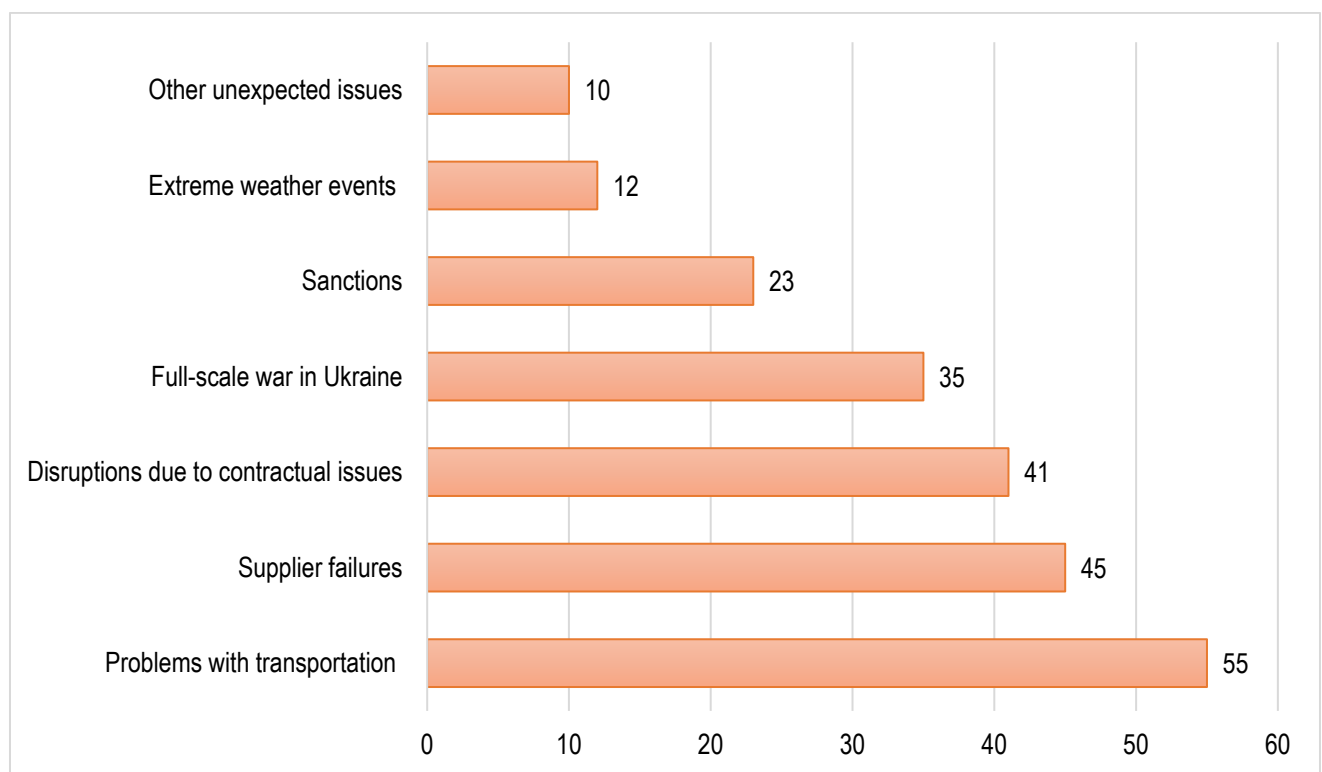


Figure 1 – Challenges in global supply chains

However, the formation of global supply chains can also have negative consequences. For example, companies' dependence on suppliers from other countries can make them vulnerable to changes in the economic, political and social environment. In addition, the formation of global supply chains can lead to deterioration of labor and production conditions in producing countries where low standards of social relations and environmental requirements are set.

Today, the situation in Ukraine and in the world is unstable due to the war and other factors. Ukraine is currently facing a number of challenges in forming global supply chains, including the following:

- Low level of technological development. Ukrainian companies often do not possess modern technologies and do not have enough skilled labor to use them. This creates barriers to entry into global supply

chains, as they require companies to use advanced technologies and processes [6].

- Insufficient infrastructure. An efficient logistics infrastructure is an important condition for successful entry into global supply chains. Ukraine faces problems with the transportation of goods due to the insufficient development of roads, railways, and seaports [6].

- Instability of the political and economic situation. The instability of the political and economic situation in Ukraine may become an obstacle for global business and the formation of supply chains. Exchange rate volatility, political conflicts, and lack of investment can pose risks to foreign investors and business partners [7].

- Low level of competitiveness. Ukrainian companies are not always able to compete with other companies in the world in terms of product quality and price. Insufficient innovation and production efficiency, as well as high energy and resource costs, reduce competitiveness.

Ukraine is currently at war, which has a significant impact on the formation of global supply chains in the country. One of the biggest impacts of the war on global supply chains in Ukraine is that the conflict has led to changes in international trade. Ukraine lost control over certain territories, which led to changes in transportation corridors and international logistics routes. In addition, sanctions were imposed that restricted exports and imports of a number of goods, which affected global supply chains in the country [8].

The war also led to a significant decrease in foreign investment, which affected local companies and manufacturers. Many companies were forced to stop production, which led to job losses and a decrease in the country's production capacity.

The war in Ukraine has had a significant impact on global supply chains, particularly on their logistics component. The conflict has changed the country's geopolitical context, leading to changes in international trade

relations and transportation routes. Several factors that affected global supply chains in Ukraine during the war:

**Changes in transportation corridors:** The war led to a change in transportation routes in Ukraine. In addition, the blockade of the territory occupied by Russia has led to a decrease in traffic flows in the country, which has affected global supply chains [9].

**Complexity of the logistics infrastructure:** The war also led to a decline in the quality of logistics infrastructure in Ukraine. For example, many bridges and roads were destroyed, which changed transportation routes and complicated the logistics process [9].

**Changes in legislation:** The war also led to changes in legislation that affected global supply chains in Ukraine. For example, new import and export control regimes were introduced, which changed trade relations and complicated the logistics process.

**Reduced economic activity:** The war in Ukraine also led to a decrease in economic activity in the country. This led to a decrease in demand for goods and services, which affected global supply chains in Ukraine. Many companies have stopped their operations or reduced production, which has led to changes in the supply of goods and services [9].

To summarize, the war in Ukraine has had a significant impact on global supply chains, in particular on their logistics component. Changes in transportation routes, the complexity of logistics infrastructure, changes in legislation, and reduced economic activity have all affected global supply chains in Ukraine and globally.

The following steps can be taken to improve global supply chains in Ukraine:

**Reconstruction of logistics infrastructure:** Ukraine's logistics infrastructure, such as roads, bridges, and other highways, should be rebuilt and improved. This will help reduce the time of delivery of goods, increase traffic flows, and facilitate the logistics process [9].

**Expansion of transportation networks:** Ukraine's transportation networks need to be expanded, including new highways, railways, and ports. This will help increase transportation volumes and facilitate the delivery of goods [9].

**Development of e-commerce:** E-commerce is an important component of global supply chains. Ukraine can take steps to improve its Internet infrastructure and increase the volume of e-commerce. This will help companies enter global markets more easily and provide access to goods for consumers around the world.

**Improving the business climate:** The business climate in Ukraine needs to be improved, in particular by simplifying registration and taxation procedures, reducing bureaucracy and corruption. This will make Ukraine more attractive to foreign investors and help attract new businesses to the country.

**Improving the skills of employees:** Efficient global supply chains require highly skilled workers who can understand complex logistics processes and respond quickly to unforeseen situations. Ukraine needs to develop a system of professional training and retraining of logistics and customs workers.

**Technology development:** The use of modern technologies, such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI), can significantly improve the efficiency of global supply chains. Ukraine should facilitate the implementation of these technologies and the development of relevant solutions and programs [10].

One way to improve global supply chains in Ukraine during the war is to create cluster associations.

Cluster associations are a group of companies that work together to improve their competitiveness and efficiency by using shared resources and expertise. Agreements between companies within a cluster can help improve the quality and efficiency of the supply of goods and services [11].

To improve global supply chains in Ukraine during wartime, cluster associations can be introduced at different stages of the supply of goods and services. For example, companies could come together to share procurement, production, logistics, and marketing. This will allow companies to shorten delivery times, reduce procurement and distribution costs, and improve the quality of products and services.

Cluster associations can also help to improve the links between supply chain participants and ensure mutually beneficial terms of cooperation. Companies can interact not only with each other, but also with government agencies, the public, and research institutions, which can provide additional benefits in supply chain management [12, 13].

For cluster associations to function successfully, certain conditions must be met. First of all, participants must have common goals and interests in improving the supply chain. Second, it is necessary to have sufficiently qualified personnel who can implement cluster association projects. Third, it is important to have support from the government and other organizations that can facilitate interaction and cooperation among cluster members [12, 14].

In general, the creation of cluster associations can improve global supply chains in Ukraine during wartime. This can create favorable conditions for economic development and ensure resilience in case of emergencies.

One possible example of a cluster association that could improve global supply chains in Ukraine and help the Armed Forces of Ukraine (AFU) is the creation of a cluster in the production of military equipment and machinery.

This cluster could bring together manufacturers of military equipment, suppliers of components and materials, research institutes, logistics companies, financial institutions, and other organizations working in the sector.

The creation of such a cluster can help solve the problems that arise in global supply chains of military equipment and supplies due to war and other factors. The cluster can provide interaction between supply chain participants, promote the development of new technologies and innovations, increase production volumes and reduce production costs.

In addition, the creation of the cluster can help the Armed Forces of Ukraine in providing the necessary military equipment and machinery, which is an important condition for maintaining national security. Also, the creation of a cluster can help attract investment in Ukraine's military-industrial complex and increase its competitiveness in the global market.

Thus, the creation of a cluster association in the field of military equipment and machinery production can be an effective tool for improving global supply chains.

In general, the formation of global supply chains is an important element of modern business, which can lead to significant economic growth and development. However, it is important to ensure compliance with high standards of social responsibility and sustainable development in order to reduce the negative impact on the economic,

social and environmental environment [11, 12].

**Conclusions.** Global supply chains are an important part of the global economy and trade. They allow companies to access different markets and meet demand for products from around the world.

However, global supply chains are also facing a number of challenges that have arisen during the COVID-19 pandemic, war and other events. These include changes in transportation corridors, complexity of logistics infrastructure, uneven distribution of risks, insufficient digital transformation, unstable political and economic situation, insufficient infrastructure, low level of technological development, and others.

Ways to solve these problems may include the use of modern technologies, such as artificial intelligence, to automate supply chain management processes, expanding transportation networks, developing e-commerce, improving employee skills, maintaining an open dialogue with all chain participants, and creating cluster associations.

Thus, global supply chains are an important element of the global economy, but their problems require improvement and the use of modern technologies to ensure stable and continuous development..

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## GENESIS OF COMPETITIVE DEVELOPMENT OF INDUSTRIAL ENTERPRISES

**Kateryna Boiarynova, Kyrlo Knyzhnyk, Alla Zaharchuk. "Genesis of competitive development of industrial enterprises".** The article retrospectively analyzes the concept of "competition" and examines its modern interpretations. It was determined that the basis of understanding competition is the struggle between market subjects for access to resources, consumers, while competition determines the economic behavior of market subjects. It is substantiated that competitive development, as one of the types of development, is a tool for ensuring economic growth and a consequence of ensuring competitiveness. Modern interpretations of competitive development by scientists are analyzed. It was found that such development is based on a process approach to the implementation of changes that provide a synergistic effect in the parallel acquisition of competitive advantages and development of the business entity. The key features of competitive development are determined by its basis on the creation of special unique advantages of the enterprise, the use of production factors capable of providing a competitive basis for development, the use of strategizing processes in ensuring competitiveness, which in the complex not only ensure the maintenance of positions and economic efficiency of operation, but also become tools for the development of the enterprise. The own vision of the interpretation of the competitive development of the enterprise as qualitative and quantitative changes in the economic activity of the enterprise, provided with innovative, organizational, economic advantages, different from those of competitors, which ensure economic growth, increase in efficiency and the transition of the enterprise to a higher level of functioning in an economic environment with hard-to-achieve results, has been formed for competitors.



**Keywords:** competition, development, competitive development, interpretation..

**Катерина Бояринова, Кирило Книжник, Алла Захарчук. «Гене́за понять «конкурентоспроможність» та конкурентний розвиток підприємств». У статті ретроспективно проаналізовано поняття «конкуренція» та розглянуто сучасні її трактування. Визначено, що основою розуміння конкуренції є боротьба між суб'єктами ринку за доступ до ресурсів, споживачів, при цьому конкуренція визначає економічну поведінку суб'єктів ринку. Обґрунтовано, що конкурентний розвиток, як один з видів розвитку, є інструментарієм забезпечення економічного зростання та наслідком забезпечення конкурентоспроможності. Проаналізовано сучасні тлумачення конкурентного розвитку науковцями. З'ясовано, що такий розвиток базується на процесному підході до впровадження змін, які забезпечують синергетичний ефект у паралельному набутті конкурентних переваг і розвитку суб'єкта господарювання. Ключовими особливостями конкурентного розвитку визначено його базування на створенні особливих унікальних переваг підприємства, застосування факторів виробництва, спроможних забезпечити конкурентну основу розвитку, використання процесів стратегування у забезпеченні конкурентоспроможності, які у комплексі не тільки забезпечують втримання позицій і економічну ефективність функціонування, а й стають інструментами розвитку підприємства. Сформовано власне бачення трактування конкурентного розвитку підприємства як якісних і кількісних змін економічної діяльності підприємства, забезпечених інноваційними, організаційними, економічними перевагами, відмінними від наявних у конкурентів, що забезпечують економічне зростання, підвищення ефективності та перехід підприємства на вищий рівень функціонування в економічному середовищі з важкодосяжними результатами для конкурентів.**

**Ключові слова:** конкуренція, розвиток, конкурентний розвиток, трактування.

**Introduction.** In the conditions of a market economy, one of the key factors in the effective functioning and development of industrial enterprises is competition. Competition itself prompts enterprises to make changes both in production technologies and in management technologies, and also stimulates the creation of new sectors of the economy in general. Ensuring competitive enterprises remains a relevant topic today. The methods of ensuring and improving it have evolved from the struggle for obtaining and optimal use of resources to maintaining positions through the use of innovations. The understanding of competition is also developing, not only as a driver of development, but also as a tool for the development of production and economic systems. From this position, new aspects of the development of such economic categories as competition and competitive development require attention from the perspective of their compliance with the

current state of the economy and possible future trends and changes.

**Analysis of recent research and publications.** Well-known classics of economic science devoted their works to the study of approaches to understanding competition and competitive development: A.-R. J. Turgo, A. Smith, D. Ricardo [1-3], as well as domestic and foreign scientists B. Shlyusarchyk, T. Pertsovykh, R. Gretskey, A. Melikhov, and others. [7-11; 14-20]. However, with the formation of new economic conditions, there is a need to update the interpretations of the specified economic categories.

**Formulation of the goals of the article.** The purpose of the study is to consider the genesis of the concepts "competition", "competitive development", the analysis of the interpretation of competitive development by scientists and the formulation of their own in accordance with modern trends.

### **Main material and research results.**

Leading scientists studied the concepts of competition and competitiveness in depth and in detail. Among them is Anne-Robert Jacques Turgot, who believed that "competition is the main force responsible for setting the market price at a certain "natural" level [1]. That is, it is competition that is responsible for the level of prices for goods and services, which is still reflected in the markets of pure, oligopolistic competition and monopoly. And the ratio "price/competitiveness" acquires the same important characteristics as "price/quality". A. Smith formulated the principle of the "invisible hand", according to which competition is a driving force and catalyst in satisfying the interests of both the entrepreneur and society [2]. That is, competition is an important lever in the implementation of the economic behavior of enterprises, it affects the activity in the constant search for opportunities to support competitiveness, monitoring the price policy and other factors of its support, forming a vision of their development.

According to D. Ricardo, competition is not subject to any restrictions [3], and the price is formed exclusively under the action of supply and demand as a result of competition between enterprises. Antoine Augustin Cournot proved that goods in a monopolized market have a much higher price level than those set in a competitive market, which is caused by a reduction in supply [4]. That is, according to the scientist's research, competition affects not only the price of goods and services, but also the volume of production and presentation of goods on the market, and these processes are interdependent.

Agreeing with the well-founded fact of S. Melnikov, that the economic system of the end of the 19th century, was considered by scientists from the point of view of perfect competition [5], let's add that it was during this period that the basic vision of the

importance of competition in the development of enterprises was formed. Receiving income as a result of competitiveness, enterprises are able to invest in new processes of its provision, which develop the enterprise as an economic entity.

Modern approaches to the interpretation of the concept of competition define it as:

- a complex characteristic of the functioning of enterprises, which requires an analysis of the enterprise's activity, provides an opportunity to establish advantages in competition [6];

- the ability (productivity) not only of the enterprise, but also of the industry, compared to others, to: produce modern, technologically intensive goods, solve new technical problems, achieve (constantly increasing) income under the condition of a high level of employment and a relatively high level of wages [7];

- determines the economic behavior of entrepreneurs, the peculiarities of their actions and the adoption of managerial decisions regarding the implementation of original and creative ideas, the skillful involvement of financial, material, informational, intellectual and other resources for this [8].

In general, in modern interpretations of the concept of competition, both its traditional signs remain, that is, the struggle between market subjects for access to resources, attracting consumers, etc., and new ones are developing - oriented to economic behavior (Table 1).

Therefore, the interpretation of "competition" continues to be in the field of view of scientists as a set of certain advantages that not only ensure holding positions on the market, but also stimulate development. Competition acquires a new meaning, integrating into the processes of enterprise development. According to the law of competition, each producer and other market participants try to obtain the most favorable conditions for production and sales, as well as the use of capital [12].

Table 1 – Interpretation of the concept of competition in research by scientists

Scientist	Interpretation	A key aspect
1	2	3
Gretsky R.	An economic category expressing production relations between commodity producers in the process of exchanging labor products [9]	Industrial relations between commodity producers
Marenich A., Astakhova I.	A comprehensive characterization of the functioning of enterprises, which requires an analysis of enterprise activity, provides an opportunity to establish advantages in competition [6]	Provides an opportunity to set preferences
Shlyusarchyk B.	The ability (productivity) not only of the enterprise, but also of the industry, compared to others, to: produce modern, technologically intensive goods, solve new technical problems, achieve (constantly increasing) income under the condition of a high level of employment and a relatively high level of wages [7]	The ability (productivity) not only of the enterprise, but also of the industry, compared to others
Pertsovykh T.O.	Determines the economic behavior of entrepreneurs, the peculiarities of their actions and management decision-making regarding the implementation of original and creative ideas, skillful involvement of financial, material, informational, intellectual and other resources for this [8]	Determines the economic behavior of entrepreneurs
Lytyvnenko T.	A system of relations that is characterized by a struggle, rivalry between various market subjects regarding the distribution of limited goods and resources, which provide an advantage to individual subjects in case of their victory in certain market conditions (perfect monopolistic and oligopolistic market structure) [10]	A system of relations characterized by struggle and rivalry
V.A. Vasylenko, Didenko A.N.	Rivalry in any field between separate legal entities and individuals (competitors) interested in achieving the same goal [11]	Rivalry between individual legal entities and individuals

Competition deepens the processes of economy, efforts to make products cheaper, as well as activation in its modification, improvement and improvement in the absence of an opportunity to produce its variants cheaper than those of competitors. The limitation in the ability to reduce product prices as a result of greater access to the economic resources of various product manufacturers gives rise to the search for other methods of competitive struggle with the use of product, process, marketing, and organizational innovations in the economic activity of enterprises, which in turn stimulates development processes. In this

context, new approaches to development are being formed, which define competitive development as a tool for ensuring economic growth.

Combining the concepts of competition and development, first of all, let's turn to the interpretation of the concept of development. Development according to scientific economic schools is considered in the context of revolutionary or evolutionary changes, progressive or regressive direction. Most scientists focus their research on progressive development, which is characterized by a transition from less perfect to more perfect [13]. Such development is

based on positive dynamics and is characterized by qualitative changes and is aimed at increasing the efficiency of the enterprise. The need for such improvements is inextricably linked to ensuring competitiveness and the formation of competitive advantages. Most scientists consider economic stability, adaptability, improvement of the company's image, etc. to be the results of development. Such goals are close to the acquisition of a high level of competitiveness, and in fact are its consequence.

The key types of development are: economic and innovative. The economic development of the enterprise is realized through a change in the economic state, while anticipatory economic development is provided by competitive advantages, cost reduction, and increased profitability based on the application of innovative technologies, approaches and tools. An increase in competitiveness contributes to an increase in income, adaptation to the changing conditions of the external environment, stable maintenance on the market, an increase in sales volumes, which in turn forms the basis for the economic development of

enterprises. The key principles of economic development, which are aimed at ensuring competitiveness, are:

- application of production factors capable of providing a competitive basis for development;
- orientation of the dominant subject of the real sector of the economy, which forms competitive advantages.

Scientists pay more and more attention to this type of development - as competitive development (Table 2), considering it as:

- the process of implementing constructive changes justified by the used competition strategy [14];
- compliance with the competitive principles of the development of the economic system in general [14];
- the process of constructive changes in accordance with the competitive strategy implemented by the enterprise [15];
- shift of priorities in economic activity, which actualizes the importance of creating competitive advantages [16].

Table 2 – Interpretation of the concept of competitive development in research by scientists

Scientist	Interpretation	A key aspect
1	2	3
Zhovnovach R.I.	Management of the competitiveness of products, which involves monitoring the behavior of competitors, identifying strengths and weaknesses, as a result of which competitive advantages are achieved in a certain market [17]	Competitiveness management
A. A. Melikhov	Based on the inherent ability of the enterprise to change, the process of making constructive changes justified by the used competition strategy, which leads to the appearance of new qualities in the enterprise, due to which the stability of the enterprise is ensured and its ability to resist the destructive effects of the external competitive environment increases [14]	The process of implementing constructive changes justified by the used competition strategy

End of table 2

1	2	3
Polyanska A.S.	The development of the enterprise not only in relation to its competitors, but also in relation to the observance of the competitive principles of the development of the economic system in general, according to which there is competition in product markets, business entities act in the interests of consumers, compete with each other for the best conditions for the production of goods, use of resources, etc. [18]	Adherence to the competitive principles of the development of the economic system in general
Mikhalchyshyn N.L.	The process of constructive changes in accordance with the competitive strategy implemented by the enterprise, as a result of which the stability of the enterprise in the market is ensured and the ability to resist the influence of the external environment is acquired [15]	The process of constructive changes in accordance with the competitive strategy implemented by the enterprise
Kondratyuk O.I.	The development that leads to a shift in priorities in economic activity in the direction of sustainable development actualizes the importance and necessity of creating competitive advantages through new approaches to management [16]	Shifting priorities in economic activity, which actualizes the importance of creating competitive advantages
Vovchok S.V.	A special form of interaction of related processes, tools and functions of the competitiveness assurance system, which is implemented within a specific enterprise, requires a special management mechanism and leads to an increase in the level of social and economic efficiency [19]	The form of interaction of processes, tools and functions of the competitiveness assurance system

In general, competitive development belongs to both economic and innovative development. Its key feature is based on the creation of advantages of enterprises, different from competitors, which not only ensure holding positions and economic efficiency of operation, but also become tools that develop the enterprise. Such benefits for industrial enterprises should apply:

- increasing the effectiveness of existing technologies for updated fixed assets, technological processes, use of intellectual property objects, etc.;
- personnel development, increase of intellectual capital;
- reducing the cost of production and increasing its value.

In view of the above, the competitive development of the enterprise should be

interpreted as qualitative and quantitative changes in the economic activity of the enterprise, provided with innovative, organizational, economic advantages, different from those available to competitors, which ensure economic growth, increased efficiency and the transition of the enterprise to a higher level of functioning in the economic environment with hard-to-achieve results for competitors.

**Conclusions.** According to the conducted research, it can be concluded that the interpretation of the concept of "competition" develops in accordance with changes in economic conditions and trends. In particular, there is a change in its understanding from the struggle between market subjects for access to resources, consumers to the basis of the formation of



their economic behavior and the formation of economic relations in the business environment. Competitive development can be considered one of the types of development, a tool for ensuring economic growth and a consequence of ensuring competitiveness. The key features of competitive development are: the creation of special unique advantages of the enterprise,

the use of production factors capable of providing a competitive basis for development, the use of strategizing processes in ensuring competitiveness. Competitive development ensures the transition of the enterprise to a higher level of functioning in the economic environment in the presence of hard-to-achieve results for competitors.

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## CONCEPTUAL PRINCIPLES FOR FORMATION OF THE SUPPLY CHAINS' DECARBONIZATION STRATEGIES

**Mariia Hryhorak, Oleh Harmash, Nataliia Trushkina.** *"Conceptual principles for formation of the supply chains' decarbonization strategies". The article examines the conceptual foundations of the formation of a strategy for the decarbonization of supply chains, the identification of strategic solutions for reducing greenhouse gas emissions, and the management of green chains from the point of view of ecological and economic efficiency.*

*A structural and logical diagram of the formation of the strategy of decarbonization of supply chains has been built. Seven key business processes in supply chains/networks have been identified that significantly affect the volume of greenhouse gas emissions: ecological design, environmental procurement, energy- and resource-saving production, green transportation, ecological storage, smart eco-consumption, recycling and disposal.*

*It was established that in closed-loop chains, managerial environmental solutions should be aimed at: preservation or restoration of products to extend their life cycle, which includes diagnostics and repair; reuse of products for the same or new purposes in their original form or with some changes; restorative repair of products or individual components; processing of waste and end-of-life products, or recycling (any recovery operations, with the help of which waste and old products are processed into materials, resources, substances for the production of other products or for other purposes).*

**Keywords:** national economy, environmental protection, greenhouse gas emissions, climate neutrality decarbonization, carbon footprint, supply chain, green supply chains, green supply chain management, reverse logistics, ecological principles, circular business models, sustainable development, green investments, green technologies, strategy, strategic management, system approach, conceptual principles, synergistic effect.

**Марія Григорак, Олег Гармаш, Наталія Трушкіна. «Концептуальні принципи формування стратегій декарбонізації ланцюгів поставок».** У статті розглядаються концептуальні основи формування стратегій декарбонізації ланцюгів поставок, визначення стратегічних рішень щодо скорочення викидів парникових газів, управління зеленими ланцюгами з точки зору еколого-економічної ефективності.

Побудовано структурно-логічну схему формування стратегії декарбонізації ланцюгів поставок. Визначено сім ключових бізнес-процесів у ланцюгах/мережах постачання, які суттєво впливають на обсяги викидів парникових газів: екологічне проектування, екологічні закупівлі, енергетика ресурсозберігаюче виробництво, екологічне транспортування, екологічне зберігання, розумне еко-споживання, переробка та утилізація.

Встановлено, що в замкнених ланцюгах управлінські екологічні рішення повинні бути спрямовані на: збереження або відновлення продукції для продовження її життєвого циклу, що включає діагностику та ремонт; повторне використання продукції для тих самих або нових цілей у первісному вигляді або з деякими змінами; відновлювальний ремонт виробів або окремих вузлів; переробка відходів і відпрацьованих продуктів, або рециклінг (будь-які операції відновлення, за допомогою яких відходи і старі продукти переробляються в матеріали, ресурси, речовини для виробництва іншої продукції або для інших цілей).

**Ключові слова:** національна економіка, охорона навколишнього середовища, викиди парникових газів, кліматична нейтральність, декарбонізація, вуглецевий слід, ланцюг поставок, зелені ланцюги поставок, зелене управління ланцюгами поставок, зворотна логістика, екологічні принципи, циркулярні бізнес-моделі, сталий розвиток, зелені інвестиції, зелені технології, стратегія, стратегічний менеджмент, системний підхід, концептуальні принципи, синергетичний ефект.

**Introduction.** The post-war recovery of the Ukrainian economy should and will take place with the support of international financial institutions and funds, as well as taking into account the goals and principles of sustainable economic development declared by the UN, the Organization for Economic Cooperation and Development and other institutions.

The central idea of the transformation of the national economy should be climate modernization, which can contribute to the attraction of significant public and private financial resources and the practical implementation of the "green transition" processes to reduce greenhouse gas emissions and the carbon footprint, as well as the dependence of business entities on fossil

fuels and the transition to alternative sources of energy.

The problem of reducing greenhouse gas (GHG) emissions, which are the key factors of global warming, is the main concern for government bodies and the industrial sector after the signing of the Kyoto Protocol as an additional document to the United Nations Framework Convention on Climate Change, signed in 1992 at the International Conference in Rio de Janeiro – Janeiro The Kyoto Protocol was adopted on December 11, 1997, and its effect began on February 16, 2005. This protocol provides for the implementation of flexible mechanisms for reducing greenhouse gas emissions by purchasing relevant certificates abroad: the Clean Development Mechanism (CDM);

International Emission Trading (IET); Joint Implementation (JI).

According to the Global Carbon Budget, the increase in emissions in 2022 has accelerated the ongoing increase in the concentration of greenhouse gases in the atmosphere, which will continue as long as carbon dioxide emissions continue [1]. Today, most companies focus on reducing direct emissions related to operational activities or their use of electricity, heat and steam. Indirect emissions are associated with the movement of goods between links in supply chains from the extraction of raw materials to the end consumer and are generally difficult to measure and influence to reduce. In most sectors of the economy, these emissions account for more than 80% of greenhouse gas emissions and more than 90% of the impact on air, land, water, and biodiversity [2].

Measuring emissions in supply chains is an important step in reducing pollution and helping to protect the environment. Emissions produced during the production of goods and services directly affect the environment and the health of people living in that area. Therefore, measuring emissions in supply chains can help identify sources of emissions and take appropriate measures to reduce them. Measuring emissions in supply chains also helps ensure that businesses comply with environmental regulations, take responsibility for their environmental impact, and take steps to reduce their emissions at strategic and tactical levels.

Thus, the development of a strategy for the decarbonization of supply chains is relevant for any type of economic activity and requires scientifically based solutions for measuring and managing these emissions. Emissions in supply chains are an important component of strategic risk management and a valuable tool for proactively resolving conflict situations in value chains of goods or services.

The implementation of low-carbon business models can catalyse the development of innovative approaches to the

optimization of logistics networks, the location of production sites, distribution centres, eco-design of goods and their storage, as well as the attraction of investments in environmental projects.

Modern information and communication technologies make it possible to identify areas where business goals and environmental goals overlap, to effectively use existing digital infrastructure to track production and transportation activities in near real time, to interact with suppliers and evaluate their progress in achieving emission reduction goals. However, online exchange platforms do not address the challenges of optimizing supply chains/networks in terms of matching chain performance and emission intensity, as well as carbon footprint measurement.

#### **Literature and researches review.**

Environmental aspects of supply chain management are the object of research by many scientists from different countries. In scientific works [3-7], the evolution of the formation of the concept of "green supply chain management" (GSCM), which appeared in the early 1990s as a response to growing environmental problems, was investigated. It has been proven that ecological chains strive to create a positive impact on the environment by promoting the safe and responsible reuse, recycling and disposal of materials.

The authors A. Diabat & D. Simchi-Levi [8], S. Elhedhli & R. Merrick [9] argue that sustainable or "green" supply chains seek to create a positive impact on the environment by promoting the safe and responsible reuse, recycling and disposal of materials.

An analysis of recent publications in this area shows an expanded treatment of GSCM including green design, green operations, green manufacturing, reverse logistics and waste management [7; 10; 11]. F. Bowen et al. [12] define GSCM as "the integration of a company's environmental procurement plan into SCM to improve supplier and customer environmental performance".

The scope of the GSCM concept in the literature varies from the selection and supply of materials, manufacturing processes, product design, delivery of the final product to end users, and management of product output after its useful life [6; 13]. Green manufacturing minimizes waste and pollution during production activities. However, as noted by scientists [14-16], the relationship between environmental and economic indicators is often contradictory. In many cases, businesses often want to maximize profits and minimize carbon emissions.

However, maximizing profits by expanding supply chain activities often leads to increased carbon emissions. It is often difficult for businesses to understand the direct link between the implementation of green supply chain management and subsequent performance improvements in operational, economic or environmental areas. To date, a number of literature reviews emphasize the need to take into account greenhouse gas emissions in the design and planning of green supply chains [17].

A. Corominas [18] suggests that the expression "Supply Chain" could be replaced by a more appropriate expression, such as "Supply Network". This new supply network philosophy, also called Green Supply Network (GSN), is a new trend that forces companies to produce and grow while respecting the environment and developing a more sustainable supply network.

The Green Supply Network concept, which includes an environmental factor in the design of the supply network, has also attracted the attention of researchers in recent years [19-31]. N. Matinrada et al. [32] argue that when different companies work together to maintain customer satisfaction, the result is a "supply chain network" (SCN). One of the main objectives of both GSCM and GSN is to assess the environmental impact of different production and/or distribution approaches to reduce GHG emissions from logistics activities [33].

As the analysis shows, there have been many publications related to studies of greenhouse gas emission volumes in supply chains/networks, justification of strategic, tactical and operational decisions concerning various participants and stakeholders. F. Montabon et al. [34] consider a key aspect of carbon reduction strategies to be their effectiveness in providing the desired long-term impact.

M. Damert et al. [35] define a corporate carbon strategy as "a complex set of actions to reduce the impact of a firm's business activities on climate change and gain competitive advantages over time" and recommend basing a corporate carbon strategy on three goals: 1) carbon management; 2) carbon reduction; 3) carbon competitiveness.

S. Yunus et al. [36] suggest developing a "carbon management strategy" and include carbon measurement, emissions reduction reporting, trading, risks, carbon reduction opportunities, and carbon market analysis. However, when a company seeks to develop a "carbon management strategy", the main bottlenecks are short-term thinking, especially when it is focused on profit maximization [37]. This approach is usually at odds with a long-term strategy that includes carbon reduction. A. Jerbi et al. [38] consider one of the main concepts for increasing the sustainability of supply chains to be cooperation between stakeholders by improving the efficiency of their shared resources. All these scientific works prove the need to develop decarbonization strategies [39-42] using green technologies and the green investment mechanism [43-47].

In the scientific literature, two methodological approaches to the measurement of emissions in supply chains are distinguished. The first approach is based on the life cycle of a product or service (product lifecycle), where the goal is to determine the carbon/ecological footprint of a specific product or service. It is the assessment (analysis) of the life cycle (life

cycle assessment, LCA) that is a tool for the implementation of the philosophy of systems thinking, which takes into account all stages of the "life" of a product (service, organization) from the birth of an idea (design) to the decision to dispose of waste and reuse it – Life cycle thinking (LCT).

The LCA methodology is described in the series of documents ISO 140405 and ISO 140446, which contain principles, areas of use and procedures (International Organization for Standardization, 2006). Other ISO standards of the 14040 series complement the general guidelines such as ISO 140467 for water footprint, and more environmental management standards are linked to ISO 14040-44 like ISO 140068 (eco-design), ISO 140259 (environmental labelling), ISO 1406410 (carbon footprint of organizations), ISO 1406711 (carbon footprint of products), ISO 1407212 (organizational LCA).

The LCA method is also used to evaluate possible investment alternatives related to environmental impact in cases related to the selection of raw materials, suppliers, and production processes [48]. Many publications use LCA to assess and quantify the environmental impact of a supply chain [49; 50 et al.], which consider the minimization of the environmental impact of supply chain design based on the LCA approach and traditional economic costs.

In 2013, the European Commission introduced the Environmental Product Footprint (EPF) in 2013 as part of the Green Single Market initiative. According to this document, the ecological footprint of a product is a multi-criteria indicator of the environmental characteristics of a product or service, which allows reducing the impact of products on the environment, taking into account their supply chain (from the extraction of raw materials, production and use to final waste management). The ECA method provides common rules for product groups so that companies can compare their product progress within a product category or sector. In turn, enterprises better evaluate

their environmental indicators, comparing them with the indicators of competitors (national and European). Benchmarking is also a powerful incentive to improve the reputation and create sustainable and environmentally friendly goods and services that are in demand in the everyday lives of consumers.

On the other hand, the organizational approach emphasizes measuring the impact of GHG emissions at the organizational level. Companies building and optimizing their own supply chains seek not only to increase economic efficiency, but also to effectively use limited resources based on the principles of sustainable development and social responsibility. In order to ensure a truly efficient and environmentally sustainable production of products or services, companies need to carefully analyse and plan their activities at the conceptual stage. Supply chains are the basis of sustainable development not only in the forward movement of flow processes, but also in the reverse, which is a reflection of the concept of circular economy [51-52].

From the point of view of accounting for carbon emissions in the supply chain of the focal company, it is important to consider the path from suppliers of raw materials through a certain number of intermediate productions to the producer of the final product (input material flows), from it through a set of distribution and trading intermediaries to consumers of final products (output goods flows), as well as in the reverse direction from the final consumer to the manufacturer or waste recycling and disposal centres (reversed or reversible flows) [53-58].

Traditionally, organizations manage suppliers to optimize the supply chain, monitor the flow of information, materials, and funds, manage logistics processes, minimize cycle times and costs, and integrate processes and functions along the supply chain. Manufacturers are increasingly demanding information from suppliers about the materials used in production and the



systems they use to track and manage their environmental impact. As suppliers receive these requests, they also send them along the entire supply chain. Therefore, an understanding of environmental impacts through the supply chain can extend to other parts of the organization, contributing to a more integrated and versatile approach to product life cycle management. Such a comprehensive approach can also be used to compare improvements in production system chains, as well as to share useful information about the quality properties of products.

Therefore, when planning supply chains/networks, the environmental friendliness of all its links and their interactions becomes more and more important. A socially responsible supply chain focal company should develop a proactive strategy to reduce greenhouse gas emissions and incorporate it into all business operations based on life cycle thinking and collaboration with value chain partners.

At the same time, it is important to clearly formulate bold ambitions and strategic goals, to develop specific measures to achieve them and a management and monitoring system. This leads to the emergence of a coordinated set of modifications or new solutions to products, services, processes, approaches and structures that contribute to increasing the efficiency and competitiveness of both the focal company and all participants.

**Aim and objectives.** *The purpose of this article* is to study the conceptual foundations of the formation of a strategy for the decarbonization of supply chains, the identification of strategic solutions for reducing greenhouse gas emissions and the management of green chains from the point of view of ecological and economic efficiency.

The methodological basis of the research is the provisions of theories of sustainable development, concepts of green and circular economy, environmental management, supply chain management, environmental economics.

The study of modern processes of forming the strategy of decarbonization of supply chains is based on the use of methods: economic-statistical analysis, balance sheet, modelling, analogies and synthesis, system approach, comparisons and observations, classification, structural-logical generalization, etc..

### **Results, analysis and discussion.**

Organizations that seek to reduce greenhouse gas emissions or reach their "zero level" need to clearly present the goals, conceptual foundations and the entire process of forming a strategy for the decarbonization of supply chains (Fig. 1).

Let's consider in more detail the main stages of strategic planning for reducing greenhouse gas emissions in supply chains.

1) Building a business model of the supply chain/network in accordance with the principles of sustainable development and creating conditions for safe and reliable production activities allows organizations to be efficient today without compromising future development. Companies aiming to reduce emissions in their supply chains/networks in the long term must create new innovative business models to identify priorities, opportunities and risks to reduce their harmful impact on the environment. An innovative supply chain/network business model should answer the following key questions:

A) who are the target customers and what target segments will be covered by the supply chain/network business model? Do customers have a demand for sustainability and emissions reduction? Focus companies must respond to consumer demand for products with a lower carbon content, or try to change existing consumer demand for low-carbon alternatives and thereby stimulate consumer interest in reducing the amount of harmful emissions into the environment;

B) what does the focal company offer to customers, a definition of the company's offer and a description of how the company meets the needs of target customers? Are



environmental requirements taken into account when creating new company products? The main idea when creating a product should be to reduce greenhouse gas emissions during the life cycle, which is achieved by increasing the duration of use of the product, efficient use of raw materials and materials for the production of the product, and possibilities of secondary use after the end of the life cycle. Product characteristics

such as weight, size, type of packaging have a significant impact on the volume of emissions during logistics operations. Separate attention should be drawn to the formation of the "product-service" system, when goods are provided for use through rent, leasing, rental, which increases incentives for creating durable products, extending their life cycle and better use;

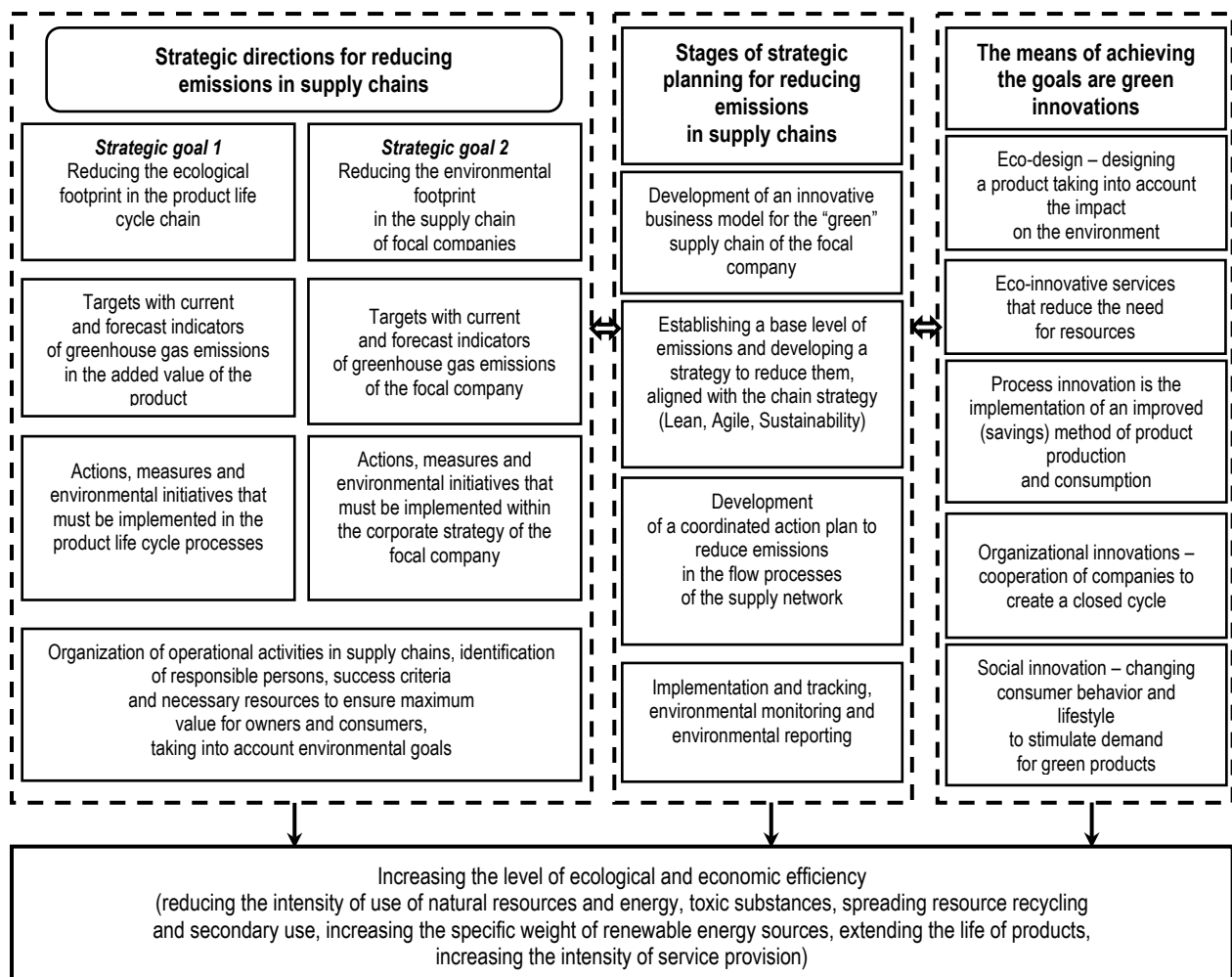


Figure 1. Structural and logical scheme of the formation of the strategy of decarbonization of supply chains

Source: author's development.

C) how is the value chain created, what processes and actions are combined with the appropriate resources and means? Are there opportunities to use more ecological types of raw materials, energy, materials? An

innovative business model requires an understanding of the environmental consequences of the production and use of a product, and concentration on the most significant of them. The expansion of

responsibility beyond production and the integrated product policy of the production system means that manufacturers must be responsible for the manufactured products from its "cradle to the grave" and therefore must develop products with improved characteristics at all stages of the life cycle;

D) why is the company profitable, what are the structure and mechanisms of profit generation? How does the environmental factor (taxes, fines, fees) affect the economic efficiency of the business? What are the possibilities for reducing economic losses, reducing ecological and economic losses and increasing incomes due to the secondary use of resources? In the conditions of a closed cycle economy, along with increasing resource productivity, companies must identify the reasons for inefficient use of available resources, compare the results of their activities with the volumes of emissions, waste and losses of heat, energy, and water; to provide recommendations on improving the management of material flows, replacing outdated technologies with more energy- and eco-efficient ones, redesigning products, etc.;

E) what are the economic relations with business partners and subcontractors? The focal company of the supply chain can be a) a full-cycle company, covering all or most of the work on the creation, organization of production, promotion and sale of products; b) a company that is engaged in product development, experimental production, possibly branding, and outsources other functions; c) a company that organizes production on the basis of other people's developments and possibly under other people's trademarks (contract production).

In the first case, the focal company can centrally manage its own supply chain. In other cases, managing supply chains is much more complex and requires building horizontal connections and partnerships with participants. But the opportunities to reduce the total volume of emissions are much greater, as synergy and cooperation allow

improving the overall result from the point of view of reducing the harmful impact on the environment.

Therefore, an innovative supply chain/network business model must take into account market fluctuations and dynamics, geographic boundaries, economic interests of consumers and business partners, etc.

2. After the formation of the business model of the green supply chain, it is important to consider the environmental factor in the construction of the strategy in order to reduce the economic losses and reduce the ecological and economic damage caused by the participants of the supply chain to the environment. First of all, the focal company needs to make sure that decarbonization is in line with its overall business strategy.

To respond to changes in the supply chain landscape, companies can use different supply chain design strategies, the most common being Lean Supply Chain and Agile Supply Chain. The goal of Lean Supply Chain is to increase customer value by reducing the cost of goods and reducing waste (waste is anything that is not of value to the customer). Transportation, inventory, handling, waiting, over-processing and over-production are parameters of waste because all these operations do not add value. As a consequence of reducing waste, lean manufacturing can help reduce pollution as it shortens cycle times and increases resource efficiency. This type of supply chain focuses on reliability and predictability, allowing emissions to be more accurately calculated, tied to costs, and mitigation measures specified.

Agile Supply Chain is a complex set of processes that enables businesses to respond quickly to changes in demand, customer and industry preferences, direct resources more efficiently, improve inventory management and increase productivity. Flexible supply chain processes allow companies to respond quickly without interruptions or delays. They can move to agile processes to adapt to new

trends and adjust their supply chains to suit their needs. Flexibility makes it easier for supply chain actors to make changes and better prepare for future market demand. This can allow companies to quickly respond to changes in customer demand in the production process, better control the production of goods and materials according to customer demand, and prioritize resources for large orders. Ideally, this avoids the waste that potential overproduction or underproduction can create. On the other hand, the flexibility/speed of supply chains can be accompanied by an increase in costs and emissions, as it requires a quick response to demand, urgent deliveries of goods in smaller batches. However, a manufacturing company's ability to track inventory and the status of materials and goods in real time helps identify bottlenecks and reduce costs by solving problems before they become serious.

Currently, in addition to traditional strategies focused on cost or customer service, there are hybrid models that change the priorities of the supply chain and can focus on resilience, agility, sustainability, etc., but all of them recognize the key role that supply chains will play in the transition to clean and socially just economy. The ability to quickly adapt to the ever-increasing pace of change is critical to the success of any business. That is why, the determination of strategic priorities in the development of supply chains/networks will play a decisive role in the selection of management tools and innovative solutions on the way to the low-carbon economy of the future.

The readiness of organizations to resort to effective strategies will depend on the nature of the business and how far the company has already progressed in implementing efforts to achieve "zero" emissions. The actions required to complete this phase can be grouped around three main strategic objectives: 1) defining a carbon baseline; 2) carbon reduction; 3) stimulation of carbon efficiency. The carbon baseline is

the starting point of the strategy, which includes setting the type of emissions, data baseline and limits. The second goal is covered by two actions, the first of which is to identify opportunities to reduce carbon dioxide, to determine what needs to be done. The second action is the setting of carbon targets, which defines the strategy over time and represents the scale of the challenge. The results of both activities should be considered as part of the strategic business plan, and both have a significant impact on the realization of the strategic priorities of the supply chain/network.

The third objective is to take advantage of the carbon strategy that has already been created in the past, analyse its impact on the company's financial indicators (gross sales volume, cost of goods sold, expenses and gross profit, etc.) and determine the prospects for innovation in the future. The typology of eco-innovations (green innovations) involves the introduction of any new or significantly improved products (goods or services), processes, organizational changes or marketing solutions that reduce the use of natural resources (including materials, energy, water and land), lead to a coordinated set of modifications or new solutions to products, services, processes, approaches and structures, contribute to increasing the productivity of supply chains and the competitiveness of the focal company and its partners.

An extremely important stage of planning and implementation of a strategy for reducing emissions in supply chains/networks is tracking, control and monitoring, which should be aimed at compliance with pre-selected indicators (parameters) of the volume and intensity of emissions into the environment by each participant in the supply chain/network, and in as a whole organizational entity. The use of monitoring results occurs primarily in the field of justifying a wide range of management decisions related to the regulation of emissions or their deviations from the

planned ones, which allows assessing compliance with the set goals and defined priorities.

It is worth noting that one of the most important steps in a carbon strategy for a supply chain/network is recognized as identifying potential improvements that will help achieve carbon reduction targets. In Fig. 2 summarizes "green" initiatives to reduce carbon emissions. Seven key business processes in supply chains/networks have

been identified that significantly affect the volume of greenhouse gas emissions. In accordance with each business process, a set of possible management solutions is proposed, which will help to increase the level of environmental efficiency, preserve natural resources, and save energy.

Let's consider these business processes in more detail.

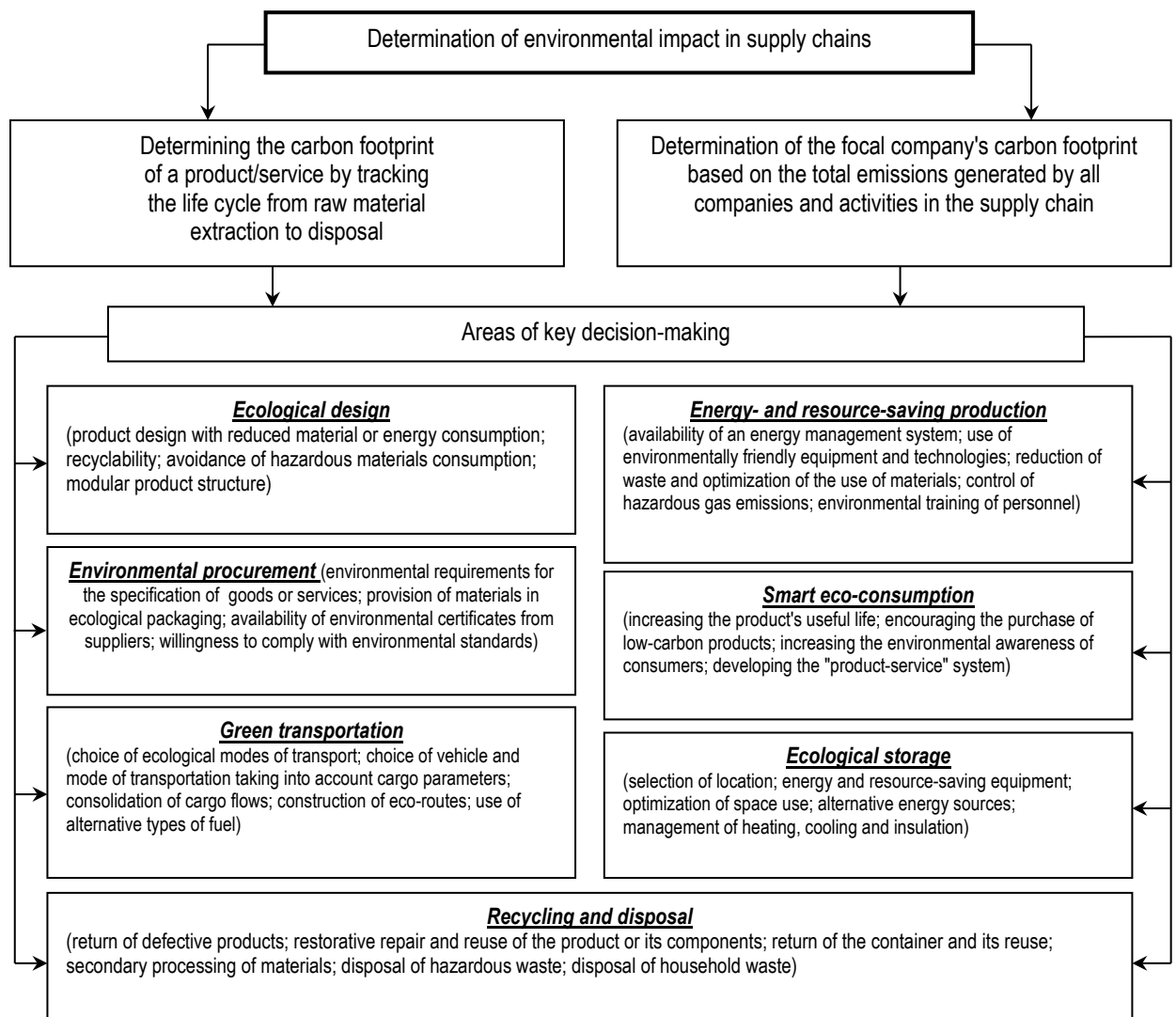


Figure 2. Key business processes in the system of green management of supply chains

Source: author's development.

#### 1) Ecological design (eco-design).

According to the stages of the product life cycle, eco-design means designing a product to minimize environmental impact, taking into account every phase of its life

cycle, starting from the supply of raw materials and ending with logistics, up to the end of its useful life. The European Union's Eco-design Directive 2009/125/EC obliges manufacturers to reduce energy

consumption during the lifetime of their products and reduce negative impacts on the environment. From the point of view of the circular economy, eco-design must be rethought as a process of creating a product to meet the needs of consumers in such a way as not to create waste, pollution (for example, with plastic) or other negative consequences for the environment, to provide for the possibility of reuse and repair. At the same time, the modular design facilitates the replacement of only part of the product, simplifies its disassembly, reduces the cost and effort required to replace components in case of damage. In addition, modular systems are easier to configure and therefore adapt to the changing and constant needs of users, preventing product obsolescence and guaranteeing its long-term use

#### 2) Environmental procurement.

From the point of view of the concept of supply chains, any linear relationship between two enterprises can be considered as a seller-buyer relationship, that is, in terms of the purchase of raw materials, materials, equipment, semifinished products, works and services. Green procurement means the purchase of necessary goods or services with improved environmental characteristics and taking into account the full cost of their life cycle to meet the needs of consumers. When choosing suppliers, it is worth expanding the list of criteria for their evaluation, in particular, take into account the type of energy used, the presence of CO<sub>2</sub> emissions efficiency certificates, the environmental friendliness of the packaging, the location in terms of transportation distance, the priorities of the supplier's corporate strategy in terms of reducing the carbon footprint, and its willingness to comply with environmental standards, etc.

#### 3) Energy- and resource-saving production.

The implementation of the environmental management system and resource-saving production in production involves, first of all, the restructuring of the

enterprise's management culture, the system of relations between divisions, and the value orientation of workers. The main goal of this management model is to create value for the client by optimizing the company's resources.

The concept of lean production (lean production, lean manufacturing) is based on an unwavering desire to reduce the consumption of energy, material and labor resources, as well as the elimination of all types of losses. The center of attention of lean production is the value of products for the consumer, so every decision that does not provide value for the consumer acquires the status of a loss. The implementation of "lean production" ideally allows you to solve a number of problems that most businesses face on a daily basis: achieve high quality at minimum costs, reduce downtime, the amount of defects and waste, shorten the time of product creation, abandon outdated technologies and harmful materials, avoid overproduction, regulate the supply and, most importantly now, ensure the development of the company, even during economic crises. The implementation of the principles of "lean production" changes the approach to work and the consciousness of every employee, from the general director to the worker in the workshop. An important aspect of the value system built on the principles of "thrifty production" is the attitude to the use of energy resources and the impact on the environment. The introduction of low-carbon technologies for the production and storage of products allows to reduce both the need for energy and the volume of carbon emissions.

#### 4) Green transportation.

Transport is one of the main sources of environmental pollution. When 1 ton of fuel is burned, 200 kg of carbon monoxide is released into the atmosphere. Motor vehicles account for about 55% of total harmful inputs, which include more than 200 different compounds. Each mode of transport has different characteristics and limitations that reflect advantages and disadvantages



according to the specific situation in supply chains. The transportation mode decision includes variables related to needs (timely deliveries, type of materials to be transported, distance, etc.) and capabilities (availability of transportation, costs and conditions of access to resources, available routes, etc.). From the point of view of reducing the harmful impact on the environment, the most environmentally friendly are railway and water modes of transport. However, they are used for long-distance transportation and heavy and bulky cargo. For short distances, road transport is the most common, accounting for more than half of domestic transport and a significant share of international transport.

The European Green Course and the European freight transport policy are oriented towards the final consumer and are built on the principles of improving the design of vehicles in terms of reducing fuel consumption and emissions, using alternative fuels, co-modality, using intelligent transport systems and "green corridors". Co-modality was introduced in the EU White Paper on transport (European Commission 2001 transport White Paper) and requires increasing the efficiency, compatibility and interconnection of various types of transport (rail, water, air, road), as well as related nodes between them. Intelligent transport systems are designed to improve the management of transport and cargo, as well as to increase the efficiency of the use of existing infrastructure. And "green transport corridors" take into account the ecological component in logistics and are used for safety in the design and operation of the infrastructure of the trans-European transport network.

In order to optimize logistics processes and reduce traffic in supply chains, centres of consolidation of cargo flows are actively being implemented, between which transportation is carried out in large batches by boat modes of transport. Modern software for transport and logistics activities helps to plan optimal routes and balance the use of

consolidation centres and direct shipments from the point of view of reducing traffic and passed retirement.

Therefore, from the point of view of reducing carbon emissions, the main solutions for movement of material flow in supply chains/networks should include optimization of routing using modern digital technologies, electrification of transport and transition to ecological energy sources, better grouping/consolidation of cargo and emphasis on rail and sea transportation.

#### 5) Ecological storage.

Warehousing and distribution are a major part of supply chains. Warehouses play an extremely important role in supply chains/networks as they consolidate significant volumes of material flows. In supply chains, warehouses pollute the environment mainly through heating, cooling and lighting. As a rule, the bigger the composition, the bigger the carbon footprint.

In recent years, the concept of "green warehouses", which considers the ecological footprint throughout the entire life cycle of the premises, has become increasingly widespread. Modern warehouses are designed according to the principles of green construction, which means that they are aimed at preserving the ecosystem and the environment, as well as bringing benefits to people and society. "Green" buildings are characterized by high-quality ecological design and high efficiency in the use of resources, namely energy, water and materials. The right location of the warehouse also plays an important role, as it can reduce the need for energy. Natural lighting can provide light during the day, and the use of solar panels can offset daily energy and reduce operating costs. Additional green products include skylights that let in natural light, ceiling fans for warehouse temperature control, energy-saving lights and fixtures, green building materials and building insulation.

Below are some of the best opportunities for eco-smart warehouses: the transition to



renewable energy sources (solar panels, windmills, etc.); minimization of energy needs due to energy-efficient lighting and insulation of premises; waste reduction, complete recycling of packaging, use of environmentally friendly packaging; rejection of paper media; optimization of the use of warehouse equipment and warehouse space; implementation of warehouse management systems (WMS) that coordinate the processes of storage and transportation of goods; automation and robotization of warehouse processes; bar coding and radio frequency identification (RFID), which improves the visibility of goods in supply chains, etc.

Today, the warehousing industry continues to evolve, finding new ways to improve operations and reduce environmental impact.

#### 6) Smart eco-consumption.

The concept of green supply chains is focused on cost reduction and involves a sustainable approach to the consumption of goods or services. That is why the involvement of consumers is an important lever for reducing emissions. They can be engaged either directly through training, collaboration or reward, or indirectly through company regulation or motivation through marketing and choice architecture. In addition, focal companies can use reactive strategies that only respond to consumer demand for lower-carbon products, or a proactive strategy to try to change existing consumer demand for low-carbon alternatives. Given the fact that the consumer often needs the product for a short time, it is advisable to encourage collective ownership of the product on the basis of renting, leasing, sharing or subscription. Thus, in the leading countries, "product-service" systems, which provide services, as well as products for joint ownership and joint consumption (collaborative consumption, sharing), are becoming more and more widespread. Shared consumption is based on the idea that it is more convenient to pay for temporary access to a product than to own that product.

There are different models of shared consumption: trading platforms, online shopping platforms, conference communication systems, systems for travel sharing, sharing things, food sharing and car sharing, etc. In particular, in numerous carsharing and carpooling projects, direct economic relationships arise between owners/carriers and renters/passengers of motor vehicles for personal (travel) or commercial (transportation of goods) use of cars. These relationships make it possible to achieve a significant economic effect: downtime is reduced and the overall utility of the car service is increased. As a result, the optimization of the use of technical means of transportation and the "collectivization" of mobility are developing. The practice of shared consumption in many cases turns out to be a more effective form of economic organization than individual ownership and use of things. These measures are an important component in reducing emissions, complementing technological changes and enabling the achievement of overall emission reduction targets more cost-effectively.

#### 7) Recycling and disposal

The last business process is related to the end of the product life cycle. In our opinion, the main goal of managing this stage is to reduce the irrational consumption of resources, to process goods that are no longer suitable for their intended use into other types of resources, as well as to dispose of waste while minimizing the harmful impact on the environment.

An advanced system of reverse logistics will eventually replace the linearity of most production methods – raw materials, processing, further transformations and modifications, to the final product, use, disposal – with a cradle-to-cradle, circular path or closed loop that begins with the return of used, obsolete, that out of fashion and otherwise "consumed" products. The product is either recycled and placed back into the production stream or broken down into compostable materials. The cycle never

ends because the materials return to the earth in safe molecular structures (accepted and used by organisms as biological nutrients) or are continuously used in the economy as inputs for new products (technical nutrients).

**Conclusions.** Based on the above, we can come to the following conclusion. Strategic and tactical solutions for managing key business processes in supply chains should be aimed at:

- increasing energy efficiency. Companies should strive to reduce emissions by improving the energy efficiency of their operations and using more efficient equipment, reducing the amount of energy consumed during transportation and reducing the number of trips and miles travelled by freight;

- use of renewable energy sources. Companies should consider using renewable energy sources, such as wind and solar power, to reduce the amount of greenhouse gas emissions associated with energy consumption;

- optimization of delivery and logistics. Companies should strive to optimize their delivery and logistics operations to reduce transport-related emissions. This includes reducing the number of trucks on the road and optimizing routes to reduce the number of miles driven;

- use of environmentally friendly materials. Companies must source and use sustainable materials in their supply chain operations. This may include using recycled or biodegradable materials, which reduces the amount of energy and resources used in the supply chain;

- attraction of investments in compensation of carbon emissions.

Companies should consider investing in carbon offset programs to reduce supply chain emissions. Carbon offsetting involves the purchase of carbon credits to offset emissions from production and transportation.

Therefore, the result of the implementation of the strategy should be an increase in the environmental efficiency of supply chains/networks, which is proposed to mean the delivery of the consumer value of the product/service to the consumer at a competitive price, while consistently reducing the environmental impact and material intensity throughout the entire life cycle. The UN World Council of Business Circles for Sustainable Development has identified seven areas of business action to improve eco-efficiency: reducing the intensity of material use, energy intensity, and the spread of toxic substances; utilization/recycling of resources; maximizing the use of renewable energy sources; extension of the period of use of products; increasing the intensity of service provision. At the level of individual enterprises – participants in supply chains – the main idea should be to reduce added value, save intermediate costs through the elimination/reduction of waste in the production chain due to the maximum possible reuse of materials and dependence on resources.

Prospects for further research consist in determining the essence of methodical approaches to measuring the volume of greenhouse gas emissions and substantiating the conceptual provisions for the development of decarbonization strategies in the context of the European Green Course.

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