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Integration of Standardized Warehouse Logistics in Ukraine Under Conditions of Structural and Cognitive Development

This paper examines the key features of standardized warehouse logistics and its implementation within the contemporary Ukrainian market, as well as the complex realities of logistics processes amidst global changes. Modern warehouse logistics, which previously relied on traditional management and communication methods, is now significantly influenced by cutting-edge technologies. Artificial intelligence, e-commerce, big data, automation, the Internet of Things (IoT), and blockchain are all rapidly being integrated into warehouse logistics operations and logistics systems, substantially improving their efficiency and adaptability to changing market conditions. The digitalization of logistics processes within the warehouse presents a challenge to the functioning of an organization's structural model.

The adoption of new technologies necessitates changes in management approaches and employee interactions, as well as demanding the development of new skills and competencies among staff. The construction of a comprehensive system for warehouse and logistics market provision drives changes in knowledge management, decision-making, and relationships among all organizational levels. Therefore, the aim of this work is to determine the main features of the modern system of standardized warehouse and logistics market provision under conditions of globalization, taking into account transformational changes and the circumstances of the state of martial law in the country.

warehouse logistics, logistics process, logistics system, warehouse logistics market, standardization of warehouse logistics, organizational structure, transformational changes, innovation, digitalization, digital technologies, logistics enterprises, business entities, innovative activity, digital logistics, globalization, intermodal transportation

Problem statement. The war in Ukraine has significantly altered the functioning of logistics processes in the country. Destroyed infrastructure, blocked ports, and constant security threats have become the new realities for businesses. From the first days of the full-scale invasion, it became clear that conventional logistics routes were no longer operational. During the first year of the war, approximately 30% of logistics and freight forwarding companies ceased their activities due to ruined infrastructure, fuel shortages, and risks to cargo. Logistics has always been a key component of the economy, and its importance has only increased during the war. The efficiency of goods delivery directly affects the operation of enterprises, the preservation of jobs, and the inflow of foreign currency earnings into Ukraine.

In the current challenging environment, marked by the instability of processes due to Russia's war in Ukraine, it is necessary to establish and streamline warehouse logistics processes. Most large companies and enterprises did not foresee the closure of borders and factories, which, in turn, led to delays in the supply of materials and raw resources. Therefore, in contemporary conditions, increasing the efficiency of warehouse logistics at the micro-, meso-, and macro-levels becomes a critical priority.

Analysis of key research and publications. Warehouse logistics is a concept firmly established in the business environment; consequently, it is unsurprising that a significant body of work is dedicated to this topic. This research spans the study of the concept itself, its practical applications, and its impact on other areas, such as cost optimization.

Specifically, researchers such as V.V. Volobuiev, I.B. Haliuk, Yu.I. Danko, O.H. Deineka, I.V. Konovalova, V.M. Kolosok, E.V. Krykavskiy, L.O. Kustrich, I.S. Lutsenko, N.O. Makarenko, N.I. Mykhailiyk, Yu.V. Ponomarova, O.M. Sumets, A.A. Cherevan, V.V. Shcherbyna, and others have studied issues in logistics. At the same time, a need exists for the implementation of standardized warehouse logistics and its application under conditions of martial law. This necessity is typically driven by new strategic objectives for warehouses, the requirement to implement modern technologies, changes in the external environment, and the imperative to operate effectively amidst intense competition. Based on this, we consider the issue of developing standardized warehouse logistics under conditions of martial law to be both topical and practically significant.

Formulation of the task. The objective of this article is to define the specific characteristics of establishing standardized warehouse logistics under conditions of martial law within the country, taking into account the ongoing transformational changes.

Presentation of the main material. Historically, Ukraine has possessed significant potential as a transit country due to its geographical location. Restoring this status will be a critical task in the post-war period. In this context, the development of warehousing technologies will play a decisive role. Modern warehouse management systems, digital solutions for cargo tracking, and the automation of logistics processes will enhance the efficiency and transparency of the industry.

As global statistics show, container trade is gradually growing every year (Fig. 1), and Ukrainian logistics as a whole has adapted to the new realities and is functioning successfully under military rule. This business sector is actively rebuilding, integrating its operations with continental and worldwide transit frameworks.

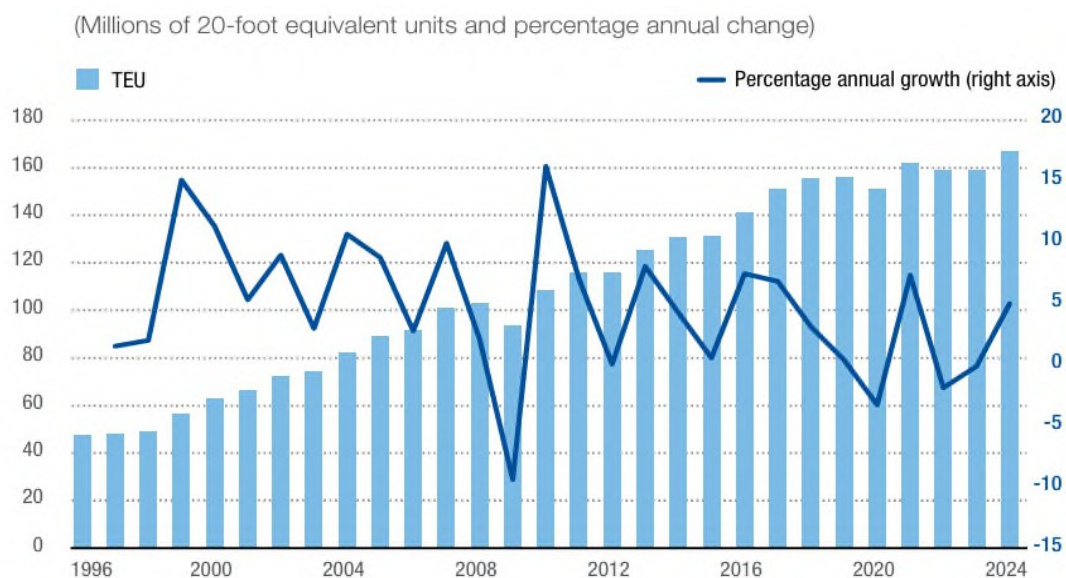


Figure 1 - Global container trade 1996-2024. [11]

According to Clarksons Research (2024a) predictions, container transport growth in tons will be 3% and 5% in 2025 and 2026, respectively. Therefore, despite the destabilizing impact of military operations, the market for standardized logistics services in Ukraine is characterized by relative resilience and gradual recovery. During the past several years, a positive trend contributing to the expansion of freight transport volumes, distinctly in the rail

and road transport segments, demonstrating the resilience and adjustment of supply chain networks amidst severe instability. This, in turn, necessitates the development of a warehouse logistics market in Ukraine.

Thus, the effect of establishing warehouse logistics is a measure that defines changes in production leading to reduced costs and increased resource utilization. Naturally, this benefit accrues to both producers and buyers. As a result of scale, revenue increases concurrently with a reduction in costs and an increase in production volume.

The effect of implementing warehouse logistics yields numerous advantages, among which the following can be noted:

- The aforementioned reduction in average total costs;
- Better access to sources of financing, such as loans;
- Greater opportunity to utilize new technologies and knowledge, associated with the acquisition of modern machinery and equipment primarily adapted for large-scale production volumes;
- The application of specialized management methods, adapted to production sectors where the enterprise achieves significant economies of scale;
- Employment of the labor force in a specific industry, thereby shaping the labor market in a particular region;
- A better division of labor;
- The ability to use more effective technologies (high-tech machinery involves high costs and is generally geared towards large-scale production);
- Specialized production and services (the more concentrated the market, the greater the specialization);
- Facilitated access to financial services (favoritism from creditors towards companies with larger assets);
- Extensive infrastructure (average costs in "dense markets").
- Greater external benefits from knowledge and reduced information asymmetry (a larger market generates more information);
- Better developed and complementary institutions, and lower costs;
- The transactional aspect, which consists of the legal protection of property rights.

For the purpose of developing warehouse logistics, we propose the enhancement of wholesale market operations – specifically, consolidation alongside logistics hubs situated within major regions. Manufacturers transport high-capacity goods toward these distribution nodes, from which distributors make purchases and subsequently allocate the inventory to regional retail networks.

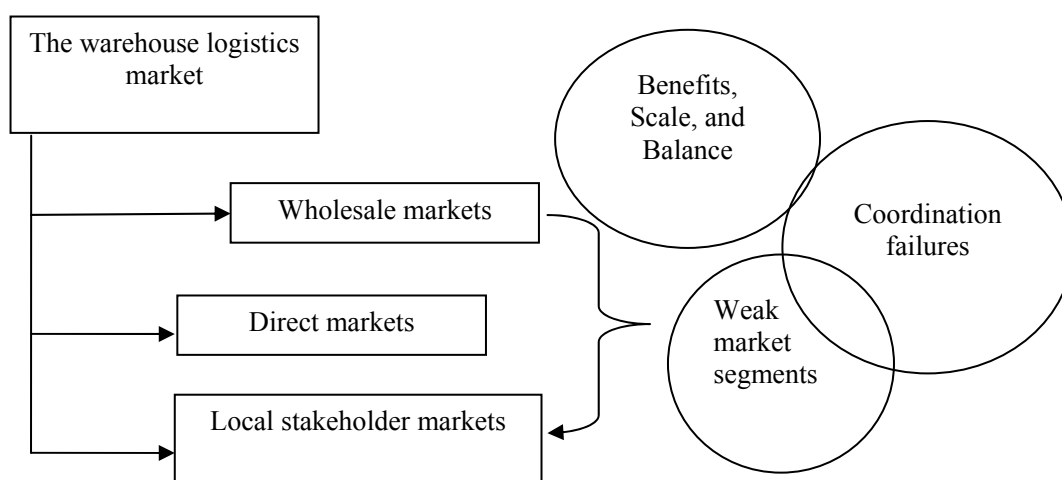


Figure 2 - The effect of establishing warehouse logistics * *Researched by the author

Buyers in warehouse logistics (terminal markets) include purchasers for retail chains or large-scale wholesalers. While specific operational needs can differ marginally, these entities seek certain fundamental attributes from their vendors:

- Substantial product quantities required from a single supplier, that alleviating the need to circumvent numerous small purchases.
- Additionally, reliable procurement stream that endures for an extended timeframe, ensuring to eliminate the necessity for constant sourcing of secondary suppliers.
- High-quality goods available for purchase aligned with current prevailing commercial rates. Such logistics hubs may additionally require diverse retail and bulk packaging options to meet diverse retailer needs.

Advantages of warehouse logistics:

- Contemporary commercial data remains typically accessible within the warehouse.
- Producers have the opportunity to connect with many potential buyers.
- Producers can sell large quantities of goods relatively expeditiously.

Frequent drawbacks linked with warehouse logistics include:

- Consumers typically approve only products of continuously maintained high quality.
- Purchasers often impose rigorous encasement specifications.
- Valuations reflect prevailing consumer rates are based on current retail market prices and might therefore vary significantly over time.
- Manufacturers bear the obligation of arranging transportation to the warehouse for their products.
- Producers must deliver products to the warehouse in relatively large quantities (i.e., truckloads).

Summarizing the above, we deem it necessary to direct efforts towards the development and implementation of a unified logistics market within a single regional center by establishing common standards and unifying them with international norms.

As an alternative to conventional warehouse buildings, some experts envision rapidly deployable structures, which can be useful when it is necessary to: deploy a warehouse, establish a production unit, rapidly expand premises, or relocate inventory. They do not require permits, assembly/disassembly takes more days, and installation is possible on any type of surface: solid ground, concrete, crushed stone, slabs, or asphalt. Furthermore, scaling the structure is possible, as it is a modular system where every construction element is certified according to EU standards.

These solutions are not new; similar projects have been implemented in Europe and Ukraine. However, they are particularly relevant now, given the extent of the damage sustained by warehousing and logistics infrastructure in Ukraine: 364,000 sq. m in the Kyiv region alone (according to CBRE Ukraine). Nearly 21% of the total volume of warehouse space in the Kyiv region has been completely or partially destroyed. Among these were facilities leased by retailers, logistics operators, manufacturing companies, and cold and pharmaceutical storage operators. The total area of warehouses that suffered partial destruction amounts to 164,000 sq. m [6].

The standardization of logistics could commence with the logistics market of the Western region of Ukraine. Logistics standardization is crucial for adapting to the gradual shifts in transportation mode utilization, moving from sea or air freight to intermodal transport.

The advantages of intermodal freight transport include:

- The ability to select an optimal route in terms of cost and delivery duration by utilizing various combinations.

- The capability to deliver goods directly to the customer's door.
- The potential to reduce transportation time.

Intermodal freight transport is most frequently used for long distances, as it allows for reductions not only in the supply period but also in cost, which is critically important for any entrepreneur.

To maintain substantial financial expansion through unified logistics market, logistics enterprises must comprehend their present logistical status, pinpoint their pertinent delivery routes, alongside resolve these complications via joint endeavors. Such endeavors encompass involve establishing standartilized distributional practices in the region, which assists in minimizing distributional expenditures while decreasing conveyance durations across entities by updating and uniformizing their distributional infrastructure, gear, and procedural methods.

The standardization of warehouse logistics in the market pertains to collaborative efforts to simplify and unify logistics equipment, including physical structures (for instance, depots and fulfillment hubs), handling apparatuses (such as forklifts), along with implements (for example, parcels, receptacles, and skids), in addition to the digital programs designed to facilitate distributional data, assets, and cash movements via synchronization and collaboration between procurement network associates

In this regard, it is appropriate to consider the seven guiding principles for standardization developed by the Standardization Committee of the International Organization for Standardization (ISO):

1. The goal of uniformization is averting gratuitous disarray and intricacy via the streamlining of societal functions.
2. Uniformization relies upon the consensus-based endeavors from every financial and societal domain.
3. The establishing of norms is directed at protecting the interests of the majority.
4. The establishing of norms ought to focus on chosen operations to be maintained.
5. Uniformization of norms undergoes evaluation alongside revision as required.
6. Normalization must consider the inherent characteristics of the item undergoing standardization.
7. The establishing of norms necessitates rigorous deliberation regarding consumer requirements for the product [9].

Based on these guiding principles, the primary objectives of harmonization of distribution processes encompass product containment, freight movement, cargo handling operations, **inventory holding**, and information and communication technologies (ICT) (Fig. 3).

The main principles of logistics standardization are highlighted below:

1. The harmonization of packaging systems pertains to the unification of packaging specifications dimensions, constituent materials, mass parameters, durability characteristics, handling administration, in addition to disposal.
2. Freight transportation standardization mainly concerns focused on the dimensional specifications of shipping containers as well as the railways and vehicles capable of accommodating palletized shipments.
3. Storage standardization is designed to unify common warehousing infrastructure, mechanized storage systems, racking structures, supply chain centers, cargo terminals, along with protective equipment and operational procedures.
4. The standardization of cargo handling involves orientation towards dimensional parameters, load capability, technical nomenclature, specifications and safety protocols related to lifts, carts, conveyors, pallets, as well as robotic systems.

5. The harmonization of ICT seeks to standardize digital data exchange systems (DDE), barcodes, identifier devices, logistics management platforms (LMP), their system integrations, and associated digital applications

Consequently, the effectiveness of warehouse logistics standardization and its condition is ensured by adherence to the principles of systematicity, feedback, optimality, and flexibility, as well as regulatory and legal support [10]. Striving to unify the process of warehouse logistics standardization, we propose considering the possibility of implementing leading practices of foreign states, including the member states of the European Union. Furthermore, given that the principles and guidelines of ISO standardization as best practices are broadly recognized by the global community, it is proposed to harmonize and consider ISO standardization procedures as a strategic framework for the effective execution of warehouse distributions regularization in Ukraine. Conventional ISO standardization processes begin through the submission of a proposal regarding the domains requiring standardization by means of Innovative Project Plan for warehouse logistics standards. However, it is appropriate here to also consider the factor that the standardization of logistics systems may cause multiple obstacles arising from significant divergences in commercial practices, cultural norms, infrastructural capacity, and regulatory frameworks.

In general, we propose directing efforts towards the formulation and execution of internal as well as international standards concerning the supply chain of apparatus, instruments, containmant matherials, warehousing, freight movement, cargo handling/unloading, together with ICT (Information and Communication Technologies), aligned with internationally recognized logistics frameworks, including ISO norms. However, such standards necessitate thorough planning and systematic coordination within the entire "manufacturer-intermediary-consumer" chain. It is advisable to pay attention to the effectiveness of the planning and conceptualization system for warehouse logistics standardization, as well as to raise the level of awareness regarding logistics standardization within the international logistics community.

Overall, within the framework of warehouse logistics standardization, it is also important considering the system of planning, delivery, and control system that governs the movement of tangible products, promotional materials, and data from the manufacturer all the way to the end consumer. The goal is to adddress client needs in tandem with obtaining a satisfactory margin.

Warehouse logistics' support for an enterprise has always played an important role in business. Among retail and wholesale enterprises, this logistical support extends farther than stock control and distribution activities, aiming to ensure one of the crucial factors for business success – it is a location's proximity to markets or supply sources. Logistics' support for the warehouse concerns key issues as planned geographical positioning, primary resources supply, and service quality benchmarks. In recent years, shifts in the business environment have compelled enterprices to address key important points when forming a business strategy: regulation policies, country's modern state of transport system, resource constrains, as well as technological development.

Comprehensive warehouse-logistics support for the market is presented generally in the form of Fig. 3. According to Fig. 4, comprehensive warehouse-logistics support is characterized by complex directions, hypotheses, and the application of various artificial intelligence and logistics tools for their interaction, and has a practical focus on supporting the domestic producer. In this case, the main directions of work for comprehensive warehouse-logistics support should be:

Artificial intelligence and data analytics increase repeat sales. Attracting new customers is always more expensive than retaining old ones. Mailings (e.g., email campaigns) effectively return users to the site—they come back to purchase the product.

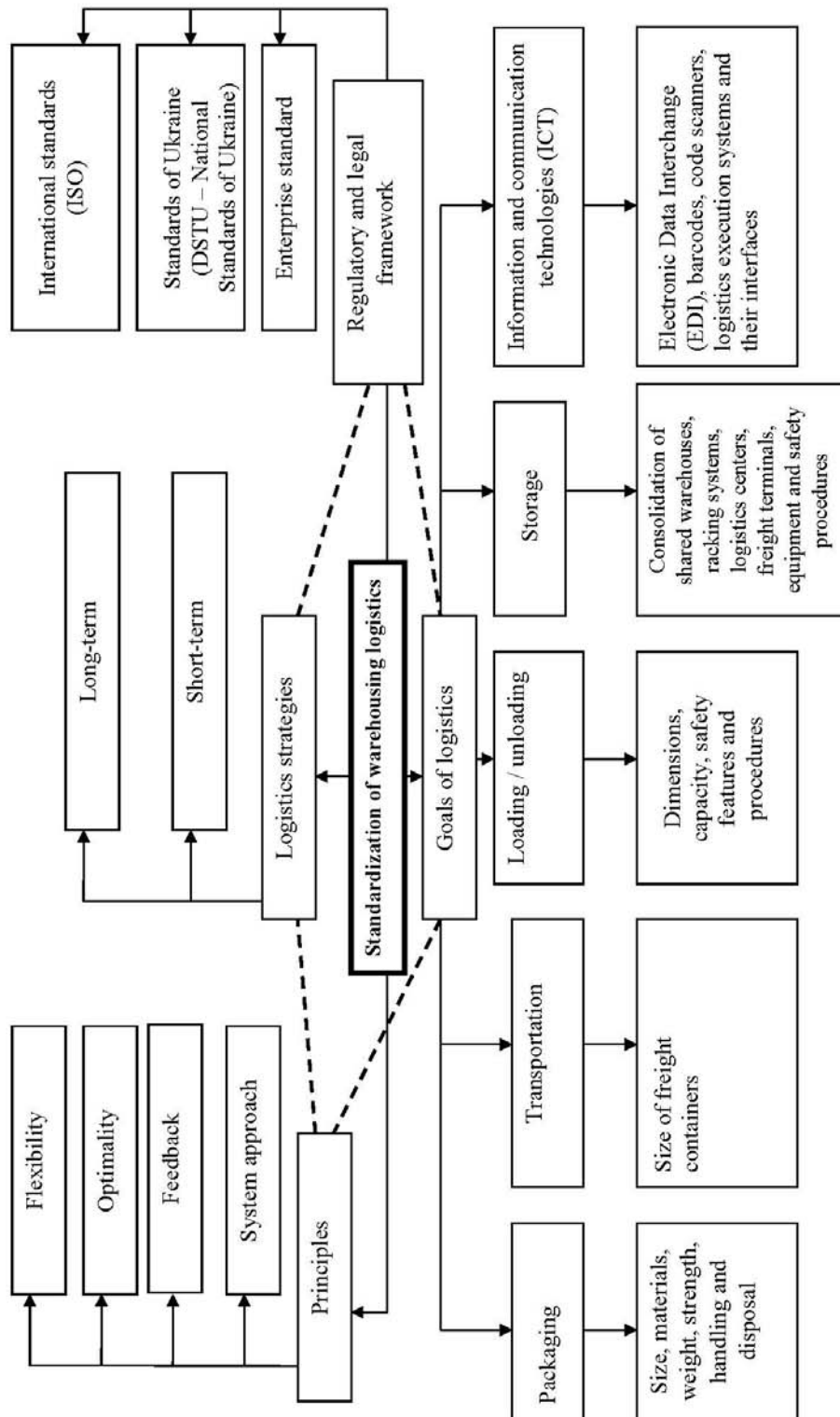


Figure 3 - The basic platform for building the standardization of warehouse logistics Systematized by the author

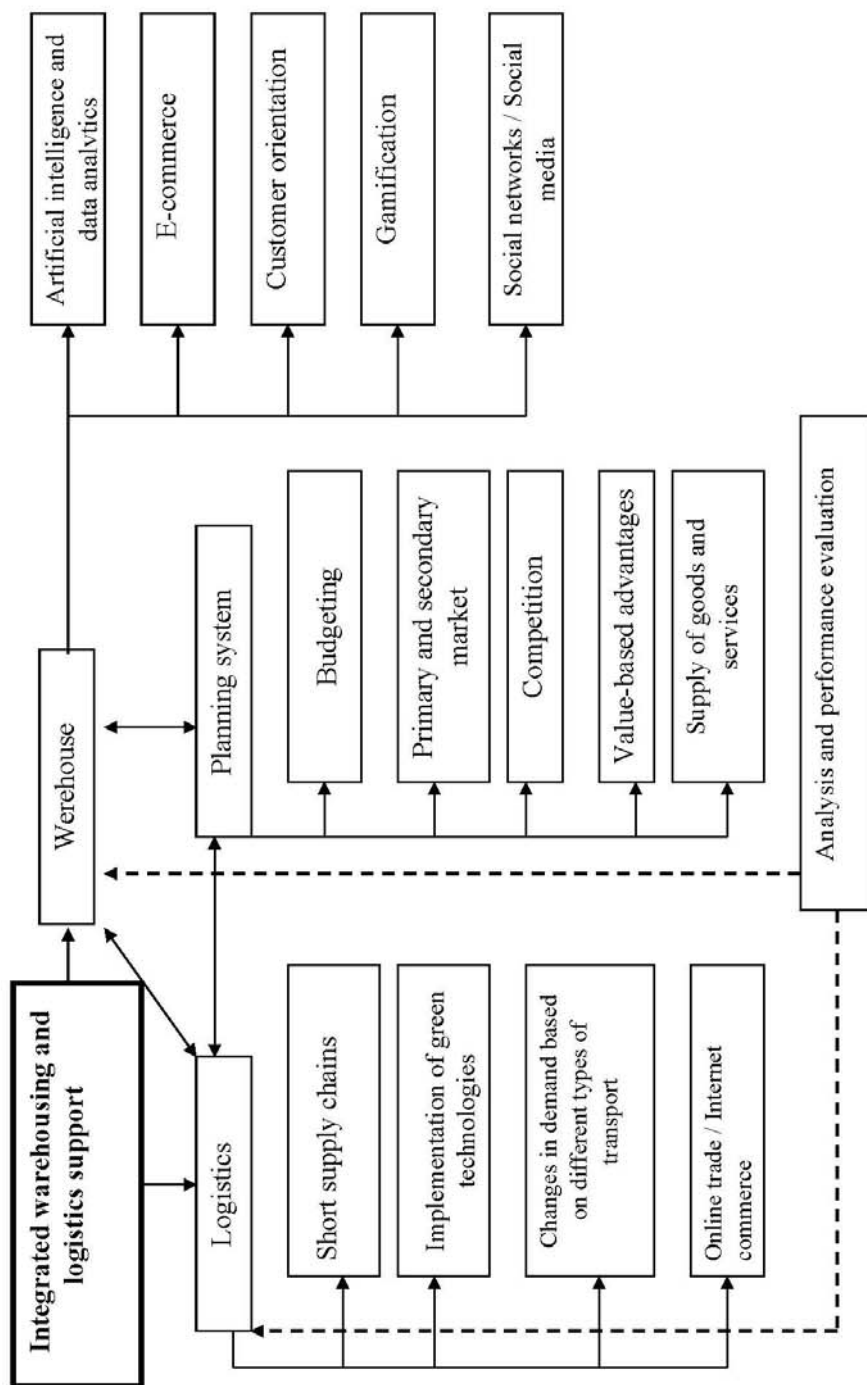


Figure 4 - Comprehensive warehouse-logistics support of the market. ** Formed by the author

E-commerce. Engaging sophisticated online tools facilitates the broadest reach of the intended audience, establishing meaningful engagement, which ensures the strong impact of this framework. Digitalization tools encompass all strategies, techniques, and approaches that enable reaching a broad audience and capturing the interest of prospective customers toward a company, brand, service, or a product. Frequently, a variety of tools are applied in parallel, which enables reaching the broadest possible audience and achieving strong promotional effectiveness. The selection of tools applied depends on the campaign objectives, its phase, the traits of the intended audience, the product being advertised, and other factors.

Customer centricity is found much less frequently in business practice and is often more the result of a manager's intuition than a deliberate step. However, modern market conditions encourage the transformation of this concept from a separate element into a business philosophy. Customer-centricity is a criterion that characterizes the capabilities and abilities of a company, oriented towards maximizing product sales volume and generating income by improving the quality of customer service. Customer-centricity is proactive; it does not arise with the appearance of a customer. For everything in the company to work this way, internal processes must be formed: correctly hiring and training employees, purchasing tools for working with clients, and designing offline and online contact points. A customer-centric business is designed for the long-term perspective and brings the owner stable income. The owner must make a choice about what they truly want: to simply make money quickly or to build a business system that will exist and develop for a long time. It must be understood that a customer-centric enterprise always invests first in one way or another, and then receives dividends for it. Conversely, if you save on customer-centricity, you will pay for it—perhaps not immediately, but it will definitely happen.

Gamification for users presents the service adoption (onboarding) process as a conscious gaming process, forcing a calculation of where effort is required from the user, where they can relax, what the user sees as an immediate goal, and how we can reward them for their work. Similar tools exist for retention: when the user should return to the service, why, how they will find out about it, and how to set a rhythm for the user. Gamification in business significantly helps to:

- increase sales volume thanks to bonus accrual and the customer's desire to spend them;
- build brand recognition;
- inform clients about product features or updates in a game format;
- expand the customer base and increase their loyalty;
- teach users how to interact with the program through games;
- stimulate clients to recommend the offered brand to friends.

Social networks. One of the main principles of warehouse logistics—meeting consumer needs and competently identifying the target audience—stimulates producers to promote brands on social networks. After all, it is there that users independently provide all the necessary data, starting from gender and age and ending with hobbies and interests. All that remains is to clearly define the target audience and engage in PR on social networks.

Within warehouse logistics, it is advisable to first pay attention to short supply chains, the implementation of green technologies, changes in demand across different transport modes, and internet trade.

Conclusions. In general, standardized warehouse logistics support must necessarily consider a system for planning and analyzing previous actions, strategies, market behavior, and so forth. It should be aimed at improving service and information dissemination. Consequently, individual clients see traditional "value" in standardized warehouse logistics as short service times, availability, and timely delivery. Customers, primarily within the scope of

logistical support, are increasing demands on logistics itself through requests for operational value-added tasks, such as packaging, barcoding, and information systems.

Therefore, comprehensive standardized warehouse-logistics support for the market is an integral process of state development that helps automate work processes, reduce the load on employees, improve communication, and optimize logistical processes. However, in practice, this process is a complex mechanism that requires comprehensive and planned implementation. Its future lies in the development of artificial intelligence and machine learning, the use of blockchain and the Internet of Things, the personalization and customization of processes, and an enhanced focus on the demands and needs of both producers and end consumers.

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Інтеграція стандартизованої складської логістики в Україні в умовах структурного і когнітивного розвитку

В даній роботі розглядаються основні особливості стандартизованої складської логістики та її запровадження в умовах сучасного сьогодення на ринку України, а також складні реалії логістичних процесів в умовах глобалізаційних змін. Сучасна складська логістика, яка раніше базувалася на традиційних методах управління і комунікацій, сьогодні перебуває під значним впливом новітніх технологій. Штучний інтелект, електронна комерція, великі дані, автоматизація, інтернет речей, блокчейн - всі ці технології швидко впроваджуються в роботу діяльності складської логістики і логістичних систем, це суттєво покращує їхню ефективність і адаптивність до змінюваних умов ринку. Діджиталізація логістичних процесів на складі стає викликом для функціонування організаційної моделі підприємства.

Запровадження нових технологій потребує змін у підходах в управлінні, взаємодії між співробітниками, а також вимагає розвитку нових навичок і компетенцій у працівників. Побудова комплексної системи складського-логістичного забезпечення ринку спричиняє зміни в управлінні знаннями, прийнятті рішень, а також у взаєминах між усіма рівнями організації. Одже мета цієї роботи полягає у визначенні ключових особливостей сучасної системи стандартизованого складського-логістичного забезпечення ринку в умовах глобалізації з урахуванням трансформаційних змін та змін в умовах воєнного стану в країні.

складська логістика, логістичний процес, логістична система, ринок складської логістики, стандартизація складської логістики, організаційна структура, трансформаційні зміни, інноваційність, цифровізація, цифрові технології, логістичні підприємства, суб'єкти підприємництва, інноваційна діяльність, цифрова логістика, глобалізація, інтермодальні перевезення

Одержано (Received) 16.02.2026

*Прорецензовано (Reviewed) 06.03.2026
Прийнято до друку (Approved) 12.03.2026*