REFERENCE MODEL FOR THE DEVELOPMENT OF STOCK MANAGEMENT IN SUPPLY CHAINS

Igor Lopes Martínez[a], Vilma Rodríguez Castro[b], Martha I. Gómez Acosta[c], José A. Acevedo Suárez[d]

(a) Instituto Superior Politécnico "José Antonio Echevarría" (CUJAE), La Habana, Cuba
(b) Instituto Superior Politécnico "José Antonio Echevarría" (CUJAE), La Habana, Cuba
(c) Instituto Superior Politécnico "José Antonio Echevarría" (CUJAE), La Habana, Cuba
(d) Instituto Superior Politécnico "José Antonio Echevarría" (CUJAE), La Habana, Cuba

[(a)] ilopes@ind.cujae.edu.cu, [(b)] valeriamor1@yahoo.es, [(c)]marthagom@tesla.cujae.edu.cu, [(d)]acevedo@tesla.cujae.edu.cu

ABSTRACT
This research is performed in several enterprises which develop their activities in connection with the services, commercial, and production fields. These enterprises have in common their relation with the stock management. Cuban enterprises are facing problems such as lack of availability, supply unstableness, poor studies of demand, and obsolete productions. This research proposes to make an assessment of these problems from the point of view of the enterprises in connection with their supply chains. Such a comprehensive analysis is poorly developed in Cuban enterprises so far. Stocks represent immobilized money thus the main objective is to keep them at the lowest possible level that guarantees a high service level to the customer and the achievement of an economical and fluid management of resources. The introduction of a reference model to assess the status of the stock management in both the enterprises and the supply chains is also proposed.

Keywords: Reference model for stock management, stock indicators, logistic cycle, assortment policy.

1. INTRODUCTION

Stock management is a complex activity, thus it is impossible to evaluate it through specific isolated indicators and parameters. Only a comprehensive assessment of results makes possible to determinate the correct level of development of the enterprise in this field. For instance, any enterprise which has a high stock rotation level but at the same time cannot guarantee a high availability of products would be evaluated as "efficient", thus disregarding the fact that its services to customers, a key factor in logistic management, are affected. Parameters depend on each other to work at a suitable level and if an enterprise focuses on optimizing only one of them, thus paying no attention to a system of interrelations, this could impair its global objective of achieving a high competitiveness level. It should be taken into account that the stock represents immobilized money which directly affects the enterprise's incomes (MULLER 2003), and that its improper management can directly affects a whole organization.

An inadequate stock growth, at the enterprise level, cannot be solved through the application of reductive actions that work only punctually, but through a global review of the form of organization that brings about such mistakes, and then to take the necessary corrective steps. The stock is the result of the enterprise management behavior and a consequence of the management of relationships within the enterprise. It cannot be viewed only as a responsibility of a specific area, but as a process in which different factors are working together such as procurement and sales or commercial activity, logistics, finance, production and even the legal area, all of them affecting the occurrence of surpluses, shortages and the desired rationalization level. (De Vries 2007; Gómez and Acevedo 2007)

Some authors said that the inventory management will not be completely effectively only with the utilization of the operation research theory, because it needs to include organizational and qualitative aspects. In other hand, the utilization of complex inventory techniques is not a guarantee for the minimization of stock level; the key is the inventory process management. (Zomerdijk and De Vries 2003)

The stock management needs an integral attention, not only at the enterprise level, it is also necessary to establish and evaluate the relationships between stocks and the supply chains (Acevedo 2008), taking into account the relationships among the supply chain links (Ballou 2004), aiming at the integration of its members to achieve the objectives that meet the final customer's requirements. Best in class companies manage the inventory at network level, and this is a differentiation factor with the laggard ones (Viswanathan 2009). A proper stock management is fulfilled through a proper functioning of the relationships within the enterprise structure which is supported by the supply chain's framework. The main objective is that inventory management techniques achieve low stocks and improved customer service. (Wild 2002)

2. THE SITUATION OF STOCK MANAGEMENT IN CUBA

In Cuba several researches connected to the stock management issue, as a part of trainings and postgraduate courses, were conducted in more than 15 enterprises between the 2004 to 2011 period. During these studies problems have been found that affect enterprises belonging to different sectors of the market.

The results show that production, service, and commerce enterprises as well as hospitals, universities, factories, car repairing centers, and stores have similar management problems such as **lack of product availability at the market, supply unstableness, low stock rotation, an insufficient study of the demand, and a high level of obsolete products** all of which are directly connected with the stock situation. Therefore it is necessary that Cuban enterprises make the analysis of these problems from the enterprise's point of view in connection with the supply chain behavior. Also, it has been noticed the inexistence of methods at the enterprises which comprehensively support the stock management activity.

As a rule each area or department gives priority to its own objectives, disregarding those of the organization and this provokes an improper stock management function. Besides, those workers directly connected with de stock management lack the necessary knowledge and training to perform their jobs with an integral vision of the issue, and even in the case that the enterprise has advanced informatics systems, which in many cases include programs for the stock management handling, these tools are not properly employed either for ignorance or because the enterprise doesn't have the necessary structure. Hence, it is very important to point out the fact that at present the stock management issue is a must for an enterprise due to the world, as well as national, financial crisis. To face this situation it is necessary that each enterprise keeps its socks at the lowest possible level that guarantees the highest level of services to customers as a result of a fluid and affordable supply chain management, with the lowest immobilized resource level, and achieving a high availability and variety of products.

In practice the product's availability issue has been analyzed in several researches in all of which different problems have been pointed out. The followings are examples of this statement,

- In one university 68% of the products marketed in the professors'' virtual store has less than 95% of availability from May 2007 to May 2008.
- In an automobile repairing & maintenance service enterprise 73% of the products of a car line under consignation regime showed less than 80% of availability over the last year.
- In one transportation base 80% of the spare parts showed less than 60% of availability during the 2007 year.
- In a nationwide commercializing enterprise a survey was made for 4 different products: natural juices, meat products, soft drinks, and oils. Results showed that the overall availability was 27, 53%.

There is a contrast between the availability problems and the high levels of nationwide immobilized products in stock. One of the main reasons for this lies on the inefficiencies of the demand prediction activity due to: an improper study of patterns and tendencies related to a product; both the qualitative and the quantitative methods to define the product's demand are insufficiently employed. Is a common practice to define the demand through empirical methods and further more codification systems cannot guarantee the reliability of data processing due to, among other factors, to its bad quality.

Another problem is that enterprises do not apply a proper assortment policy and the main example of this is a nationwide commercializing enterprise which during 2010 sold more than 650 millions USD employing different kinds of marketing sites which ranged from large malls to little stands. At the stands which represent 12% of the total sales, due to a bad assortment policy problems arise such as: lack of shelve space to display the products, and poor merchandizing techniques. As a consequence 14000 codes of different products were sold because there was no guidelines for the supplies which failed to support the stability of commodities on offer, this is a risk in a retail management because they work with a high number of stockkeeping units. (Bowersox, Closs and Cooper 2002)

Codification is a common problem among all the studied enterprises. There are different problems with the code standardization, as well as with the standardization of the descriptions of goods. So, it is possible to find that the same product exhibits different codes in the database. Another problem is that more than 50% of the studied enterprises cannot guarantee that the same product exhibits the same code throughout its internal chain of market places. In several databases products were identified which have different codes at different places of the chain, this affect the product's traceability as well as any other demand analysis that might be necessary to perform. The core of this problem is the lack of a definition which establishes, with no exceptions, that each code for each product is centrally created.

Another problem is the low stock rotation of goods, which results in higher warehouses maintenance costs, and higher losses and wastages of products. It also results in a low rate of the investment return, all of which adversely affects both the enterprise's net incomes, and its ability of payment to suppliers.

Since the Cuban economy largely depends on imports, many Cuban enterprises have commercial relationships with international suppliers. As a general rule, order cycles are quite extended and unstable (3 to 6 months with less than 50% of shipments stability). Besides, due to an inefficient stock management, an improper assortment policy, and the lack of studies concerning the composition of the order cycles the generalized common practice is to order large amounts of goods which occasionally results either in idle stocks or slow moving stocks. In other cases, for the same reasons, when there is a need for an urgent consignment normally suppliers send it to Cuba as airfreight which largely increases the costs of the operation. Another problem is that the suppliers-customers relationships are weakly established, and the supply chains in which the Cuban enterprise participates, mainly as a link within the national supply chain, have a deficient organization, and wants for integration between chains links. This, along with: a) the absence of a systematic evaluation of suppliers in reference with the accomplishment of contracts and its effects on logistics, and b) the inefficient internal management of supply orders has created an unnecessary stock surplus in Cuban enterprises. This situation, in turn, has resulted in a disproportionate chain of unpaid debts which an improper use of the enterprise's active capital makes heavier.

The main reason which brings about the above mentioned situations is the poor skills of enterprises' executives and specialists on the advanced concepts and techniques of stock management. Even though the methods for planning and carrying out good stock management practices are widely exposed in the scientific literature, and that this issue is usually taught in both technical and higher education (embracing both pre graduate and post graduate teaching), enterprises' executives and specialists do not clearly master the use of this concepts in the institutional practice, and therefore their decisions are mainly based on their operational experience rather than on any analytical method. Besides, their knowledge is based on those aspects related to operational researches, rather than on the organizational management science related to the stocks.

This problem gets worse with the application in Cuban enterprises at present of the ERP (Enterprise Resource Planning) systems such as SAP, EXACT, ASSETS NS, and others. All the potential advantages of these systems are not fully exploited because, at the Cuban enterprise level, the determination function of the organizational working parameters is too weak. It has been observed that even though these systems are at present available which are capable to gather all the data related to the stocks status, and to store this information in large databases, the personnel in charge makes no use of it. Instead, they use these systems only as a data storeroom, and no further processing of such information is made. It can be said that the presence of this issue in both pre graduate and post graduate teaching programs at the universities is insufficient. (Manual de ASSETS 2004)

3. A PROPOSED SOLUTION

First, it´s important to said that the performance of inventory systems is influenced by its organizational architecture, not only for the planning and controlling process. (De Vries 2005)

Since a suitable level of the stock status results from enterprises organization within the supply chain frame, it is necessary the development of the fundamental bases to accomplish the improvement of this situation. These bases are supported on 5 basic components of the institutional organization which are the followings:

- Demand management
- Assortment policy
- Product codification and classification system
- Organization of the logistic cycle
- Purchase planning and organization

The results of previous researches have showed that the centralization of stock management planning activities is not a guaranty of the achievement of higher service levels with lower stock levels (Zomerdijk and De Vries 2003; De Vries 2005). It is also necessary to make efforts toward the fulfillment of the 5 basic components above mentioned. Furthermore, efforts should be based on both the intra-enterprise relationships, and the supply chain (Ayers and Odegaard 2007). This is the condition that guarantees a sustainable stock management at the enterprise level; it is not a partial solution to any punctual problem.

The organization of the **demand management** process guarantees a more reliable determination of the needed amounts of raw material which should be obtained through the supply chain to satisfy the requirements of the final customer (Fleury, Wanke, and Figueiredo 2000), while, in turn, the definition of **the assortment policy** allows the enterprise to decide which products should be placed at the market, with all the process based on the real market demand, and on strategic decisions.

The organization of the **product codification and classification system** guarantees the feasibility of the information system, and it also facilitates the control and decision taking activities due to the reliability of the obtained data. It would be difficult to analyze the information gathered for each individual product, thus the organization of products into groups facilitates the analysis of the information and save time. (Barry 1991; GS1-Cuba 2005; ONE 2008)

The organization of the **logistic cycle** makes possible a continuous flow of operations to cut it short, and then focus efforts on increasing its stability (Gómez and Acevedo 2007). Besides this, it is necessary to work with the information about cycle time duration or lead time in order to take decisions concerning the **purchases management,** a process supported by the 5 basic components to start on the flowing of raw material at the supply chain. (Ballou 2004)

Fig. 1 shows the diagram representing the stock management model which guarantees that the planning and control activities meet the objective of rationalize the stock.

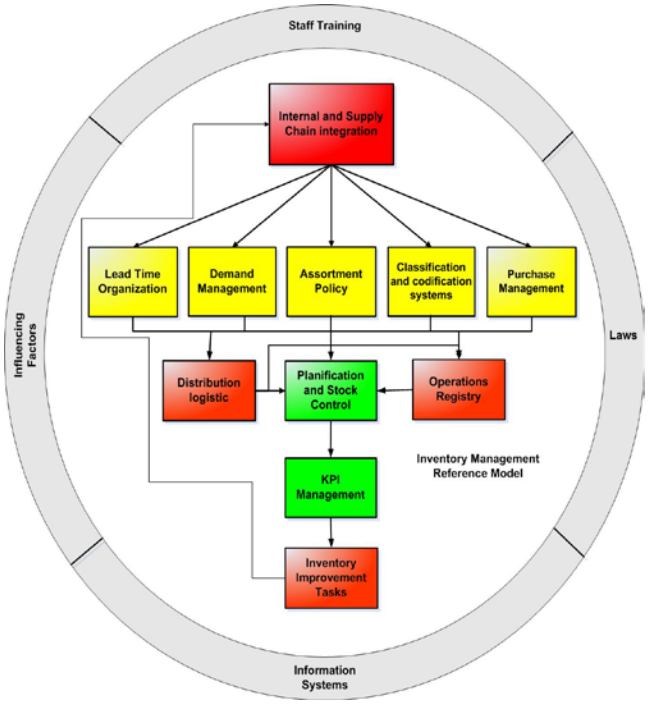

Figure 1: Organization components defining the stock.

The correct organization of the 5 basic components enables the enterprise to properly perform the stock planning and its control to meet the final customer requirements with a minimal cost. The problem to accomplish this in Cuba is the lack of a tool which allows enterprisers to evaluate the stock management functioning level from the analysis of the different aspects of the organization since many solutions focus on those aspects connected with operational researches without taking into account the organizational aspect.

Usually it is possible to calculate some indicators that bring about results which can be analyzed to take decisions, but it is impossible to determinate, with an acceptable degree of accuracy, which are the critical points of the management that should be improved, and even its strengths are difficult to determinate due to the lack of a suitable tool to evaluate whether the management work is performed, as it should be done, to meet problems and to find the proper solutions according to the present development of knowledge, as it is defined by the good stock management practices which are included in the proposed model.

The proposed model is based on the enterprise evaluation according to those aspects related to good management practices, which are organized in several groups (De Vries 2007). These are connected to integration issues such as: demand management; the assortment policy; stock codification and control systems; stock management and parameters methods; stock classification systems; studies on logistic cycles and their variability; warehouse management; informatics systems; in force legislation; integration within the supply chain; centralization level; evaluation of costs; distribution management; and the management of indicators. All these aspects should be evaluated according to well defined criteria which establish its relevancy in each case.

One of the objectives of this tool is to obtain the integration between both the demand and the supply activities to increase the stock management in our system, having into account the real demand of consumer, and so speeding up the raw material flow to avoid either the occurrence of product accumulations due to a low demand, or the occurrence of losses due to a bad management of resources with a better use of the invested capital.

3.1. The results.

On applying this tool in a commercializing chain a number of problems in the stock management activity were detected which directly affected chain performance, such as:

- 2,5 inventory turns in a year
- More than 80% of products had less than 50% of availability in 2010, while only 10% of products had more than 90% of availability

It was defined that 42% of the model aspects represent weaknesses and for these strategies were defined which contain the following tasks:

- To define and to apply a primary registration system to perform the calculation of both the indicators, and logistic costs.
- To increase enterprise's wholesale and retail distribution (routing; allocation; costs; and service level measurement.)
- To improve purchasing methods (contract management and cycle management)
- To improve commercial activity (assortment policy design and its control; ordering system; and consumption and demand analysis.)
- To achieve internal integration at the commercial chain.
- To achieve integration at the supply chain (development of integration projects at the national supply chains and management of

contracts with the external suppliers of logistic services.)

- To perform availability studies adjusted to both the international standards. (Commodity shortages at salesrooms), and the internal country policies (reports from the Cuban Internal Trade Ministry (MINCIN).
- To perform the calculation of the stock parameters at each link of the chain and its practical application in Havana City sales stands.
- To devise a solution to the product ownership transference issue at the supply chain in order to increase the reliability during the commercialization activity.
- To design a container traceability system
- To create educative courses on stock management for the enterprise workers.
- To design distribution centers.

Model application brings about the following improvements:

- The application of the assortment policy at small sales stands and definition of the 300 basic commercial products.
- The availability increasing of the selected products (40% of products showed more than a 90% availability)
- Rotation increases (50% of the selected products showed more than 12 turns in a year.
- Higher efficiency in the supplying and storing process.
- Adjustment of the production plans of 2 regular suppliers to the actual requirements of the supply chain.

4. ACKNOWLEDGMENTS

- The stock inventory results from the relationship and process managements in the enterprises which occur within the supply chain framework.
- At present, stock management is supported by an integral management that should be performed having into account the relationships among processes, activities of all the enterprises participating within the supply chain. It is necessary the organization and integration of processes intervening in the stock management to achieve a reliable and economic performance.
- The basic condition to achieve a sustainable planning of the stock inventory is the fulfillment of the 5 basic organization components already described based on both the relationships established among enterprises, and the supply chain.
- Product and service supplies should be adjusted to the actual demand at each sales point prioritizing the visibility and the actualization of stock levels and movements.
- All the enterprises participating in the supply chain work together and make their plans to satisfy specific requirements of the final customers, rather than to fulfill their particular production plans, in order to increase their efficiency and.
- Each participating enterprise and organization makes its plan of activities based on a unique demand prediction standard: the final customer requirement.
- Management at the enterprises focuses its efforts on producing, importing, and supplying on time according to the market demand. To meet these objectives the necessary planning and control methods are already established which allow for the accomplishment of these goals, along with both a high availability of products, and a high ability to supply products and services to final customers.
- The stock management is backed up by: the informatics system; the staff training; the legal framework; and the influencing factors.
- Information systems and technologies should be integrated in order to facilitate a systematic information exchange among the supply chain participants that includes the use of the electronic trade and Web systems.
- The integrality of the indicators is a must so as to obtain full information from them on taking accurate decisions. Partial analysis should be avoided.
- Supply chains should pay a permanent attention to the increase of staff training and professionalism, including managers, technicians and other workers, through the cooperation among its members

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AUTHORS BIOGRAPHY

Igor Lopes Martinez. Born in Havana City, Cuba (1980). Industrial Engineer since 2004 (CUJAE). Professor Instructor at CUJAE. Professor of Logistics and Process Management. He is member of the Process Management and Supply Chains Professorship at the Industrial Engineer Faculty, CUJAE. He has conducted researches on the Stock Management topic at several institutions in Cuba. e.mail: ilopes@ind.cujae.edu.cu

Vilma Rodriguez Castro. Born in Havana City, Cuba (1987). Industrial Engineer since 2010 (CUJAE). Currently is an specialist of the Department of Operations at the Drug Logistics Enterprise (EMCOMED) e.mail: valeriamor1@yahoo.es

Martha I. Gómez Acosta. Born in USA (1955). Industrial Engineer since 1978 (CUJAE). PhD in Technical Science since 1998. Science National Award in 2003 granted by the National Science Academy. She has received different awards from several Scientific and Technical Forums. Titular Professor of CUJAE. Professor of Logistics, Economics, and Production Organization. Coordinator of the Europe-Latin America Center of Logistics and Ecological Projects (CELALE). e.mail: marthagom@tesla.cujae.edu.cu

José Antonio Acevedo Suarez. Born in Matanzas, Cuba (1953). Industrial Engineer since 1976. Titular Professor. PhD in Science. Industrial Design Technician (1971). Specialist in Enterprise Management (Germany, 1985). Doctorate in Technical Sciences (CUJAE, 1988). Post-graduate trainings on Marketing and Logistics at the Technological College (Dresde, Germany, 1992), and at the Humboldt University of Berlin (Germany, 1996; 1999; 2000; and 2001). Consultant on logistics development and enterprise managements at important Cuban enterprises. Dr. Acevedo Suarez has publish the following books and papers: Manual on Industrial Economy and Production Organization and Planning; The Challenge; Organization Projects in Industrial Enterprises; different teaching reports on; enterprise economy; logistics; and a General Organization Model; 4 different reports on post graduate teaching; 52 technical articles in specialized magazines on management, logistics, organization, planning and economy. Of these 10 in different German publications; 1 in a USA review; 2 in Colombian magazines; 1 in a Mexican review; and 3 in Spanish magazines. In 2000 he publish several books on logistics in Colombia (Supply Logistics; Logistic System Capability Management; Case Histories Studies on Logistics; Planning and Control of the Logistic Cycle). He is the principal author of the book: Modern Enterprise Logistics (La Habana, 2007). In 2003 Dr. Acevedo Suarez received the National Award of Science granted by the Cuban Science Academy. e-mail: acevedo@tesla.cujae.edu.cu