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METHODS OF ANALYSIS OF LOGISTICS PROCESSES OF FOOD SUPPLY OF THE MILITARY UNITS OF THE NATIONAL GUARD OF UKRAINE

This article presents the development and substantiation of methodological tools for the analysis of logistical processes of food supply to the military units of the National Guard of Ukraine. The scientific novelty of the obtained results is the development of theoretical and methodological principles for the analysis of logistical processes of food supply to military units. In this study, the main stages of the methodology of analysis of logistical processes of food supply of military units of the National Guard of Ukraine are proposed. The essence of various external factors, under the influence of which the implementation of the methodology of analysis of logistic processes falls, is analyzed, in particular in the context of food supply of military units. The article emphasizes the need to highlight such external factors due to the fact that these factors can affect the efficiency and effectiveness of the analysis, as well as the possibility of implementing the recommended changes. Particular attention is paid

to the specifics of military factors, such as military operations and changes in the deployment of military units.

The article systematizes and examines in detail the regulatory requirements, namely the requirements of the legislation on storage, transportation and quality control of food, which can complicate or, on the contrary, improve logistics processes. The key internal factors that determine the possible analysis of changes in the logistical processes of food supply of military units of the National Guard of Ukraine are described and carefully analyzed. In particular, attention is paid to the factor of information systems and technologies supporting logistical processes of food supply to military units in modern conditions. This study presents an economic-mathematical model of overcoming the risks of logistical processes of food supply to military units. A mechanism of influence at risk points of the logistical chains of food supply of military units has been formed. Possible limitations of the implementation of the methodology of analysis of logistical processes of food supply of military units of the National Guard of Ukraine are analyzed. The practical significance of the obtained results lies in the formation of relevant conclusions for the management in order to take into account key risks and factors affecting the logistics processes in the food supply management system of the military units of the National Guard of Ukraine.

Keywords: *logistic processes; food supply; military units; risk points; mechanism; methodology; National Guard of Ukraine.*

Statement of the Problem. Food supply is critically important for maintaining the physical and morale readiness of our Defense Forces to carry out combat missions. Service members must receive high-quality, timely rations to remain in peak physical condition. Shortcomings in food logistics can negatively affect the combat effectiveness of National Guard units. Given limited financial and material resources, it is essential to optimize the use of all forms of food provisioning. An analysis of logistical processes helps identify weaknesses in supply, wastage, and other issues, enabling resource savings and their reallocation to other critical needs.

Moreover, under martial law in Ukraine, logistics often face significant challenges due to damaged infrastructure, route blockages, and other factors. Examining current supply chains allows planners to prepare for such disruptions by developing alternative routes and contingency plans, thereby enhancing the resilience of the food-supply system.

Losses of provisions resulting from improper storage, transportation, or other logistical failures can incur substantial financial cost and degrade troop nutrition. Process analysis uncovers the root causes of such losses and supports corrective measures that boost overall system efficiency.

Thus, the foregoing underlines the relevance of researching the logistics of food supply for National Guard units of Ukraine.

Analysis of recent studies and publications. Scientific works by S. Sokolovskyi, M. Naumenko, and I. Morozov, and S. Pavlenko [1; 2; 3] establish methodological principles for managing logistics chains in today's information economy. Practical recommendations for developing and applying analytical algorithms to manage logistics processes are offered by A. Dykyi, N. Butenko, N. Valianska, V. Nikitiuk, I. Ushakova, and Ya. Hrabovskyi in their articles [4; 5; 6]. In studies by M. Naumenko and M. Ptashchenko [7; 8], analyses are proposed for overcoming warehouse management challenges in support of logistical operations, and possible routes for optimizing food-supply logistics for military units are systematized. O. Starkova, D. Bondarenko, and M. Naumenko present analyses of information-support mechanisms for economic analysis and anti-corruption components in managing food-supply logistics for National Guard units [9; 10]. A methodology for planning financial control over procurement of goods, works, and services for National Guard units – relevant to specific conditions encountered in analyzing food-supply logistics – is provided by V. Herasymenko [11].

Thus, to date, the specialized literature does not include a comprehensive, scientifically substantiated methodology for analyzing the food-supply logistics processes of Ukraine's National Guard units.

The purpose of this article is to develop a methodology for analyzing the logistical processes of food provisioning for National Guard of Ukraine units.

Presentation of the Main Material The effective food supply of National Guard units of Ukraine is a critically important component for maintaining both combat readiness and the morale of personnel. An analysis of logistical processes enables identification of the system's strengths and weaknesses, optimization of resources, and enhancement of supply efficiency.

From this review of current food-supply practice, the following core stages of a methodology for analyzing the logistical processes of food provisioning for National Guard units can be proposed:

1. Data Collection and Preparation

Identify data sources. Gather information from warehouse reports, delivery logs, logistics plans, supplier contracts, etc.

Assess existing data. Verify the timeliness and completeness of information on procurement, transport, storage, and distribution of rations, equipment, and supply-service assets.

2. Mapping Logistical Processes

Create a logistics map. Visualize every step of the food-supply chain – from procurement to issuance to end users in the units.

Pinpoint key nodes. Identify critical hubs such as procurement points, depots, transport routes, and distribution centers.

3. Efficiency and Performance Analysis

Measure time and resources. Quantify the duration of each logistics step and the human, material, and financial resources required.

Evaluate losses and delays. Detect bottlenecks where spoilage or delivery lags occur.

4. Risk and Safety Assessment

Analyze supply risks. Identify threats to uninterrupted provisioning (e.g., supplier delays, transport disruptions, storage-condition breaches).

Ensure quality and security. Implement controls to maintain food quality throughout the chain and to protect stock from damage or loss.

5. Cost Analysis and Resource Optimization

Break down costs. Calculate expenditures at each stage-procurement, transport, storage, and distribution.

Optimize resources. Seek cost-reduction opportunities and efficiency gains, such as introducing automated inventory systems or streamlining delivery routes.

6. Recommendation Development and Implementation

Formulate proposals. Based on the analysis, draft actionable improvements – e.g., revised procurement practices, warehouse upgrades, new technologies.

Execute improvements. Plan, roll out, and monitor optimization measures, and evaluate their impact.

7. Monitoring and Control

Ongoing oversight. Establish continuous KPI tracking for logistical performance.

Audit and feedback. Conduct regular audits of implemented changes and gather user feedback to drive further refinements.

Finally, it is important to recognize that external factors – such as infrastructure damage, security constraints, or funding shifts – can influence both the analysis and the feasibility of recommended changes. A robust methodology will anticipate and adapt to these variables, ensuring the National Guard's food-supply system remains resilient and effective.

The following external factors influence the effectiveness and outcomes of analyzing the food-supply logistics processes for National Guard units of Ukraine:

1. Political Factors

- Shifts in the political landscape. Political changes can alter state-funding priorities, including support for military programs such as food provisioning.
- International relations. Relations with other countries may affect access to imported foodstuffs, supply-service equipment, or logistics technologies. Sanctions or trade restrictions can complicate the execution of efficient supply chains.
- Changes in military strategy. Political decisions to revise defense strategy or tactics can redefine

logistics requirements, forcing the methodology to adapt to new conditions.

2. Economic Factors

- Budgetary constraints. The national economic situation may limit budget availability, affecting resources dedicated to logistics—potentially reducing spending on infrastructure, transport, and other logistics elements.
- Fluctuating food prices. Variations in the cost of food items, fuel, and other resources influence logistical expenses and may require adjustments to provisioning plans.

3. Social Factors

- Demographic shifts. Changes in population structure—such as regional population growth or migration—affect food-supply needs and the labor force available for logistics.
- Public opinion. Society's attitude toward military spending influences political decisions on funding and sustaining logistics programs. Public support or criticism can determine these programs' level of priority.

4. Technological Factors

- Technology maturity. The adoption of modern tools – automation, inventory-management systems, GPS – can greatly enhance logistics, but requires sufficient investment and resources that may be limited.
- Access to innovations. Restrictions on obtaining cutting-edge technologies, whether economic or political, can hinder the improvement of logistics processes.

5. Legal Factors

- Regulatory requirements. Laws governing storage, transport, and quality control of provisions can either complicate or improve logistics. Non-compliance risks legal penalties or product spoilage.
- International standards. Aligning with standards such as ISO may necessitate adapting processes and introducing new practices.

6. Environmental Factors

- Climatic conditions. Climate change and adverse weather can affect food transport and storage, requiring extra safety measures and revisions to logistics plans.
- Natural disasters. Events like floods, fires, or earthquakes disrupt supply chains and demand immediate logistics adjustments.

7. Military Factors

- Combat operations. Active fighting can sever logistics routes and destroy infrastructure, complicating food supply to units.
- Unit relocations. Frequent redeployments or new operational tasks necessitate rapid reconfiguration of logistics support.

These external factors significantly affect the design and implementation of the methodology for analyzing National Guard food-supply logistics. Accounting for them during development and rollout will ensure the methodology's effectiveness, flexibility, and adaptability to changing external conditions.

In implementing the methodology for analyzing the food-supply logistics processes of National Guard units of Ukraine, various types of risks can arise that significantly undermine the effectiveness of the logistics management system. To mitigate these risks, control interventions should be applied to the logistics management system. Such interventions ought to be targeted at the risk points within the food-supply logistics chains of the units, according to the scheme shown in Figure 1.

The conventional symbols adopted in Fig. 1 are as follows:

R_k – Set of risks affecting the *k*-th component of the logistics process;

CM_k – Stabilizing mechanism encompassing a set of risk management methods;

MD – Multiplier-demultiplier, understood as a control element of the logistics management system that increases or decreases the level of risk;

UR_{p-1k-1}, UR_{pk} – Previous and subsequent levels of the logistics process management system for food supply in military units.

Definition of the Logistics Process Component After Stabilizing Mechanism Influence.

The logistics process component after the influence of the stabilizing mechanism should be defined as:

a) If the rate of change of the component is positive – $d_k^{(2)} = d_k^{(1)} \times \alpha \times \beta$,

b) If the rate of change of the component is negative – $d_k^{(2)} = \frac{d_k^{(1)}}{\alpha + \beta}$,

where $d_k^{(1)}$ is the rate before the stabilizing mechanism's influence.

Coefficient α

The coefficient α is determined by the formula:

α = 1 – r,

Where r is the risk level.

Thus, when α = 0, the risk is maximal; when α = 1, risks are absent.

Coefficient β

The coefficient β characterizes the level of risk impact compensation and can be determined by the formula:

$$\beta = \begin{cases} 1 + \frac{Y^0}{Y'}, якщо Y' \neq 0; \\ 1 + \frac{Y^0}{1 - Y'}, якщо Y' = 0 \end{cases}$$

where: Y_0 – Number of logistics operations transferred by the stabilizing mechanism to a risk-free or moderate-risk zone;

Y' – Number of logistics operations in the high or unacceptable risk zone.

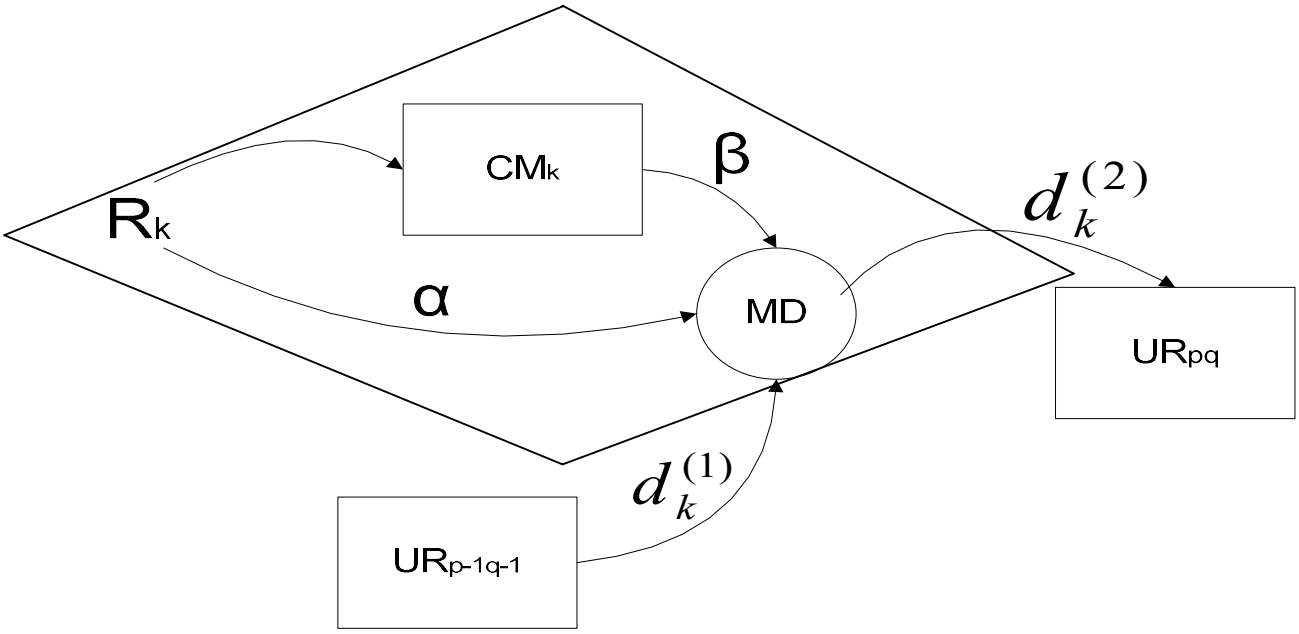

Figure 1. Mechanism of interventions at risk points in the food-supply logistics chains for National Guard Units

If α > 0, the coefficient β ranges within $1 \leq \beta \leq 1/\alpha$

- When β = 1, the stabilizing mechanism is absent.
- When β = 1/α, the mechanism fully compensates for potential risk.

Implementation Limitations of the Methodology.

The implementation of the methodology for analyzing logistics processes in food supply for military units of the National Guard of Ukraine may face certain constraints. Possible limitations include:

1. Resource Constraints.

Financial constraints: Insufficient funding may limit the adoption of modern technologies, personnel training, or infrastructure modernization, leading to ineffective analysis and implementation of recommendations.

Material and technical resources: Lack of or outdated transport, warehouses, and equipment may hinder methodology implementation and cause delays in food supply.

2. Lack or Inaccuracy of Data.

Outdated information: Absence of accurate, up-to-date data may significantly distort analysis results, leading to incorrect conclusions and inefficient decisions.

Data collection challenges: Difficulty in gathering necessary data due to insufficient process automation or lack of standardized data collection procedures.

3. Infrastructure Limitations.

Poor infrastructure condition: Outdated or poorly maintained infrastructure (warehouses, transport, communications) may restrict effective logistics and process analysis.

Lack of modern technologies: Limited integration of information systems or absence of access to modern technologies (e.g., inventory management systems) may reduce analysis effectiveness.

4. Personnel Constraints.

Low staff qualifications: Insufficient training or experience among logistics personnel may lead to errors or delays in analysis and implementation.

Shortage of skilled specialists: Lack of qualified personnel may limit the execution of complex logistics measures.

5. Bureaucratic Obstacles.

Complex administrative procedures: Inflexible management structures or bureaucratic delays may slow the adoption of recommended changes.

Lack of interdepartmental coordination: Poor coordination between units or agencies may result in duplicated efforts or missed critical steps.

6. Time Constraints.

Limited implementation time: Tight deadlines may lead to rushed analysis, reducing accuracy and effectiveness.

Changing circumstances: Unforeseen changes (e.g., combat operations, emergencies) may hinder the execution of developed recommendations.

7. Resistance to Change.

Organizational resistance: Staff or management may resist new methodologies, especially if they require significant process changes or additional effort.

Cultural factors: In some organizations, changes may face cultural resistance if they disrupt established traditions or workflows.

8. Legal and Regulatory Constraints.

Legislative barriers: Legal or regulatory requirements may impede certain aspects of the methodology.

Regulatory risks: Non-compliance with new standards may lead to sanctions or legal issues.

The constraints that may arise during the implementation of the methodology for analyzing logistics processes in food supply for military units of the National Guard of Ukraine require careful planning and adaptation to existing conditions. Addressing these limitations during development and implementation will enhance the methodology's effectiveness and ensure the achievement of planned outcomes.

Conclusions and Future Research Directions. Thus, the conducted research has enabled the

development of a comprehensive methodology for analyzing the logistics processes of food supply for military units.

The analysis of food supply logistics processes for military units of the National Guard of Ukraine serves as a crucial tool for enhancing the efficiency and reliability of the supply system. The proposed methodology allows for the identification and elimination of weaknesses in the logistics chain, optimization of costs, and ensures timely delivery of food supplies with a high level of quality and safety.

The scientific novelty of the obtained results lies in the methodology for analyzing the logistics processes of food supply for military units of the National Guard of Ukraine.

The practical significance of the findings consists in formulating relevant recommendations for military unit command regarding the consideration of key risks and influencing factors in the logistics processes of the food supply management system for National Guard units.

Further research may focus on developing strategies to improve the efficiency of food supply management for military units of the National Guard of Ukraine.

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