"HENRI COANDA"
AIR FORCE ACADEMY
ROMANIA

"GENERAL M.R. STEFANIK"
ARMED FORCES ACADEMY
SLOVAK REPUBLIC

INTERNATIONAL CONFERENCE of SCIENTIFIC PAPER
AFASES 2015
Brasov, 28-30 May 2015

LOGISTIC DECISION MAKING PROCESS INSIDE THE MILITARY ORGANISATION USING EXPERT SYSTEMS

Marius Milandru*

***Territorial Internal Audit Section No. 5, Brasov, Romania**

Abstract: *Inside military organisation, logistic's management has its' own architecture, it is made off structural elements, with functionalities which are directly related to their interpedencies and connections. From its components, an important role is being held by logistic decision subsystem, this being used at all levels, and which is characterised by dynamism. Logistic decision holds a central role inside management process; this has to be approached through conceptual delimitations and role, involving the existence of many alternatives in order to facilitate the efficient one. The artificial intelligence tehniques lead to utilize the ''expert'' systems in many domains and scopes, one of them is the logistic decision making process.*

Keywords: *military organisation, logistic, decisional subsystem, logistic decision, expert systems.*

1. CONCEPTUAL DELIMITATIONS RELATED TO LOGISTIC DECISION

The logistic decision subsystem is a component of logistic managerial system which represents the assembly of decisions taken inside, those being applied accordingly to objectives established by military structures and their managerial architecture.

Through logistic decision subsystem all the 5 specific functions of logistic management are used, the main percentage beeing held by prevision, this one could be found in all logistic decision processes.

The logistic decision subsystem can be compared with a command system which has the role of adjusting, correcting and streamlining the logistic activities inside any military structure at all levels (service branches, headquarters, brigades and bellow).

During peace time this represents a special complexity, the variety depending on the type, nature, characteristics and the quality of the decisions taken.

We can conclude that the logistic decision is the main component of logistic decision process, a tool through functions of logistic management could be trained. In practice, logistic decision can be compared or equate with a standard formula, this being adequated to concretely situations of military logistic domains during peace time.

Inside military organisation, in relation with other types of organisations, logistic decision becomes the action which reunited material, human, financial, informational resources with specific character, in order to accomplish military objectives and tasks.

Brigades and bellow units unfold their activity under the influence of events, with diverse frequence and types, which are not all,

become logistic decision problems but can be solved in a certain way. So that an event could to become a logistic decision problem, it has to fulfill the main condition of obtaining the same result using different paths with different characteristics.

Inside any military structure, appearance of logistic decision problems will be generated by the following situations:

-the situation in which disruptive factors created an imbalance between operational and functional subsystems with negative results in achieving logistic objectives and its mandatory to reestablish the system functionality at standard parameters;

-the situation in which it is a balance between those 2 subsystems in order to realise the proposed logistic objectives but where the manager wants high class performances.

The diversity and complexity of decisional problems which have to be solved by logistic managers ask for a systematization related to certain criterias or elements.

Criterias are different but all have a same common element which is to "order and make easy decident work". The diversity of systematization criterias of logistic decision problems determined different points of view regarding their hierarchy, phenomenon explained through their way of approach and criteria's importance.

The systemic approach of military organization allows grouping of logistic decision problems according to those three essential components of functioning: inputs, logistic processes, outputs. System inputs are related to marketing, suppling and transportation functions and are referring to material resources, procurements and their quality.

The logistic processes which are taking place inside brigades and bellow structures determin a great number of decision problems, with a high degree of complexity.

The outputs generate various decision problems which are related, mainly, to: quantities of goods and services which have to be ensured, maintenance services, medical assistance.

The systematization of logistic decision making process, according to some criterias, represents a special importance, because, it is related to some characteristics as: information volume and structure, the methods of using information and the decision of taking courses of action, indicators' system (estimates) for analyzing consequences and results.

Establishing systematization (evalution) criterias and logistic decision frame is a complex problem, influenced by multiple effects when it will be materialized.

For example, taking a decision related to procure and use a more performant medical equipment than those which are already in use, can be framed inside the group of "technical decisions", but during equipment using and exploatation can be obtain effects that will determin achievement or increasing performance indicators.

Using the equipment can lead to social effects, especially if it has new and upgrated technologies integrated, which will ask for high qualification of medical personnel through different courses. Of course, the problem can be solved through supervising of the decision in a group with similar effects.

From the data presented above it results that, in most of the cases, the logistic decisions inside military structure could have triple dimension: tehnique, financial – economical and social one. Most important criterias and elements which are used to group logistic decisions are: destination, hierarchically level of decident, problems which have to be solved, substantiation level, events asessment, decidents number, etc.

Present days, in logistic manager's activity, there are a great number of decisions based on empiric analysis or rough information which are available during logistic decision making process.

The scope has to be concordance between level of efficiency and numbers of superior decisions according to available resources. The activity of optimizing the report between the objectives established by the manager and the available resources has to be done sequentially, according to each military logistic domain.

The activity of training in logistic decision process has three levels: organisational, informational and methodological.

The evolution of Romanian society, of military organisation and also of national and regional security environment, determines the process of taking the logistic decision to fulfill some requests.

They are mandatory in order to achieve, efficently, all those functions related to the domain where they are issued.

2. USING THE EXPERT SYSTEMS IN THE PROCESS OF TAKING DECISION

The theory of systems and systemic thinking and also their conceptual delimitations determin disputes, contradictions and evolutions in all scientific domains (mathematics, astronomy, economy, sociology, military science).

The apeareance of systemic thinking was tied with the process of thinking; even from antiquity Aristotle gave a definition, whose quote was "the whole is greater than the sum of its parts".

Ludwig von Bertalanffy (1950) defines the system as "an assembly of elements which interact in order to accomplish a common objective using an assembly of material, informational, energetical and human resources".

The development of systemic thinking is almost similar with the evolution of society, of organisations, including military one, this being faster in evolution than other because of economical activities intensification and also because of I.T. technological revolution**.**

The system, in especially literature, is defined as "*mass of identifiable and related components and conections which evolv according to laws, and / or plans and / or established tasks*" or "*an assembly composed of parts each of them having its own laws and partially independently"*, *[Arsac, J. Informatics, Romanian Encyclopedic Publisher, 1973, p. 179.]*.

Inside the military organisation, the logistic management has its own architecture, being made of structural elements, its functionality depending directly on interdependencies and connections between them.

The evolution of technology in I.T. industry is very fast, the bound from one to another technical generation being realised in short periods of time. The I.T. systems performances grow from one year to another, sometimes much faster, so one could say that artificial inteligence is characterized by a continuous dynamic.

Once since the I.T. has appeared, especially the computers, a new word has been created "the artificial intelligence", which is part of information technology.

The natural and also artificial intelligence have at their bases processes, mechanisms and logical reasonings, the difference being that the artificial inteligence can reach maximum performances, results and established objectives can be realised in optimal times.

The appereance of artificial inteligence was immediatly after The Second World War, and was related to fascination or curiosity and concretized through creation of some programs which could resolve puzzles or play some games.

After that, those programs were upgrated and were necessary to add more knowledge, rules, theorems, which lead to resolving and demonstrating complex problems.

An important period of developing the artificial intelligence was between 1965-1975, when some equipments, named "machines", through their programs, could understand the natural language (ELIZA an PARRY programs) for example: dialogues or tales even simulations.

The most important period was the evoluated expert systems period when artificial intelligence becomes more lucid,

more critical with itself even more pragmatic, for the first time appearing efficient expert systems, these being utilised in industry (XCON was used for configuring some calculation systems).

From that moment the evolution was continuous, exploating the artificial inteligence in order to acumulate more knowledges, to make judgments and logical processes, to take decision and leading some material processes and of course cooperating with human factor through a common language, realising interaction between expert system and user.

We can say that expert systems are components of the artificial intelligence apllied to economical, technological processes and also to management, to financial mechanisms or statistics.

The expert systems represents high complexity programs which incorporates high level knowledges, using the human experts background in a multitude of domains, some of the programs being used to resolve complex problems or to obtain performant solutions or results.

The architecture of expert systems represents a general structure of artifical intelligence systems with some particularities which derive from representation modes, knowledge organisation and utilisation for expert aplications *[Marian Zaharia, Claudia Cârstea, Liana Sălăgean, Artificial inteligence and expert systems in assisting economical decisions, Economic Publisher, Bucharest, 2003, p. 33]*.

In the case of using the expert systems in decision taking process, only the identified problems will be used, these problems have to be very clear and well issued; the scope of resolving is to obtain a result for each unknown.

These parameters will be obtained as a result of a logical reasoning, from where will depart, using the bases of a logistic problem, taking into account the situation, thus a conclusion will be drown.

The mechanism used for unwinding the reasonings is the engine of interferences, this being the fundament of any expert system.

An example of expert system for assisting the decision process is *VB-Expert editor,* which has a text editor used from 2 menus: main and consulting one. If the selection is made from main menu, the user will point the file name which has to be edited.

When it is started, *VB-Expert* editor will functioned as a normal text editor where the user can use specific commands to edit, through functional tastes.

In the case of logistic decision, when data are introduced, it has to follow some steps:

- the introduction of data related to legal aspect and specific rules (as organisation, table of equipments);
- the scope of analysis;
- the establishing of the logistic situation (risk, certainty, incertainty);
- establishing criterias (including those for performance);
- establishing the rules and the clasification matrix;
- the introduction of questions which system will have to answer;
- finding the optimal decision course.

This type of expert system can be used especially in the resources domain, supply and ressuply and also in transportation field where logistic decisions are required to be performant and optimal.

Another example of using the artificial inteligence is the utilising of some programs as Excel, through it can be created optimal conditions for each criteria (tastes through we can select the options of maxim and minim with implications in data processing).

4. CONCLUSIONS & ACKNOWLEDGEMENT

Mathematic and economical models as tools of aquiring knowledge, used through decision making process has to be done taking account different factors interactions and the final result will be a comparison between proposed and realised objectives / tasks.

The content is changing, during military units activities, lead to a logistic decision process with a dynamic character and a continous training.

Utilising the expert systems in logistic decision process can be seen as a modern method of optimising activty, because of the

fact that it offers the posibility of upgrating the decision act and initiate premises of obtaining a high performance status through:

-realising a focus of decision activity;

-identifying the ways of implementing adequate decision;

-can be considered as base for continuing the increase of decision processes quality;

- facilitate the control of logistic processes.

This paper has been financially supported within the project entitled "Horizon 2020 - Doctoral and Postdoctoral Studies: Promoting the National Interest through Excellence, Competitiveness and Responsibility in the Field of Romanian Fundamental and Applied Scientific Research", contract number POSDRU/159/1.5/S/140106. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. Investing in people!

REFERENCES

1. Arsac, J. *Informatics, Romanian Encyclopedic Publisher,* Bucharest, *(1973).*
2. Minculete Ghe., Vasilescu M., *Logistics management during peace time*, Bucharest, Muzeum Publishing House, (2002).
3. Minculete Ghe., *Service and support management elements,* Bucharest, National Defense University Publishing House „Carol I", (2005).
4. Minculete Ghe., *Modern approaches in logistics management*, Bucharest, National Defense University Publishing House „Carol I", (2009).
5. Răduț N., Bujor E., *Logistics bases and tehnical support of military operations,* Bucharest, Military Tehnical Academy Publishing House, (1998).
6. Niculescu O., Verboncu I., *Management and efficiency,* Bucharest, Nora Publishing House, (1994).
7. Zaharia M., Cârstea C., Sălăgean L., *Artificial inteligence and expert systems in assisting economical decisions,* Bucharest, Economic Publisher, (2003).