

“PUSH” AND “PULL” SYSTEMS IN SUPPLY CHAIN MANAGEMENT. CORRELATIVE APPROACHES IN THE MILITARY FIELD

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The increase in economic, social and security risks is currently determined by the resource crisis on the one hand, as well as by the economic competition and global military challenges on the other hand, which amplifies instability and jeopardizes the viability of inter-state relations at global level. In these circumstances, the complexity of the economic and military environments determines company managers and military leaders to act by way of “push” and “pull” systems in order to make their own logistic activities more effective, in view of attaining their projected strategic objectives. In the current article we try to briefly address the “push” and “pull” systems within the Supply Chain Management, setting off from the concrete demands of consumers/users in the economic and military fields.

Key words: *supply chain management; “push” strategy; “pull” strategy; “feel and respond” logistic model; supply; resupply; logistic transports.*

1. GENERAL ELEMENTS REGARDING THE “PUSH” AND “PULL” SYSTEMS WITHIN THE SUPPLY CHAIN MANAGEMENT

The business terms “push” and “pull” have their origin in the logistic management and in the (logistic) supply chain management, but they are also used in marketing on a large scale [1].

In view of developing the “push” and “pull” terms, the first research used as reference is the one conducted in 1982 by Richard J. Schonberger in one of his first published books which approaches the “Japanese Manufacturing Techniques”, having as an amazing subtitle: “Nine Hidden Lessons about Simplicity”. Hence, he

was one of the first American researchers who focused on the “Japanese method” to produce consumption goods, which was assumed to be very competitive [2].

The expert Schonberger made a distinction between two contrary modes of production which constitute the origin of the application of the “pull” and “push” concepts, as follows: the Western “Push production system” which is in fact based on the planning of material resources mechanism and on the manufacturing resources planning philosophy; the Japanese “Pull production system” which includes the KANBAN logic control technique in conjunction with the principles of the “Just-in-time” concept (JIT) [2].

In business practice, a “push-pull” system describes the movement of a

product or related piece of information between two subjects. Thus, on the market the consumers usually "pull" the goods and pieces of information adequate to their demand in order to satisfy their needs, while offerers and suppliers "push" the required products/services toward consumers/customers. In the logistic and supply chains, both push and pull modes usually functions, in order to supply toward customers the demanded products and services [2].

In the field of marketing, a "push" strategy is used when the development and improvement of a new product, unknown to consumers/users, existed. In the situation where no consumption demand for the product to be launched was noticed, the product and the related information are "pushed" toward the consumer through distribution and promotion. Due to the asymmetry of information, producers permanently act in support of consumers/customers in order to reduce the pack of information with regard to the products and services being offered [3].

The Supply Chain Management based on the "push" mode is characterized by the fact that products are "pushed" through distribution channels from production to retailers. The producer establishes the level of production in accordance with the quantities recorded in the historical orders issued by retailers. It thus results that a longer period of time is required for a supply chain based on the "push" system to meet the changes in demand, which may lead to increased stocks or blockages and delays (due to unacceptable services and obsolescence of products) [4].

In the practice of relational marketing, the consumer demands the product suitable to the "pull" systems and he "pulls" it through the distribution channel. For example, a large vehicle manufacturing company produces the make or makes launched

on the market when they were ordered by customers. Thus, in these conditions the application of the "pull" system within the supply chain is explained by: increased uncertainty of demand on the market; production and distribution are led by demand; lack of stocks due to the adequate response to specific orders; decrease of the time to run the business etc [4].

In a Supply Chain Management based on the "pull" mode, purchasing, production and distribution are led by demand, so that they are coordinated by the actual orders of the customers (compared to the anticipated demand mentioned earlier).

On the basis of the aspects emphasized in the case of the "pull" system, if we have in mind the suppliers necessary to a company whose products are demanded by customers on various markets, we must keep in mind the specific relations within the supply chain pertaining to the procurement of the materials required by the production process. Thus, within this functional mechanism, the suppliers in the supply chain get involved in managing the stocks of the producing company, with which they have normal legal and business relations, by using the stock managed by the supplier system [5]. To this end, the producing company transmits to its suppliers information with regard to the actual demand, the situation of its stocks, other logistic elements etc. The obtained information allows suppliers to intervene at the opportune moment to complete the stocks (by sending advices of delivery). Following this procedure, the expected positive economic effects emerge within the producing company, making reference to the reduction of: the duration of the projected production cycle, the number of employed personnel, the level of total costs. At the same time, the precision within the logistic chains increase through

the concretization of the economic fluxes: inputs - conversion - outputs - distribution - complete satisfaction of consumer/user requirements [5].

In **Figure 1** a simple mechanism acting within a Supply Chain Management for the functioning of the “push” and “pull” systems can be observed.

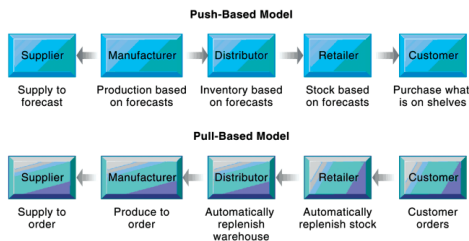


Fig. no. 1. Emphasis of the “push” and “pull” systems in Supply Chain Management [6]

A Supply Chain Management is almost always a combination of the two “push” and “pull” procedures, case in which the interface between the two is known under the border name of “push-pull”. In this framework, the levels of inventory of the individual components are determined by the forecasted general demand, but the final assembling represents the response to the specific demand by customers. Thus, the “push-pull” border would then be at the beginning of the assembling line [3].

The mechanism of distribution of goods is nowadays in a continuous change of paradigm between the “production for supply” (it implies logistics based on stocks and “push” logistics) toward “production upon demand” (it determines the logistics based on resupply and “pull” logistics). Thus, the elements of the paradigm range between maintaining the stocks necessary for the approximate satisfaction of the demand through a complete system of assurance, especially through production and transport on demand, in order to precisely respond to customer requirements [6].

2. “PUSH” AND “PULL” SUPPLY/RESUPPLY SYSTEMS IN THE MILITARY DISTRIBUTION MECHANISM

During the last two decades a significant transformation in logistics has been observed in the United States Armed Forces, following the improvement of the mobility in the land-air-sea triad, transport infrastructure and In-Transit-Visibility (ITV). According to American specialists, a further increase in capability is still necessary, having in mind the principles of Joint Vision 2020 which emphasizes the importance of the dominant manoeuvre through the speed and agility of the forces designated to the complex military operations of the future. In this sense, Operation Iraqi Freedom (OIF) demonstrated some of the capacities of the network base warfare of the XXI century, as well as a number of current and future logistic challenges [7].

The Sense and Respond (S & R) logistics represents a solution in accordance with the concepts of the war of the future, because it uses firm commercial practices and eco-service military supply concepts, as well as information, operations and logistics related technology adequate to a network work mode [8]. Thus, the network facilitates the connection between transport and supply. This will determine the general reduction of the logistic foothold in the theatre of operations, taking into account the lessons learned regarding the vulnerability of long resupply lines experimented during OIF [7].

It is worth mentioning that in nowadays industry both the “push” and the “pull” systems exist. Apparently, smaller stocks tend to favour a “pull” system. Military specialists argue that the accumulation of large stocks in distribution points in the theatre of

operations reduces the effectiveness and manoeuvrability of the combatant forces. Such stocks also have a negative impact on ITV/TAV (Total Asset Visibility) because of the large work volume of the support units. In contrast, a "Just-in-Time" supply approach in industry, which inclines more toward a "pull system", presents a greater risk to the fighters [9]. This risk is determined by potential loss of lives during combat and commanders' ability to counter enemy actions. A commander cannot afford even the smallest chances of materials and supplies being delivered late. In the theatre of operations large stocks are not to be desired, and neither minimum stocks in support of military operations. A more balanced approach is rather more favourable, somewhere between huge and minimum stocks (the industrial model), which allows for a small safety margin for military operations which permanently require a flexible and lean logistic support. As in the situation of the commercial supply chain, where its specific operations are permanently monitored, military leaders and logisticians must know at any given time the movement in the distribution system of the materials (on classes) destined to resupply [7; 10].

According to the belief of American experts, the efforts of the Department of Defence to transform logistics must continue in the direction of a progress toward a "push" system for all types of supply. To this end, the development of the "push" system represents the systemic approach to a major change in logistics, due to the use of the best commercial practices in the field of Supply Chain Management. At the same time, the "push" system correlates with the "Sense and Respond" (S & R) logistic model, which is also a "push" system developed by IBM. Hence, the integrated approach of the "push" system represents the type of

logistic transformation occurring in the American Armed Forces in support of the network centric warfare [7; 10].

This way, a "push" system will be more effective also through the growing operational capacity of the force by way of quicker and more credible support provided to combating forces. This effectiveness is possible because information, operations and logistics are correlated in a complex manner in an ITV/TAV network, which allows logisticians to "pull" the scheduled materials and supplies to the units, initially on the basis of planning factors, and then in real time, due to knowledge regarding the progress of the actions specific to the battle field [7; 10].

Some support materials (for example rations, ammunition, fuels, lubricants) are better dealt with in a "push" system in case they are processed and delivered on the basis of a weekly or monthly schedule, having in mind the logistic planning factors determined by the size of the force, its mission and the estimated consumption. The advantage of the "push" system is that it is not based on demand, which determines the rapid unfolding of the process (in the supply chain) from the initial input point, continuing with distribution (sail, delivery), up to the end consumer (combatant) [7; 10].

At the same time, American logisticians assert that the "push" system will eventually be capable of giving an impulse to many other capabilities, including by fully putting into practice of the RFID. It thus results that, once a "push" system is developed to meet the requirements of a modern army, the combatant will have more confidence that necessary transport will reach him in time and thus numerous requirements for the same resupply item will cease. Operational commanders will also benefit from an optimization of the transported goods, which will shorten the time allotted for delivery [7].

At the same time, nowadays the logistic support with individual services is oriented toward a “pull” system largely dependent on automated and end-to-end rapid distribution systems. Nevertheless, the “pull” system is generally used for the materials destined to resupply which have various rates of use/consumption.

Many critical materials destined to resupply (for example spare parts), which have different rates of use/consumption, are ordered through a “pull” system, which uses demands hierarchically launched toward the sources. The process specific to demand is dependent on direct communication between the logistic personnel and the large / operational units [10]. Under these conditions, the delivery deadline set by the requiring unit is often delayed due to a more prolonged processing time between order and supply. Due to the lack of synchronicity between the transport and supply functions and the lack of visibility of demands and transfers in the system, especially in the theatre, various items destined to resupply are repeatedly ordered, thus determining the emergence of dysfunctions in the logistic chain (deliveries of exceeding materials, delays in the transport of materials to their destination and so on). These irregularities (frequent delays) were obvious during OIF and, in order to solve the critical situations, the in-depth support units proceeded to “pushing” materials for the tactical level in response to the lack of critical spare parts [7; 9].

3. “PUSH” AND “PULL” SYSTEMS IN SUPPLY CHAIN OF THE FORCES ENGAGED IN JOINT OPERATIONS

As in the economic field, each Joint type military operation, regardless of scale, implies a complex logistic support which is designed and tuned

by using an adequate supply chain. Under these conditions, the fluxes of materials and services within the Supply Chain Management require the efficient use of the push and pull systems.

In NATO, for the adequate functioning of supplying/resupplying of forces, the “push” and “pull” systems exist and they are considered fundamental.

The “push” system is applied where supply/resupply is based on the anticipation of requirements and the standard consumption levels. In such a system, in general, deliveries are carried out toward the beneficiary as early as possible. To avoid the building-up of large stocks it is necessary to coordinate between operational and logistic planners, as well as to efficiently use technology, such as command, control, intelligence systems (CCIS) and goods tracking systems [11].

The “push” system is applied where supply/resupply is based on demands by large units and supported units. Under certain precise conditions this system can offer economic advantages, but when the contact with the enemy is imminent a less risky approach could be necessary, especially due to the short available time [11].

During the preparation and execution of joint operations, supplying in view of completing (planned, support) stocks necessary to the forces engaged in military operations represents a complex process carried out by logisticians, in which logistic command structures on the one hand and logistic support execution subunits, units and large units on the other hand are involved, as well as economic operators and territorial facilities (product suppliers and/or service providers, territorial military and civilian warehouses etc.).

Both supplying and resupplying have a dynamic character depending on the size and diversity of the engaged

structures, particularities and pace of the military actions and so on, being planned and carried out in order to meet the overlapping requirements of the logistic support with the operational effort (tactical and/or operative).

In our view, the planning and execution of supply/resupply are directly connected through the projection and execution of logistic transports and, this way, the two fields of the logistic support are integrated according to the options of action in three (resupply) systems: push, pull and combined.

Supplying and resupplying operational forces require specific determinations on classes of materials according to consumption rates, standard days of supply (SDOS) and fuel, lubricant and ammunition multiplication quotas. On this basis, both the quantities of materials necessary to maintaining the planned stock at the initial level and those for achieving a support stock, adequate to operational requirements, are assured.

We continue by addressing the „push” and „pull” supply/resupply systems having in mind the particularities of preparing and executing military operations, the means, resources and abilities of logisticians.

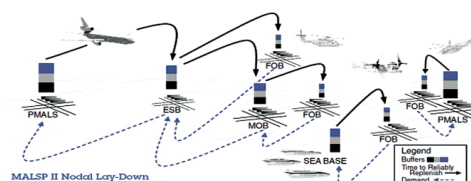
In the situation where the operational (tactical or operative) echelon orders subordinate structures material consumptions (classes I, III and V) expressed in SDOS both during deployment, preparations for the operation, and also during disengagement and redeployment, then the proactive supply/resupply “push” system is applied. Therefore, also through the application of this system, the superior echelon uses its own means for the transportation of materials (according to the provisions of Annex R-Logistics, as they were transmitted to the subordinated structures) to the areas of the units, subunits and their logistic support components.

During military operations, the military operational structures make

their resupply needs/requests known for all classes of materials through logistic reports filled to the superior echelon on the evening of each day, which determines the superior (tactical or operative) echelon to proceed as a consequence to response actions within the logistic chain by using the reactive supply/resupply “pull” system. Thus, the superior (tactical or operative) echelon, through its own logistic module, processes the requests received from the subordinated units and large units and executes the transport of materials by its own means (from the directly subordinated logistic support execution structure) to the areas of the units, subunits and their logistic support components, at the time and place specified in their requests.

One model of usage of the two mentioned systems is depicted in **Figure 2**.

But there can also be situations when a combined “push-pull”



Legend:
MALSP II = Marine Aviation Logistics Support Program II
PMALS = Parent Marine Aviation Logistics Squadron
MOB = Main Operating Base
ESB = En-route Support Base
FOB = Forward Operating Base

Fig. no. 2. Elements specific to the Pull and Push systems in joint operations [12]

procedure is applied, because on the one hand the superior echelon ordered adequate consumptions to the subordinated structures, while on the other hand the latter reported deficits and losses which, if cumulated, imply

supplementary quantities that need to be resupplied to them.

Through the use of the depicted models, materials can be distributed through supply or distributions points, through a logistic support execution structure (at unit or large unit level) or both, as well as combined. In case of the use of distribution through supply points, materials are moved toward central distribution locations (components), where the receiving units or large units can arrange, if ordered, their own transportation system of the materials allocated to them. Distribution by a logistic support execution structure (at unit or large unit level) requires the functioning of a delivery system through which materials are transported in a centralized manner to the receiving unit or large unit, thus eliminating the need for personal supplying.

In the process of execution of the actions specific to the three resupply systems mentioned above, the logistic command bodies of the superior echelon can legally allocate certain quantities of materials (classes I, III and V) directly to large units and subordinated units (by using their own means) from the sources (economic operators, warehouses, offloading stations) situated at certain distances from the logistic support execution structure (p.10 km. to B.; p.20 km. to Bg.; p.80 km. to D.I.). In certain situations the superior echelon can order, upon request, as transportation means loaded with materials reach as far as the artillery firing positions of certain subordinated structures or the workshops of their subunits (units) of engineers.

The supply flux toward the area of joint operations begins before the flux specific to the arrival of large units or units or at the same time with it, which requires adequate and continuous synchronization. After the planned and support stocks have been transported to the area of joined operations, it is next required to maintain a continuous

resupply flux in order to avoid overloaded transports and to minimize the risk of losses. At the same time, in order to diminish the stockpiling area, it is required to avoid an excessive level of the stocks. For reaching this objective, the existing multinational solutions must be used, such as the NATO Logistic Stock Exchange (NLSE) [11].

The commander of the joint force that benefits from the logistic support establishes the policy, procedures, priorities and line of communication for the support activities. The commander will normally proceed to conduct the support mechanism based on the „push” and „pull” systems applied in support of the subordinated categories of services, in order to resupply its structure in the area/theatre of operations. In the absence of commander's precise details and requirements, each service will support its forces using their own procedures, which include the logistic support assurance of the subordinated forces. The support transports do not always follow the same routes used by the deployed forces, because some of them (such as the ammunition ones) often require a special infrastructure in order to be manoeuvred and they can lead to the significant disturbance of the activities in which the transport (land, air and sea) means and the locations used (railway stations, air bases, sea ports) are involved [13].

In order to achieve an adequate resources management, the commander of the Joint Task Force (JTF) will coordinate and prioritize the deliveries of materials destined to the forces, except the National Support Elements (NSE). At the same time, the prioritization of deliveries to the national support elements represents a problem for each nation [11].

During joint operations, the usage of the mentioned resupply systems implies adequate collaboration and

coordination activities between the operational and logistic structures in order to avoid the building up of exceeding stocks or the emergence, at a given moment, of raptures of stocks at the level of the combat structures subordinated to the joint force commander.

4. CONCLUSIONS

The market competition within a dynamic and turbulent environment determined economic organizations to engage more and more actively in a competition for the development of their own businesses, being integrated to this end in a Supply Chain Management (SCM). Hence, in the functional mechanism of a SCM the partner firms are functionally integrated also through the use of the Push and Pull business systems.

Due to a growingly accentuated global economic and military instability, NATO and EU as organisms are determined to act for the development of operational preparedness in an allied context, in order to intervene in the situations imposed by the action realities in order to guarantee the sovereignty of their member states, as well as of the states that are in the process of becoming members.

We appreciate that more than ever, in the face of the military challenges of the future, national and multinational joint operations be prepared and logistically supported as well as possible. Hence, to this end, it is necessary to apply in optimum conditions within the supply-resupply chains the "push" and "pull" systems by specialists in logistics, in order to provide structures in the operational force with everything that they need for the successful planning, preparation and conduct of joint military actions.

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