The role of the information system "Bulgarian army logistics" for material storage in Bulgarian armed forces

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***Abstract*—: The information system " Logistics of the BA" (IS 'Logistics" of BA) is built in accordance with the Conception for Information Strategy of MOD referring to C4I systems ensuring the necessary compatibility with the systems of the other countries members of NATO. IS Logistics of BA is an integrated system. It is a complex and an instrument to manage and execute all the ordered movement with the material resources, including automated registering of all the accounts sheets in a previously set accounts module. The concrete benefits for the warehousing in BA are specifically in the spheres of: introduction of the Bar Code technology, and also in relation to the amount of data reports pertaining to the basic and additional parameters of the material resources- the object of safe-keeping.**

I. INTRODUCTION

The information logistics presents an integral part of any logistical system, providing the functional area of the logistical management. The object of the information logistics are the information flows, reflecting the movement of the material, financial, and many others (operations) activities, related to the logistical support.

The information flow is generated by the material flow. Processing logistics information is the basis of material flow management. A necessary condition for the coordination of all the units of the logistical system, turns out to be the existence of an information system, which should be capable, to give, quickly and economically, the right signal, directed to the right point, at the right moment.

The existing logistics system of the Bulgarian Armed Forces includes management structures, logistical structures, infrastructure and transport communications, as well as, the the sequential order, forms and principles in all activities concerning logistical support, and finally, it also involves the communication and information systems.

In MOD and BA, they aim at developing a common informational environment, which has to be viewed as an integral part of the process of transformation. A part that will ensure the effective functioning of the command and management systems. [1] BA is already working on projects, concerning the automation of management activities and also aiming at the improvement of the informational support. Upon finalization of these projects, we will have a common information environment, and will be able to minimize time and resources spent in processing documentation. So far, what BA has developed and has been using, is based on the available segments of the public network 'The Internet' and the departmental network "Automated Information System of the Bulgarian Army"(AIS of BA), which is used for sharing of classified information, giving opportunity for a number of common features (electronic mail, WEB, and other) to be used, as well as, giving an access to intranet departmental informational systems.

One of the main principles of logistics, is the requirement for clarity, as it is manifested through the access given, and by creating the automated system that gives account of the expenditures made, processes data and gives an easy way for sharing of information between the civilian and military structures in national and international environment of the logistics area of operation. [2]

Since 2011 in AIS of BA, we have the readiness to support an infrastructure using a public key, and maintaining all standard functions, based on digital certificates and the electronic signature.

Also a further development of the military messages exchange system by NATO standards has been planned, based on the standard electronic mail service in its full functional scope.

AIS will deal with estimate, estimate-analytical and reference information systems of individual and group information services of a large number of units of the BA. It encompasses more than 60 spots in the respective units. [3] The work on AIS is now focusing on the maintenance and exploitation of the already created infrastructure and subsystems on the one hand, and on the other - on its improvement and modernization. The existing infrastructure systems are partly sustained through outsourcing, on the basis of signed contracts with external firms.

The exploitation of the existing systems- the automated system for management "Human resources", the information system "Logistics", " Payroll department" "Documentation turnover" " Information rubrics', " Operative archive', " Observation and control system' and others, to a great extent, facilitate the administration of the processes, the management of information flows and the development and dissemination of accurate and timely analyses, that will assist in the taking of management decisions.

II. CHARACTERISTICS AND IMPORTANCE OF IS "LOGISTICS OF BA".

The information system" Logistics" is an integral part and a subsystem to the logistical support in the armed forces.

One of the main requirements for the logistic system to be effective, is the existence of an information system, that will allow all the activities involved in the planning, contracting, supply, transport, storage and the rest of the logistical activities, to be combined together and managed according to the common logistics principles.

The information system " Logistics of the BA" (IS 'Logistics" of BA) is built in accordance with the Conception for Information Strategy of MOD referring to C4I systems ensuring the necessary compatibility with the systems of the other countries members of NATO. The project aims at fulfilling the requirements for building a modern information system, which will ensure: [4]

- improving the efficiency of management of logistics support

- increasing opportunities to integrate with the other NATO members armed forces

- providing actual info at actual time for material and financial resources in BA

- providing means for control and management of the processes in BA and MOD in real time

The system is designed to automate and optimize the work of the logistical structures, by providing timely and accurate reference and management information. By way of its component parts, it can be referred to as ERP last generation system.

Initially, the system was programmed to serve the logistical needs of the BA, but it has been provisioned for it to be able to widen its scope to include also MOD with regards to its structures for finance, planning, budgeting, and material resources procurement.

IS Logistics of BA is a web based system for monitoring, management, and control of the logistical and financial processes, where the customers find a centralized data base in servers, which save all the info for all the BA units. This info is not available at the regular working place of the customers or in the units.

The access of the users to the resources of the system is restricted. It is in close dependence to the specific functional responsibilities of the logistical bodies. At the same time, the system is entirely transparent and doesn't allow abuse, or fraudulent actions on the part of the users. As soon as it starts an operation with material resources, it becomes visible to the users who are allowed access to it.

IS Logistics of BA is an integrated system. It is a complex and an instrument to manage and execute all the ordered movement with the material resources, including automated registering of all the accounts sheets in a previously set accounts module.

This system uses Oracle Applications and Oracle Database, adapted for the military. In the different functional modules of these software products many world recognized practices are applied (logistical, accounting, planning, contest announcing, collecting offers, conducting auctions and others) and the ways these are carried out.

The development and implementation of *IS Logistics* of BA starts in 2003 with a pilot project. It is funded by the Program for foreign financing in the military (FMF). An agreement memorandum and subsequently letters of intentions and requirements to the system have been signed between the MOD and the Office of Military Cooperation of the American Embassy in Bulgaria.

The executive person of the project is the American company Unisys Federal Corporation, with sub-executives the Bulgarian firms Solutions Ltd.- one of the leading firms, implementing solutions on the basis of ERP software from the world recognized business software suppliers- Oracle and Microsoft. The project has been carried out under the surveillance of TSIO (Theater Systems for Information Office) attached to NATO, and together with Manifold Corporation.

The execution of the pilot project will go through three stages:

Stage1: (2003-2005). During this stage, the main functional areas and work places in the units are developed, which were initially included in the Pilot Project of the Logistics Information system. A trial of the system has also been conducted under limited organizational and functional scope.

Stage 2: (2007-2009). During this period, the system software has been further developed, as the functions have been increased to include the greater part of the army logistical procedures. Users' feedback tests have been applied, which confirm the functional range and its correspondence to the applied document papers, as well as its performance. A six-month long laboratory test examinations have been carried out to find and remove faults in the system.

Stage 3: (2012-2014). This is the final stage to implement the information system in the military units of the BA and the MOD structures included in the project. Additionally, during this period the software is being improved, by gradually moving from 32 to 64 Bits version, the infrastructure is being built(communication points and work stations) in 10 more military units that will be included in the system. Also training of the personnel that will work with the system is being carried out. Test for the completion stage are also done, a final operation test of *IS Logistics* of BA, included in that number.

According to the signed memorandum, there is a provision for 12 months software maintenance by the person in charge of the execution of the project, and as far as hardware is concerned, the maintenance will be with respect to the warranty guarantees of the producer companies.

IS Logistics of BA presents a mechanism and ready-made procedures and algorithms of operation and management of more than 200 logistic and finance processes. The separate modules and the logistical processes are closely related, and work in a synchronized way while sharing the data needed. At every stage of the system operation, there are processes of managing the finances and managing the material resources reserves.

On a functional level the system comprises unified standard procedures and operational processes in the following spheres: planning, supply and delivery, storage and preservation; application and usage; management of the material resources; technical support; upkeep; individual object safekeeping; finance and accounts management.

Module *Planning* ensures the distribution of the financial means among the organizations, registered in the system, the development of a unified plan for material and technical support (UPMTS) and the drawing of the annual budget for each organization. The operational modes for

the completion of a number of activities are included in the planning module: statements for financial limits for programs or paragraphs, planning of material resources, munitions limits, usage of railway transport limits, limits for the disposal of the redundant material means and utilization, for the individual object safekeeping of the personnel and so on.

Module *Supply* controls the supplies made to the system from internal and external sources. By means of the logistics processes in this module, the accomplishment of the contract provisions and receiving deliveries is observed and controlled- as far as quality and quantity is concerned, as well.

Modules *Storage* premises and Fixed assets manage the stock and safe storage of MS (Material supplies) and FA (fixed assets) of the organizations, registered in the system.

Module Storage allows for a flexible structure of storehouses to be built, with its subdivisions of storehouses and location devices for them. The warehouses can be set to give balance and off-balance accounts sheet, and the average estimated cost of each material stock, is calculated automatically.

These modules cover all the working processes of MR and FA- registering the in-stock and out-stock, developing an inventory of assets, re-arrangement, culling and others. The accounts sheets are set for each separate logistical process and the system automatically registers the accounting data, produced by the material operations.

Module *Material Resources Usage* allows that all the resources used are monitored and registered with view to their target use as well./ to be spent or to be returned/. The systems makes it possible to work with practical an indefinite number of materially-responsible personnel, with the use of locators for that effect.

Module *Finance* ensures budget control and automatic accounts record of the financial and economic operations done in the system. This module works in close connection with the Planning Module, as it ensures the control and accounts statements of the financial resources respectively for the programs, paragraphs, and positions of common material plan of Bulgarian Army.

The information system has its own accounting modules, corresponding to the national and international accounting standards and assigns a unified accounts plan for all organizations, registered in the system. The accounts record data and the required reference data for each separate organization are available for control and examination by the higher ranking authorities at real times. The system keeps at its disposal, a wide number of reference and accounts record sheets, and some of these, on request, can be consolidated.

Also the system keeps a big number reference and accounts sheets used by the logistics structures in their work and they cover all the functions in the system.

IS Logistics of BA is founded on an hierarchical basis, based on its turn, on the chain of command of the BA. The system provides means for hierarchical units to be built, according to the set objectives. These units are built dynamically and can be altered with time.

In their scope a number of outside BA structures can be involved, if their activities are realized through the logistics system. At present these functions are realized through structures in the system.

This hierarchical structure also lies in the completed model for security of the system. The customers are allowed access according to their clearance and this access is in relation only to their own respective organizational units and sub-units.

The scope of the model depends on the scope of the pilot project, the customers, and the requirements for the cooperation of the system with outside systems. Defining the particular levels of interaction with the system through users interface, we can come down to the following:

- Participants- organizational units (departments, units, command structures), interacting with the system.

- Work places- there will be a few work-place in each organizational unit, each with a range of defined separate functions to which there is an access.

- Users- any work place, but it is not recommendable to be used by several users, since each one has a defined range of functions they have access to. One user can be authorized to deal with all the functions for this working place, or a part of them.

The requirements for information access for the different levels of the armed forces structures, are also different with respect to the range of data access and functions performed. The data access is based on the principle that from each organizational unit, the subdivisions data record can be tracked, down the hierarchical chain. The high level users in charge of one type of MR (material resources), can track down those particular items of MR down the chain.

The system users are the officials, authorized to work with *IS Logistics* of BA.

From the users point of view the interaction with the system depends on what report data goes in, and what results come out. Users of the systems will be: commander; accountant; MR officer; SPC Technical support; SPC Military Assets; materially responsible officer/MRO/ of the military store, Application Administrator; System security Administrator and Database Administrator.

Towards the end of 2013, the basic tasks of Stage 3 were completed and trial implementation tests of the system were done, which tested its: functionality, the configuration of the system, developed benchmarks, the system operability. The system operation performance was checked with different numbers of users and a particular number of trial situations in operation mode.

A test, establishing a standard, was conducted. It tests the time needed for the system to respond to queries from different locations of the transfer area. Also a final operative test was done, testing the system in real production environment, through manual execution of a certain number of scenarios.

Confirmation trials show that after some improvements to the software have been done, it works properly and ensures the automated logistics management.

IS Logistics of BA will considerably improve the logistical work in the Bulgarian army and MoD, in all aspects, and will allow management decisions of every character and level to be made- strategic, operative, tactical. The existence of such a system, is also one of

NATO requirements for the further development of our armed forces.

The system will provide timely information for the in stock material resources, needed by the army. It will be useful for the management personnel on strategic and operative levels.

The realization of a project of such a scope holds a lot of difficulties, though. Many people do not grasp its importance, and also do not understand the system in its essence and objectives. It's very hard to part with old habits and work methods, established in the past decades. The problem with the lack of well-trained staff for the realization of the project is also an issue. The motivation of the personnel is not up to what it should be, mainly, due to the fact that together with the work on the implementation of the system, they are to manage the logistical functions for the army, as well.

There is no other alternative, but to develop the *IS Logistics* of BA. The opposite would mean that instead of going with the flow in the era of super fast speed and information exchange, we have chosen to go back to the stone age. At present, everything comes down to persistence, hard work, and the governing will to train well-prepared and motivated staff. A lot of hard work should be done, in order to accomplish the assigned tasks.

III. ANALYSIS OF THE BENEFITS OF THE APPLICATION IS LOGISTICS OF BA FOR THE STORAGE IN BA.

The expected benefits of the systems are great, since the investment put is considerable. While defining the systems' characteristics, some of these benefits have already been outlined; such as real time information, allowing for better management decisions to be made, and paperless exchange of information.

As a result of the research made, certain conclusions referring to its benefits can be made: [5]

- Improvement of the army organization and management related to materials' supply and services provided
- Optimized reserves management, leading to prevention of surplus storage of stock
- Improved organization and accountability of storehouse goods- in all areas- provision, equipment, munitions and so on.
- Opportunity for better planning and better realization of supply refreshment
- Information assisted auctions and contract agreements
- Optimal finance control of operations with materials and services.
- Better options for the command staff to control the storehouse access.
- Unified names for materials and services in BA and their compatibility to other coding systems, for instance NATO Stock Number
- Providing ways for data transfer with other NATO systems.

These benefits, so outlined, apply to the whole logistics system in the BA. It will be useful, however, to examine also the concrete benefits for the warehousing in BA- specifically in the spheres of: introduction of the Bar Code technology, and also in relation to the amount of data reports pertaining to the basic and additional parameters of the material resources- the object of safe-keeping. [6]

First, the barcode technology is to be introduced. This is a technology that has been in use for 58 years. It was originally patented on 7th Oct,.1952 after the names of Joseph Woodland and Bernard Silver. Initially the barcodes were used for car labeling, but they didn't get universal recognition until the grocery stores and later supermarkets, started to use them, which drastically speeded the service to the customers. Barcode technology has been constantly developing and today we can find different systems for coding with different symbols. Their mass utilization helps considerably the business processes connected to the tracking of stock, sales, sending and tracking packages etc.

The usage of barcodes is provisioned in IS Logistics of BA, only for some processes, namely: barcodes with continuous access and bar codes with non-continuous access. All MR(material resources) in the project input, are an object of identification according to EAN (European Article Numbering) standard and have to have identity numbers. Trade item are identified by EAN number / supplier, client, carrier, firm/, logistic units/containers / and locations. Each trade item is coded by GTN/ global trade number/, which has 14-digits code structure, which allows us to distinguish between single items, packets, and container/pallets, that is, it covers all levels of packaging. The code scan gives information for the features in several data sheets. Such as, for example, in the software the system uses, several data will be filled in: item name, shipment number, quantity and measurement figures.

With applying **the continuous access barcodes**, the software makes it possible for the processes to be managed by means of bar code devices. To use them, some conditions should be fulfilled: the material object should be registered by its barcode in the system, and there should also be a connection between the manufacture barcode and the MR in the nomenclature storehouse. To work with barcodes we need to build a communication structure. For this purpose a network should be developed, with storehouse scope, and also to buy particular barcode devices, combined with barcode printer.

The processes where this new technology can be applied are as follows:

- In-put of MR with barcode read
- Check for ramp correspondence
- Management of containers and ID labeling
- Allocation of subdivision storehouses- zones, coding of locators
- Partial and complete inventory
- Tracking of validity and expiry terms of MR
- Packaging and parceling
- Preparation, assembling and loading of shipment and others.

Using the non-continuous access barcodes, where there is no constant connection between the barcode read and the info system, it's necessary that the devices and the system, have a synchronization protocol. When a connection is established the system can work efficiently, because it receives the data needed. Such data are: a list of nomenclature for the particular storehouse, the ID of the

user of device, list of in-stock, as well as other information. After the device has been initially charged, it can be disconnected from the system and it goes to autonomous work mode. This makes it possible for the materially accountable person to carry out a number of warehouse activities, as the results are logged in the specially designed data base. The work finished in the autonomous mode, the materially accountable person connects the device to the centralized system again. It can be done out of the warehouse perimeter. After the synchronization, all the data in the mobile device are deleted, and it is ready, once again, to be initially charged.

Functional uses of barcodes with non-continuous access:

- Receiving stock from supplier

- Shipping stock to other warehouses in the system scope/ internal shipping/

- Automatic ID of labels

- Location control- with the creation of the necessary organization of the warehouses, the system will make it possible for data in-put, identifying the items' location in warehouse, by the use of barcode labels.

- Partial and complete inventory and others

In the second place, the information system can ensure for the storehouse management benefits in relation to the amount of information kept referring to basic and additional parameters of the MR- the object of safe-keeping.

Logistics information systems use different parameters to identify the stock and services through their entire life cycle, and they also differ in the processes used for identification and demanding for them- planning, purchase, delivery order, storage and preservation, exploitation, until they are waived of report.

The identification and specification of the basic and additional parameters of the material resources and services, together with the respective business processes, is a key point in the development of any logistic information system, as this classification, although theoretical, gives a clear idea of the extent of use of those parameters in a given functional environment and the processes involved.

It's necessary to distinguish between the following parameters: Type MR; Nomenclature N in BA; Name; Declared manufacturer; Nomenclature number of manufacturer; Substituting stock; Measurement figures; Quantity; Category of MR; Cost.

The parameters of the material resources should be viewed with respect to the desired functionality of the information system, and in relation to their connection to the NATO systems for classification and coding, namely:
- **in connection with the processes of planning and management of deliveries**: packaging type; physical proportions; weight; place of delivery; time of delivery.

- **in connection with the processes of storing and preservation of material resources**: delivery date; manufacturer/supplier; manufacture date; validity period; shipment number; serial number; conditions for storage and preservation, assigned by manufacturer, period of preservation at storage, assigned by the manufacturer, period of preservation at field conditions, assigned by manufacturer, storehouse/place of preservation; coordinates in store; actual conditions of preservation/ type conservation; date of preservation/conservation; period of preservation/conservation.

- **in connection to the processes of exploitation**: conditions of exploitation; maximal technical resource; period of technical servicing; type of technical servicing; actual conditions of exploitation; processed resources; technical condition; technical resource until next technical servicing.

IV. CONCLUSIONS

On the basis of the research done, we can conclude:

- The application of IS Logistics of BA holds a number of **hazards**, too; insufficient amount of nomenclature material stock in data base; not enough data about parameters and features of MR; out-of-date data base; incorrectly assigned users of the system- necessary officials not involved; key users not determined; commanders not involved; officials responsible not involved; no provision and delays in the technical implementation of the system; insufficiently trained users; interruptions of project development due to financial reasons.

- **Main benefits** of the implementation of the system for the Bulgarian armed forces: improvement of organization and management of supply; optimal reserves control; improvement of store-house organization and accounts reports; opportunity for better planning and realization of the refreshment of reserves; information assisted auctions and contract talks; full financial control of operations; better command control on the warehouse access; summed and detailed information about all logistics and financial operations; unification of names of MR and services and correspondence to foreign coding systems; ensured data share with other NATO systems.

- **The concrete benefits** for the storehouse management of BA are: the use of the barcode technology; the upkeep of full data base about the MR parameters at preservation; real time information exchange; generated information flows for the needs of control and management.

We have to conclude here, that the establishment and structuring of a data base, the accurate determining of the users of the system, as well as, the timely and accurate information for the supplies in stock and the demands, for the factual progress of material flows, can reveal the whole potential of the IS Logistics of BA, and the real benefits it brings for the warehouse management of the BA.

The matter of how useful it is, will yet to be confirmed and reconfirmed in the years to come, when it is going to still bring more new benefits for the management of the warehouses of the Bulgarian army.

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