THE SYSTEMS APPROACH TO TRANSFORM THE CAPABILITIES OF MILITARY LOGISTICS

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ABSTRACT

The aim of the paper is to analyze the potential and challenges of applying the systems approach to transform military logistics as an element of the armed forces development program. First of all, the structure of the military logistic system is identified and discussed. Secondly, the principles governing military logistics are studied in order to point out the requirements for a military logistic system. Thirdly, the operational capability based approach to transform and develop contemporary armed forces is considered. Finally, the systems approach to develop the capabilities of military logistics is operationalized and the tools supporting the planning of the military logistic system development are proposed.

Keywords

Military logistic system, operational capabilities, military logistics capabilities, functional components of operational capabilities, DOTMLPF-I

1. Introduction

The idea of a learning organization, which emerged in the early 1990s, has become one of the most popular contemporary management concepts. A learning organization is “an organization that is continually expanding its capacity to create its future” [1]. Originated in the business environment the concept of a learning organization has been adopted in the military context. For instance, both NATO and the U.S. Army officially declare their aims to transform respectively into a “knowledge centric organization” (KCO) [2] and a “knowledge-based organization” [3].

In his seminal work, Senge enumerates systems thinking among the disciplines (building blocks) of a learning organization and labels it as “the fifth discipline” integrating all remaining disciplines (i.e. personal mastery, mental models, shared vision and team learning) and “fusing them into a coherent body of theory and practice” [4]. System is defined as “a set of
interrelated elements” or “an entity which is composed of at least two elements and a relation that holds between each of its elements and a least one other element in the set” [5]. The systems approach is considered as one of the most prominent theories in management studies. Applying the systems approach means recognizing that: there are intra-organizational interdependencies between the elements of a system; the change in one subsystem may affect other subsystems; the change in a single subsystem (suboptimisation) may not contribute to the improvement of the whole system effectiveness; the impact of the whole system on its elements is stronger than the opposite influence; the external elements have the impact on the open system and its elements [6].

Contemporary armed forces face the challenges of transformation due to turbulent and multidimensional changes in the global context and their operational environments. Transformation processes encompass all the functional systems of the armed forces, including military logistics. The mission of the military logistic system is to provide a wide range of combat service support to fighting troops in order to enable them to achieve operational aims and objectives. Therefore, the transformation of the military logistic system is to be closely linked with the changes in remaining combat and combat support functions. Moreover, any changes in the area of logistics should take into account the variety of logistic functions. As a consequence, the systems approach is recommended to be followed to transform military logistics.

The aim of the paper is to analyze the potential and challenges of applying the systems approach to transform military logistics as an element of the armed forces development program. In order to achieve the main aim of the paper, the following operational objectives have been established: (1) to identify the structure of the military logistic system and the relationships among its elements; (2) to study the principles governing military logistics through analyzing the case of NATO and some of the Alliance member states; (3) to discuss the foundations of the operational capability based approach to transform and develop contemporary armed forces; and (4) to operationalize the systems approach to develop the capabilities of military logistics and to propose tools supporting the planning of the military logistic system development.

The analysis of military documentation and literature review were the main data collection methods applied to achieve the aim and objectives of the paper. The analysis of military documentation included NATO, U.S. and UK logistic doctrines and handbooks. Certainly, due to unlimited distribution of the study findings, exclusively unclassified materials were used for analysis.

2. The Military Logistic System

Military logistics is considered to be one of the functional areas of paramount importance for the contemporary armed forces due to the fact that providing operational troops with necessary supplies and logistic services is indispensable for the effectiveness of any military operation. In NATO, military logistics is defined as “the science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, the aspects of military operations which deal with: design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposal of materiel; transport of personnel; acquisition or construction, maintenance, operation, and disposition of facilities; acquisition or furnishing of services; and medical and health service support” [7]. In the national military logistics doctrines of NATO members states, the aforementioned definition is directly adopted (e.g. the United Kingdom [8]) or modified (e.g. the United States [9]).

In order to fulfill its mission during the peacetime, crisis and war, the military
logistics requires an efficient and effective logistic system. A military logistic system is defined as “a military organization following the principles of military art and management science, which consists of executive bodies, logistic units, installations and relationships among them. Such an organization aims at planning and executing the deliveries of supplies as well as rendering services to the troops” [10].

There are three main criteria to identify the elements of a military logistic system: the logistic function, the category of elements and the type of organizational structure where logistic resources are allocated. First of all, the following key logistic functions are enumerated: supply, logistic services, maintenance, movement and transportation, engineering, medical support and contractor support. Certainly, some minor differences between the nations, and even within nations, are observed (cf. Table no. 1). Nevertheless, the aforementioned elements make up the catalogue of core military logistics functions.

Table no. 1

<table>
<thead>
<tr>
<th>The comparative analysis of operational logistics functions</th>
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<td><strong>NATO</strong></td>
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<td>Services</td>
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<td>Logistic Information Management</td>
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<td>Materiel</td>
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<td>Equipment Maintenance and Repair</td>
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<td>Movement and Transportation</td>
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<tr>
<td>Infrastructure Engineering for Logistics</td>
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<tr>
<td>Medical Support</td>
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<tr>
<td>Contractor Support</td>
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<td>Host Nation Support</td>
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The theory and doctrine of the Polish military logistics enumerates the subsystems of the military logistic system which correspond with the logistics functions in NATO and the United States military. In accordance with the Polish approach, a military logistic system consists of the following subsystems: management, supply, maintenance and recovery, movement and transportation, medical and military infrastructure. The management subsystem is responsible for planning, organizing, coordinating and monitoring the activities of military logistics. The supply subsystem provides the troops with material supplies and logistic services. The maintenance and recovery subsystem is to ensure the technical efficiency of the military equipment. The movement and transportation subsystem is responsible for
planning and organizing the movements of troops and the transportation of supplies, ensuring smooth traffic on the transportation network and movement control. The medical subsystem deals with the medical evacuation, medical treatment and providing medical supplies within the area of operation. The military infrastructure subsystem is to maintain military facilities for the purposes of billeting, warehousing military supplies, training troops etc. [11].

The military logistic system includes the following elements: (1) military units and subunits (supply, transportation, recovery, maintenance and medical units), (2) stocks of military supplies of various classes, (3) military infrastructure (warehousing, transportation, maintenance and medical facilities) and (4) transportation means [12]. Logistic resources and capabilities are allocated in the following types of organizational structures: (1) deployable logistic units supporting the troops with supplies, providing them with maintenance and recovery services and movement and transportation capabilities, (2) in-place elements of military logistics and (3) the resources of the national economy supporting the military logistics systems and providing the host nation support to sending nations [13].

The elements of the military logistic system are linked to each other with three following types of relationships: (1) hierarchical relationships between superiors and subordinates; (2) functional relationship between the elements of the same subsystem (e.g. supply, movement and transportation etc.); and (3) cooperation and coordination relationships [14].

Summing up, the study of military logistics from the perspective of the systems approach highlights some of its characteristics and points out consequences. First of all, the military logistics should be perceived as a system, which consists of subsystems (logistic functions). Secondly, the military logistic system is an element (subsystem) of wider systems (e.g. the NATO logistic system, the national military system etc.). Thirdly, the methods of rationalizing the military logistic system (e.g. standardization, codification) may be identified and applied in practice. Fourthly, applying the systems approach supports problem solving within the field of military logistics [15].

3. The Principles of Military Logistics

The structure of the military logistics system and all processes within the system are determined by the principles of the military art. Referring to the study by Polak [16], Jałowiec [17] supports the opinion of Nowak [18] who claims that the following principles of the military art are of predominant importance for the military logistics system:

- aim of the logistic support;
- concentration of logistics efforts;
- economy (using only those logistic resources which are necessary for the effectiveness of operations);
- maneuver of logistic troops and resources;
- coordination and cooperation (both within the military logistics system and with the elements of its environment.

The analysis of doctrinal assumptions of NATO and its member states points out the differences in identifying principles governing military logistics. The NATO Logistics Handbook enumerates the following logistic principles [19]:

- collective responsibility of NATO authorities and nations for logistic support;
- delegation of authority to a NATO commander;
- primacy of operational requirement;
- cooperation with all parties involved in providing support;
- assured provision of logistic resources;
- sufficiency;
- efficiency;
- flexibility;
- visibility and transparency.

The NATO logistic principles highlight the importance of responsibility, authority
and cooperation among the logistic systems of allied and partner nations as well as all organizations contributing to the logistic support of the forces. The U.S. publication on joint logistics provides the catalogue of principles of logistics including [20]:

- responsiveness (“providing the right support when and where it is needed”);
- simplicity (including “clarity of tasks, standardized and interoperable procedures, and clearly defined command relationships”);
- flexibility (“the ability to improvise and adapt logistic structures and procedures to changing situations, missions, and operational requirements”);
- economy (“the minimum amount of resources required to bring about or create a specific outcome”);
- attainability (“the assurance that the essential supplies and services available to execute operations will achieve mission success”);
- sustainability (“the ability to maintain the necessary level and duration of logistics support to achieve military objectives”);
- survivability (“the capacity of an organization to prevail in spite of adverse impacts or potential threats”).

The logistic doctrines of the U.S. Army adopt some of the principles from the Joint Logistics publication (e.g. responsiveness, simplicity, economy, survivability) and they mention some new principles such as: integration of all supporting elements, anticipation of operational requirements, continuity of support and improvisation in unexpected situations) [21]. The British doctrine publication on logistics in joint operations focuses the attention on: foresight (“the ability to predict and manage critical logistic constraints”), efficiency, cooperation, simplicity and agility [22].

In spite of differences in defining military logistics principles among the nations, the focus is given on providing necessary support for operational troops in order to contribute to the achievement of the overall aim of the operation. The principles embedded in the situational context of the armed forces establish the requirements for a military logistic system and they determine development directions of the military logistic system.

4. Capability-Based Approach to Develop the Armed Forces

As observed by Gen. Mieczysław Gocul, the Chief of the General Staff of the Polish Armed Forces, according to the NATO standards, the armed forces are transformed by the changes in operational capabilities. In the Polish Armed Forces, military logistics is enumerated among five areas of operational capabilities. The remaining capabilities include: command and control, intelligence, fires and non-kinetic effects, force protection and survivability. The operational capabilities are developed by changes in their functional components such as: doctrine, organization, training, material, leadership, personnel, facilities and interoperability (DOTMLPFI). The development of operational capabilities is planned and coordinated by the nominated organizers of the following functional systems: command and control support, intelligence, fires and non-kinetic effects, force protection and survivability, logistics, human resources management and training [23]. The model of the operational capabilities development within functional systems is presented in Figure no. 1.

![Figure no. 1 The model of the operational capabilities development within functional systems](image-url)
The development trends in operational capabilities are determined by both external and intra-organizational factors. An interesting analysis of the challenges for the Polish Armed Forces development is provided by Gen. Mieczysław Cieniuch, the former (2010-2013) Chief of General Staff of the Polish Armed Forces. In his paper, Gen. Cieniuch discusses political, military, economic, demographic and climate trends in the macro-environment. The analysis constitutes a basis for defining the challenges and requirements for the contemporary armed forces. Moreover, Gen. Cieniuch identifies and studies the key areas of the Polish Armed Forces transformation such as: the shift from the compulsory service to the fully professional armed forces (professionalization), the changes of command and control structures, education and training and the modernization of military equipment [24].

Certainly, there is a need to monitor the situation in order to identify any significant shifts in trends and discontinuities in the global and operational environments. Such an analysis in the context of recent conflicts in East Ukraine and Syria as well as defense budget austerities caused by the financial crisis is conducted by Maj. Gen. Anatol Wojtan, the First Deputy Chief of the General Staff of the Polish Armed Forces [25].

The process of operational capabilities development starts with the study of the operational environment and it encompasses identifying required capabilities, acquiring them and maintaining. In the Polish Armed Forces, the efforts to develop operational capabilities are coordinated by the Chief of the General Staff who integrates all the functional systems, sets priorities and de-conflicts the development of operational capabilities. The implementation of the concept of coordinators (organizers) responsible for managing functional systems enables the armed forces to achieve the synergy effects in the development of operational capabilities, both in the national dimension and in the NATO and EU frameworks. The roles of coordinators encompass planning, budgeting, allocating resources and monitoring the process of capabilities development [26]. In the field of military logistics, the Chief of the Logistics Department (J4) is appointed to be the functional system coordinator.

As regards the toolbox supporting the development of operational capabilities, the lessons learned (LL) system and the concept development and experimentation (CD&E) process should be mentioned. The lessons learned system enables the military to identify observations (capability gaps) and best practices, analyze them, plan and implement remedial actions, validate their outcomes and finally to disseminate the lessons. The LL system might be a very useful tool to implement continuous improvements triggered by small suggestions made by the troops who are direct beneficiaries of the military logistic system. The concept development and experimentation process supports the capability development by the project management based methodology to develop and test innovative solutions. Therefore, the concept development and experimentation process is recommended as a tool to design breakthrough and multidimensional innovations and to validate already existing concepts [26].

Summing up, systems changes in the contemporary armed forces are implemented through the development of operational capabilities within functional systems. Effective military logistics, integrated with combat and combat support functions is an indispensable element of any armed forces. Therefore, the development of military logistics capabilities should be studied from the systems perspective.

5. Development of Military Logistics Capabilities

The functional components (doctrine, organization, training, material, leadership, personnel, facilities and interoperability) are the areas of changes in operational capabilities. Table no. 2 enumerates the aspects of functional components which should be taken into account when planning the development of military logistics considered as an operational capability.
Table no. 2

**DOTMLPFI – the functional components of the operational capabilities of the armed forces**

<table>
<thead>
<tr>
<th>Functional components</th>
<th>Aspects to be considered (questions)</th>
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</table>
| **Doctrine**          | Are there relevant doctrines and procedures in place (joint, service, agency doctrines)?  
                        | Do existing doctrines and procedures require to be updated?  
                        | If no doctrine or procedures are in place, do new doctrine or procedures need to be developed and implemented? |
| **Organization**      | Do the elements of the military logistic system have properly set missions, roles and responsibilities?  
                        | Are there organizational structures adjusted to the assigned roles and responsibilities? (“strategy determines the structure”)  
                        | Do organizational values, priorities and culture contribute to the success of logistic organizations?  
                        | Do logistic organizations have enough resources (human, material, financial, informational) allocated to perform their duties properly? |
| **Training**          | How is training organized for the military logistic system?  
                        | Are training programs coordinated with operational needs and HRM?  
                        | How are training outcomes measured and monitored?  
                        | Is logistic training delivered effectively and in a timely manner?  
                        | Is logistic training properly staffed, funded and supported?  
                        | Are the logistic troops trained sufficiently to perform properly their roles and responsibilities?  
                        | Are the logistic lessons from training, exercises and operations identified and learned through effective lessons learned processes? |
| **Material**          | Are the logistic troops equipped with adequate (up-to-date) systems and equipment?  
                        | What are the required functionalities of new systems and equipment?  
                        | Who would be the primary and secondary users of new systems and equipment?  
                        | Can increases in performance be achieved without development of a new system? |
| **Leadership**        | Have leaders established the conditions for effective cooperation, coordination and communication with external organizations?  
                        | Are the leaders of logistic organizations trained adequately to perform their functions and implement changes?  
                        | Is the leadership team aware of determinants, drivers and barriers to develop the military logistic system? (including both external and intra-organizational factors) |
| **Personnel**         | Are there enough personnel to handle the workload?  
                        | Do job descriptions accurately reflect tasks of logisticians?  
                        | Do logistic personnel meet the requirements of job descriptions? |
| **Facilities**        | Is the logistic infrastructure (warehousing, transportation, maintenance and medical facilities) in adequate condition?  
                        | Is the access established to roads/rails/ports and routes of supply in order ensure the freedom of movements?  
                        | Do logistic units have enough resources and support to establish field infrastructure? (e.g. engineering support) |
| **Interoperability**  | Are military technologies, logistic systems and equipment interoperable with allies?  
                        | Are the logistic procedures interoperable with allies?  
                        | Is the logistic personnel trained and prepared for cooperating with allied logistic systems and troops? |

Source: Adapted from *Joint Analysis Handbook*, (Monsanto: Joint Analysis and Lessons Learned Centre, 2007), 43-44. Customized to the context of the military logistic system by the authors of the paper.
The implementation of changes in functional components should cover all the functional areas of the military logistic system. In order to plan and de-conflict these changes the matrix of logistic functions and operational capabilities components (Table no. 3) is recommended to be applied.

The matrix of logistic functions and operational capabilities components

<table>
<thead>
<tr>
<th>Military logistics subsystems (functions)</th>
<th>Functional components of operational capabilities</th>
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<tr>
<td>Logistics management</td>
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<td>Supply</td>
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<td>Maintenance and recovery</td>
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<td>Movement and transportation</td>
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<tr>
<td>Military infrastructure</td>
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<td>Medical support</td>
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</table>

The military logistic systems is considered to be one of the functional systems of the armed forces. It means that interdependencies with other functional systems should be taken into account when planning and implementing any changes within the military logistic system. Simultaneously, the changes in other systems and their influence on logistics need to be analyzed. In order to identify these relationships, the matrix of interdependencies between armed forces functional systems (Table no. 4) is recommended to be applied as a tool supporting the analysis.

The matrix of interdependencies between the armed forces functional systems

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<tr>
<th>C2</th>
<th>Intelligence</th>
<th>Fires</th>
<th>Protection</th>
<th>Logistics</th>
<th>HRM</th>
<th>Training</th>
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<td>Intelligence</td>
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Following the systems approach to transform military logistics sets some requirements. Firstly, all functional components should be considered when planning the development of the operational capabilities of military logistics. Secondly, the changes are to encompass all subsystems (functions) of military logistics. Thirdly, the holistic view is needed to analyze the development of the logistic system in the context of the armed forces transformation, focusing on interdependencies transformation between the changes in the area of military logistics and other functional systems.

6. Conclusions
The aim of the study was to analyze the potential and challenges of applying the systems approach to transform military logistics as an element of the armed forces.
development program. First of all, the structure of the military logistic system has been identified and discussed. Secondly, the principles governing military logistics have been studied in order to point out the requirements for a military logistic system. Thirdly, the operational capability based approach to transform and develop contemporary armed forces has been considered. Finally, the systems approach to develop the capabilities of military logistics has been operationalized and the tools supporting the planning of the military logistic system development have been proposed.

The findings have established the foundations and tools for further studies on the role of the military logistic system in the armed forces development and interdependencies between military logistics and other operational capabilities and functional systems. In the next step, empirical research is planned to be employed in order to explore thoroughly and validate theoretical assumptions.

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