Systemy Logistyczne Wojsk
Zeszyt 60 (2024)
ISSN 1508-5430, s. 135-148
DOI: 10.37055/slw/193854

Instytut Logistyki
Wydział Bezpieczeństwa, Logistyki i Zarządzania
Wojskowa Akademia Techniczna
w Warszawie

Military Logistics Systems
Volume 60 (2024)
ISSN 1508-5430, pp. 135-148
DOI: 10.37055/slw/193854

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Holistic foundations of military logistics theory development

Holistyczne podstawy rozwoju teorii logistyki wojskowej

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Abstract. The paper presents the following research problem: whether the adoption of holism as a philosophical concept can be the foundation for developing the theory and development of military logistics. It was hypothesized that the reason for the slow development of the theory of military logistics is the authors' less interest in formalized logic on the basis of which theoretical logistics can be developed. The research presented in the article fills the research gap in the search for the foundations of logistics theory in a holistic approach. A holistic approach to military logistics was analyzed as the basis for the development of the theory of military logistics. A systemic approach derived from holism was characterized. teleology, processualism and praxeology. It was found that military logistics occurs most often as a scientific specialty in the following sciences: safety, management and quality, and engineering and technical sciences. It was determined that the subject of research in logistics are logistics systems and the processes implemented within them and that it does not have a sufficiently developed cognitive and methodological apparatus. The relationship between systems theory and military logistics was presented, and military logistic systems and their features and functioning were characterized. As a result of the research, the following conclusion was formulated: holism and the systemic approach derived from it may constitute the basis for the development of theory and cognition in military logistics.
Keywords: Security, holism, systems theory, military logistics, military logistics systems

Abstrakt. W pracy przedstawiono następujący problem badawczy: czy przyjęcie holizmu jako koncepcji filozoficznej może być fundamentem opracowania teorii i rozwoju logistyki wojskowej. Postawiono hipotezę, że przyczyną powolnego rozwoju teorii logistyki wojskowej jest mniejsze zainteresowanie autorów sformalizowaną logiką na bazie której można rozwijać logistykę teoretyczną. Badania prezentowane w artykule wypełniają lukę badawczą w zakresie poszukiwania podstaw teorii logistyki w podejściu holistycznym. Przeanalizowano holistyczne ujęcie logistyki wojskowej jako podstawę rozwoju teorii logistyki wojskowej. Scharakteryzowano wywodzące się z holizmu podejście systemowe. teleologię, procesualizm oraz prakseologię. Stwierdzono, że logistyka wojskowa występuje najczęściej jako specjalność naukowa w naukach: o bezpieczeństwie, zarządzaniu i jakości oraz naukach inżynieryjno-technicznych. Określono, że o przedmiotem badań w logistyce są systemy logistyczne i realizowane w ich ramach procesy oraz, że

nie dysponuje ona dostatecznie rozwiniętym aparatem poznawczym i metodologicznym. Przedstawiono relacje pomiędzy teorią systemów a logistyką wojskową oraz scharakteryzowano wojskowe systemy logistyczne oraz ich cechy i funkcjonowanie.
W wyniku przeprowadzonych badań sformułowano następujący wniosek: holizm i wywodzące się z niego podejście systemowe może stanowić podstawę rozwoju teorii i poznania w logistyce wojskowej.
Słowa kluczowe: Bezpieczeństwo, holizm, teoria systemów, logistyka wojskowa, wojskowe systemy logistyczne

Introduction

It is commonly assumed that logistics comes from the military sphere, although in the literature we can find information about its place in the civilian sphere. The term „logistics" is probably of Greek origin, as indicated by the meaning of words such as: *logos* - counting, reason; *logistics* – the art of calculating; *logikon* - power of reason, reason; *logos* - word, reason, many. The Latin adjective *logisticus is close in meaning,* meaning understandable, rational, capable of logical thinking. From them also comes the narrower term *logistique,* which in French means: transport, quartering and supplying troops.

Analyzing the definitions of military logistics contained in encyclopedias, logistics doctrines, as well as original publications, and starting from the Greek and Roman origins of this concept in military logistics, two main sources can be distinguished: formalized logic (Oziemski, 2005, pp. 74-78), on the basis of which theoretical (mathematical and philosophical) logistics and pragmatic (applied) logistics derived from the observation of practical activities can be developed.

Despite the significant development of military logistics in the pragmatic part, its theoretical development is very slow. So far, logistics is dominated by an empirical research strategy. However, conducting the actual course of phenomena in logistics is possible to a small extent and requires long-term, systematic and repeated observations and painstaking studies of the collected research material. Hence, the development of logistics knowledge based on practical experience is very slow.

The adoption of the philosophical concept of cognition will be of significant importance for the development of the theory and development of military logistics and its modeling (Oziemski, 2007, p. 74). Therefore, an extremely important task of military logistics as a science is to create a possibly coherent set of ontological, epistemological and axiological assumptions. Since military logistics is based on the integration of processes and activities to achieve specific goals, its theoretical foundations should be sought in systems theory. This is indicated by many researchers pointing to the systemic nature of military logistics. Moreover, the systemic approach is equated with a holistic approach, which in my opinion is a mistake. The adoption of holism as a philosophical concept that is the foundation for the development of the theory and development of military logistics is, in my opinion, appropriate. The adopted philosophical concept helps to illuminate the fragment of

reality that interests us and gives consideration to the ideas adopted in its modeling (Brzeziński, 2015).

The research problem was formulated as a question: is it appropriate to adopt holism as a philosophical concept that is the foundation for the development of the theory and development of military logistics? The aim of the article is to analyze the holistic approach to military logistics and to base its development on systems theory and the praxeological approach. In considerations on the development of the theory of military logistics, the following hypothesis was formulated: the development of the theory of military logistics should be developed based on a holistic approach.

The research used primarily deductive reasoning, which involved drawing conclusions from many premises - general statements. In this way, taking into account the theory and formulating a hypothesis, attempts were made to confirm it by observing real phenomena.

A number of methods were used in the work, the leading ones being analysis and evaluation of the literature on the subject of research, comparison, analogy and generalization, as well as synthesis and inference. Undoubtedly, the problem was the small number of publications on logistics used in combat operations. Nevertheless, the adopted approach made it possible to obtain a cross-sectional nature of the considerations, while providing the basis for further, extended research on this extremely important and current problem.

A holistic approach to military logistics

Holism (Greek holos - whole) is a theory of the development of reality, according to which the world is a hierarchical whole composed of wholes of lower orders and is subject to dynamic, creative evolution, leading to the emergence of new, qualitatively different wholes (irreducible to the sum of their parts) (Encyklopedia, 2007, p. 385).

At the same time, holism is an epistemological-methodological orientation, according to which all phenomena (processes, objects) should be recognized and studied holistically, due to the fact that comprehensive systems (systems) are subject to specific regularities that cannot be inferred on the basis of the knowledge of the regularities governing their parts (elements).). The whole cannot be reduced to the sum of its parts. It is the basic principle of holism that reality can be known by examining its parts and the relationships between them, and that the whole is more than the sum of its parts. Therefore, a systemic approach should be used in military logistics. A derivative of holism, apart from the systemic approach, is teleology, processism and praxeology.

Teleology (Greek *telos* - goal, *logos* - word, science) is the science of purpose, the theory of purposefulness. The teleological explanation, like the holistic one,

derives from the whole and is opposed to the mechanistic approach (starting from the component parts) (Encyklopedia, 2007, p. 1014).

Purposefulness is an essential feature of human activities consisting in the conscious pursuit of specific goals, and that these goals can be achieved by various methods. You don't create military logistics systems aimlessly. The purpose of logistics activities will result from the purpose of the operation (combat) in wartime or training in peacetime. The action takes place in some present and is aimed at achieving logistical goals in the future. Especially during combat operations, a man does not have complete knowledge about the future, and he selects means according to the technological plan for the implementation of logistics processes in the present and expects the achievement of goals in the future. Human action in military logistical systems is due to the scarcity of resources in warfare in particular, as opposed to desirable logistical goals.

Decision making is primarily about setting a goal. Defining the purpose of the action is very useful, but not always fully possible. This is due to the existence of the following types of goal hierarchy: time dependent on the range in which we consider the operation of valuableness for the units that determine its operation.

The time structure of the hierarchy of goals in military logistic systems results from the fact that in order to achieve a further goal, a number of closer goals must first be achieved. In this way, a chain of goals is created, consisting of a time hierarchy of intermediate goals, i.e. means of action and the final goal. In order to achieve the final goal, it is necessary to consistently pursue the next intermediate goals. This is a chain of goals typical for logistics activities.

Another criterion of the hierarchy of goals is their ordering depending on the scope in which we consider logistics activities. We can talk about the goals of the entire logistics system, the goals of individual subsystems and individual goals. Of course, the concept of the purpose of the military logistics system and its subsystems is a certain simplification, because - as mentioned earlier - only people can have goals.

The next type of goal hierarchy is based on the value of goals. Logistic activities may have several equivalent goals, which are treated as final. They can be consistent or incompatible, i.e. mutually exclusive, or implemented to varying degrees depending on their value. In connection with the implementation of the objectives, in addition to the intended effects, unintended effects may also arise.

The foundation of cognition in military logistics should also be sought in praxeology. Praxeology (gr. *praxis* – action), the science of the efficiency of action, formulating and justifying indications on what should be done, what is good to do or on what is enough to do in certain circumstances to achieve the desired effect in the most efficient way (Encyclopedia, 2007, p. 823).

Praxeology is based on the fundamental axiom that individual human beings act, that is, on the fundamental fact that individuals engage in conscious action to achieve selected goals. Processes are the basic category of processualism. The

processes are carried out in logistic systems. They occur only in the real world and they are always dependent on being, because they must necessarily coexist with the objects within which, among which or around which they take place. They can be treated as sets of events or sequences of changes. The processual approach aims at isolating and examining various processes occurring in military logistic systems, as well as between them and the environment.

There is a certain dualism in the approach to the study of logistics systems. On the one hand, the praxeological method with its empirical nature of praxeological axioms, drawing its premises mainly from consciousness and connection with the activities of the human mind, and on the other hand, the methodology of natural sciences in which the deductive process originates from hypotheses or observations that are the result of individual generalizations.

In logistics activities, we use material and human resources. Resources and means of action can be combined in different ways and in different sequences. The selection of resources, means of action and the adopted sequence is called the method of action. For this reason, the essence of praxeological considerations focuses on determining the most efficient mode of action, i.e. the selection of resources, the determination of the means of action and the determination of the order of action.

Knowledge of the structure of effects of action is of significant practical importance both in the design of a military logistic system and in the analysis of the benefits of action. If the useful result exceeds the inputs, we say that the action is beneficial, if the useful result is less than the inputs, we call the difference a loss. It should be noted, however, that it is very difficult to make a full assessment of the effects both before and after the implementation of the objective. Nevertheless, such an assessment is necessary and measurable effects should be taken into account, which are very difficult to determine in the case of military logistics.

According to T. Kotarbiński, the basic values of operational efficiency are efficiency, benefits and economy (Kotarbiński, 1975). In the case of military logistic systems, the basic values of operational efficiency during combat operations are efficiency, and economy in peacetime. An effective (purposeful) action is an action that leads to the effect intended as a goal. However, it should be remembered that knitting can be effective but disadvantageous (Pyrrhic victory).

Another basic form of efficiency of military logistics systems is economy. The measure of economy is the ratio of the useful result (effect) to the costs of action (outlay) incurred to achieve it, with the proviso that this is a concept different from that used in economics. In the case of military logistics, determining the inputs is relatively simple, while the effects are extremely complex. The measure of the effect can be taken as the degree of readiness of the military logistics system to fulfill the assumed tasks.

ex-post evaluation (after completion of the activity), actual or methodological performance is established. In the *ex-ante* evaluation (before action), we can only assess efficiency in the methodological sense (Kieżun, 1998).

To sum up, the praxeological methodology enables scientific solving of practical problems in military logistics, as it takes into account integrated action including methodologically rationalized determination of goals and criteria for action. The interdependencies between the goals, criteria, means of operation and conditions in which military logistics functions, which change over time in the flow of goods, determine the need for a systemic examination of these receivables, e.g. logistics systems due to the available resources.

In this situation, the relationship between the systemic approach and the praxeological approach in the study of military logistics should be determined, without going into the search for differences and similarities between the theory of systems and the theory of efficient operation. Such a comparison seems much more justified due to the fact that military logistics is an applied science.

The differences in the systemic approach and the praxeological approach relate primarily to the genesis. The systemic approach is derived from the observation of reality focused on its cognition. On the other hand, the praxeological approach has its genesis in practical activities that serve to change reality. The levels of generality of the two approaches are also different. The systemic approach is primarily focused on the object called the operating system, which is undoubtedly the military logistics system. The praxeological approach, on the other hand, is mainly focused on the subject of action. The essence of the systemic approach is the comprehensive treatment of the subject of research, while the essence of the praxeological approach is the examination of the efficiency (efficiency) of processes carried out by the system. This, of course, does not mean that the praxeological approach resigns from a holistic approach - it is a derivative of the efficient approach to actions, a systemic approach with effectiveness and efficiency, which in turn is a derivative of the holistic treatment of phenomena. As a result, the system approach and the praxeological approach are close to each other, which may facilitate their use in military logistics.

Logistics as a scientific specialty

Despite the fact that many researchers point to military logistics as a category of science or knowledge, they are still looking for substantive foundations and theories (Jałowiec, Grala, 2022, pp. 5-15. Jałowiec, 2021, pp. 37-48). Logistics as a scientific discipline also has no place in the current classification systems. It is most often found as a scientific specialty in the following sciences: safety, management and quality as well as engineering and technical sciences. There is a general agreement that the subject of research are logistics systems and processes implemented within

them (Ficoń, 2015). The constantly evolving military logistics as a scientific specialty does not have a sufficiently developed cognitive and methodological apparatus. Military logistics widely and willingly uses the research workshop and theoretical achievements of other scientific disciplines, primarily social, engineering and technical. This is due to the specificity of the subject of research, which requires a multi-faceted approach to the study of logistics systems and processes as complex socio-technical objects. The multifaceted nature of the analysis results from the fact that logistics has a multi- and transdisciplinary character (Brzeziński, 2013, pp. 60-70). In addition, the research methods used and the theorems formulated are common to various scientific disciplines, because they easily penetrate the boundaries of these disciplines nowadays.

They may exist, but it would be hard to find examples of original research methods used only in military logistics. The research methods used so far in logistics are therefore primarily transferred from other scientific disciplines and adapted to its needs.

In logistics, three strategies can be distinguished as groups of research methods: conceptual, formal and empirical.

So far, military logistics is dominated by an empirical research strategy, inductive reasoning by analogy, modeling on solutions proven in practice and generalizations of the experience of research and development centers. The empirical strategy is inherently oriented towards the analysis of real military logistic systems and processes. Thus, it is limited only to the study of the characteristics of systems and processes that can be directly perceived or are recorded in documents. Reliable empirical research of the actual course of phenomena in military logistics is possible to a limited extent and requires long-term, systematic, repeated observations and painstaking studies of the collected material. However, one should be aware that the conditions for the functioning of military systems and the implementation of logistic processes, especially in military operations, are very dynamic and thus the obtained research results may often be of little use. The empirical strategy provides empirical models and data to create mathematical models, primarily simulation ones. Empirical models are often in the form of statistical, probabilistic or stochastic models.

In addition to the currently dominant empirical strategy, logistics should make wider use of conceptual and formal strategies.

Depending on the scientific discipline in which research on military logistics systems is carried out, a different research strategy may be dominant. The conceptual strategy involves extensive theoretical reflection and is a methodology that employs both induction and deduction. It can be dominant in security sciences and management and quality. It is very loosely and only partially connected with empiricism and uses rather qualitative research methods and techniques. It provides hypotheses and theoretical models. Heuristic models can be used in the study of military logistics systems. Heuristic models are most often used for forecasting

and decision making. They can be used to determine the state of military logistics, to indicate the directions and dynamics of its development or to choose the best logistics strategy. They make it possible to discover new facts and relations between them, and to discover new truths. Heuristic models are built on the basis of experts' opinions, using their knowledge, experience and intuition. Brainstorming and the Delphi method are most often used to build heuristic models. In the modeling process, survey techniques are used and the research tool is a questionnaire.

In turn, the formal strategy that can be used in the study of military logistics systems is all quantitative research methods and techniques using systems engineering, operational research, mathematical logic, cybernetics, mathematics and artificial intelligence techniques (Fernández-Villacañas, 2020, pp. 293-303). The formal strategy provides models for the study of military logistic systems. In the study of military logistics systems, the following models can be used: multi-criteria, praxeological, stochastic, network and. In many works in the field of military logistics, deterministic models using the probability theory are used, but they do not take into account the stochastic nature of the implementation of logistics processes in combat operations, which in the author's opinion, this is a major drawback. The stream of operating system needs should be described using stochastic models. Such possibilities are created by building models of logistic processes based on Markov processes, in which the future is conditionally independent of the past at a given present. They enable ongoing analyzes and assessments of the logistics system, providing the basis for making decisions depending on the needs of the operating system.

The above-mentioned research strategies cannot be treated in isolation. They should complement each other, support and be complementary in the study of logistic systems and processes.

Summing up the above considerations on military logistics as a scientific specialty, it should be stated that its theoretical achievements are getting richer and more diverse. When assessing it, one must take into account the relatively short period of its development and the high complexity, diversity and dynamics of processes, phenomena and problems. The main shortcomings of this output are insufficiently developed theoretical foundations, terminological discrepancies and a rather poor methodological basis.

Systems theory and military logistics

Each pattern of science is inextricably linked to the broadly understood pattern (paradigm) of civilization from which it originates. As human knowledge progresses, it is difficult to predict the directions of this interdependence. It is dialectical in nature. On the one hand, a given pattern of science determines the directions of development of a given civilization, but on the other hand, this pattern itself is entangled

in many ways in the basic values of a given culture. Authors representing the trend of the „new consciousness", otherwise known as the „new paradigm", practicing theoretical reflection on the changes of our time, presenting synthesizing, holistic, broadly understood systemic, processual and dynamic thinking (Toffler, 2001).

Problems solved in human activity (divided into (Newell, Shaw, Simon, 1958, pp. 151-166):

- structured problems – formulated quantitatively, in which significant relationships are explained numerically by means of symbols. Operations research methods are used to solve problems of this type;
- unstructured problems - expressed qualitatively, in which there are no quantitative relationships between elements. Problems of this type are solved by heuristic methods;
- poorly structured problems - mixed, which contain both qualitative and quantitative elements, with qualitative, poorly recognized, undefined aspects of the problem prevailing. Problems of this type are solved using the methods of system analysis and statistics.

The third type of problems includes economic, engineering and military problems. Also, the problems of military logistics are poorly structured problems, so a systemic approach should be used to solve them.

In the mid-twentieth century, the concept of a system became the basic category used to describe and explain phenomena occurring in reality.

The term „general systems theory" was introduced by L. von Bertalanffi in 1947. Systems theory in general is „a logical-mathematical branch of science whose task is to isolate and formulate general principles that can be applied to systems in general (Bertlanffy, 1972) .

According to L. von Bertalanffy, there are general laws applicable to all systems, regardless of the nature of their constituent elements, the relationships and interactions between them. Thanks to this, it becomes possible to apply similar models and systemic laws in many fields and to transfer them to other fields. General systems theory in its broad sense is concerned with general concepts, principles, tools, problems, methods, and techniques related to systems. It does not specify the essence of the elements or the relationships that bind them. General systems theory therefore considers the relationships between the properties of elements and systems, regardless of whether these elements and systems exist, and regardless of what the essence of the phenomena under study is.

The system is an epistemological and methodological category widely used in science, and the system approach is still an important paradigm in the scientific cognition of reality. The application of the systems approach requires a certain limitation of considerations and a transition from general systems to a specific system, which may be a logistics system (Mesarowic, 1975). As soon as a general system is realized, it ceases to be general and becomes specific, but of the same type as the

general system. In specific systems, which are military logistic systems, both their elements and relations are identified.

A special class of systems are operating systems. Action systems are distinguished from general systems by the fact that people act in them as subjects of action. In these systems, apart from people, there are other objects, among which technical objects play an important role. The category of operation systems includes military logistic systems. Action systems are the subject of the study of action systems theory, which provides effective models for identifying, evaluating and optimizing systems with various properties. These properties depend both on the operating systems themselves as well as on their system environment. Military logistic systems are operating systems that take the form of systems, processes, chains and logistic networks.

The concept of a military logistics system is defined in various and ambiguous ways. Using the provisions of the set theory, it can be assumed that a logistic system is a set of elements and relations ordered with regard to the goal, which is the logistic security of the troops.

The following elements can be identified in the military logistic system: units (*sub-units*): supply, transport, evacuation, repair and medical; stocks of military, material, medical and technical means: transport, storage, military service, maintenance and repair, medical and information infrastructure. The following processes are carried out in it: supply, e.g. for storage, transport, social and living services, recovery of technical fitness, medical and information services.

Relationships are relationships and/or couplings (interactions, interactions). Between elements and systems, transference relations, connection relations and support relations can be distinguished. The *input - output relation* applies to people, military equipment, combat and material assets, and information flowing through the system - together or separately. On the other hand, in the connection relation, one should distinguish the ordering relation defined by the purpose of the military logistic system, which is the logistic support of the troops. In military logistic systems, one can also distinguish support relations that determine the order, thanks to which it is known which subsystem (element) serves the distinguished subsystem (element).

What separates the military logistics system from its surroundings are its boundaries. The boundaries of military logistics systems are difficult to define. They are out of focus and often blurry, especially in warfare conditions. They are mostly conventional. Military logistics systems are therefore relatively isolated from the environment.

The environment of the logistics system is a set of all objects that do not belong to it, but their properties affect the system and at the same time change under its influence. The environment closer to the military logistics system includes: the infrastructure system on which logistics processes and activities are carried out; securing the army, the superior's logistics system, the logistics systems of the neighbors and

the market as well as the enemy's army (Zeimpekis, Kaimakamis, Nicholas & Daras, 2015, pp. 105-169). On the other hand, the further environment of the logistics system is the logistics system of the senior superior, the country's back-up system, the coalition system. In addition, the military logistics system is affected by the environment in the form of the environment, climatic and atmospheric conditions as well as the time of year and day in which logistics processes are carried out. The environment of the military logistics system can change from a state of stability - time of peace to a state of chaos - time of war. It is also difficult to determine the strength and direction of changes in the environment of the military logistics system.

Military logistics systems are hierarchical. The hierarchy of military logistics systems can be understood as inclusion, i.e. the inclusion of parts in the whole, e.g. the battalion's logistics subsystem is part of the brigade's logistics system, and as ordering, for example, the battalion's logistics subsystem is subordinated to the brigade's logistics system.

Through a specific arrangement of the elements of the military logistics system, a synergistic effect can be achieved (from the Greek *syn* - together, together + *ergon* - work, action). In this case, the Aristotelian motto is reflected - „the whole is more than the sum of its parts".

The synergistic effect consists in the fact that the interacting elements of the military logistics system give a resultant result greater than the simple sum of the effects of each of them. It is created as a result of skilful associating of system elements by humans. The elements can be combined in the system in various ways to achieve the greatest synergistic effect.

Every system, no matter how large or how complex, is subject to the law of ever--increasing decay, disorganization, and entropy accretion according to the second law of thermodynamics. The increase in the degree of disorganization of the military logistics system occurs especially during combat operations. Military logistic systems are organized systems, which means that they are capable of maintaining or even decreasing the state of entropy. An increase in the chaotic nature of the environment may lead to an increase in the entropy of the military logistics system, which may cause it to cease to fulfill its function. The military logistic system is also a self-organizing system by drawing human, financial, material and information supplies from the environment, it is possible to cause a decrease in the entropy of the military logistic system (negentropy), i.e. an increase in order. Therefore, the increase in entropy also affects the decrease in synergistic effects.

The military logistics system is required to maintain a state of balance. Maintaining one or many variables at the same level, despite changes in the environment, is called homeostasis (Greek homoíos - similar, equal; stásis - standing, persistence, attitude) (Dictionary, 1981, p. 75). **homeostasis** is associated with constant basic control **parameters of such features of the military logistics system as: usability, readiness, potential.** This term usually refers to the self-regulation of logistics

processes, of course within certain limits. Each system has a certain ability to eliminate the influence of disturbances, which is called system stability. This involves self-regulation processes based on the principle of feedback. Open systems, such as military logistic systems, are able to maintain their state of equilibrium, despite disturbances leading to its change, but under certain environmental conditions. The state of equilibrium is understood as a state not subject to change as a result of transformation. The turbulence of the environment will have a negative impact on maintaining the system parameters, and with the increase in the chaos of the environment, it will even prevent homeostasis, system stability and maintaining the balance of the military logistics system.

In summary, systems theory and military logistics have a common set of concepts, which makes them relevant and is an important argument that systems theory should be the basis of military logistics systems.

Conclusions

This article contains the results of many years of work and the author's thoughts in the field of military logistic systems. In its implementation, the author also used his experience in the implementation of scientific and research works in the field of system modeling.

The foundation of every theory and every cognition are the appropriate philosophical concepts, hence the development of the foundations of engineering of military logistic systems was associated with their search. The analysis of philosophical concepts showed that the foundation of cognition in the engineering of logistic systems should be sought in holism, processualism, teleology and praxeology. So far, the effects of empirical research in military logistics allow for its development, but not to the extent that one might expect. One should agree with the views that the philosophical concept for logistics is formalized logic and its basis is the philosophy of systems derived from holism. Currently, in philosophy textbooks we will probably not find "systems philosophy, it is the history of holistic thinking in the category of parts and whole and systemic thinking that can be applied in logistics. The premise for this type of thinking is also the fact that logistics is an interdisciplinary field. In this situation, in addition to the empirical research strategy, it is worth making extensive use of mathematical and praxeological models in logistics research.

There is general agreement on the subject of research - the military logistics system. On the other hand, the development of the theory of military logistics requires the search for original research methods or the adaptation of methods used in other scientific disciplines, taking into account the specificity of the functioning of military logistics, especially in combat operations. Thanks to models and system methods, not only can many problems

in military logistics be formulated, but also solved, thanks to the development of tools, which are provided primarily by the development of mathematics and computer science. Of course, it may not be possible to solve all problems in military logistics in this way, but this cannot be a reason to reject the methodological rationality of this approach. It seems, however, that basing logistics on mathematical logic will allow for the development of its cognitive and methodological apparatus. Particular attention should be paid to the use of stochastic models, which reflect the functioning of logistics in combat operations to a greater extent than deterministic models.

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