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ABC ANALYSIS AS A TECHNIQUE OF INVENTORY CONTROL IN DISTRIBUTION COMPANIES

Jelena Kovačević
University of Belgrade, Technical faculty in Bor, Engineering Management Department Bor, Serbia

Abstract

In the former way of doing business the rule said: “maximum = efficient”, however, the term “maximum” was replaced by the term “optimal” in production as well as in all other spheres of business. This new rule is also applied to inventory. In the past, inventory was neglected but in today's business, it is a priority. It is said that it is too expensive to keep excessive stocks, and that is the reason why the “optimal” rule should be applied on. In order to implement that rule, the control and planning of the volume of inventory should be done. One of the most efficient inventory control techniques is the ABC method. The aim of this paper is to test ABC technique on inventory in distribution companies. The study is based on the data on inventory from Serbian distribution company „Nelt“. Results showed that smaller number of inventory items should be in the optimal assortment of the observed company.

Keywords: *interview, bitcoininventories, optimal inventories, inventory control, ABC technique*

1. INTRODUCTION

Today's companies encounter a large number of risks and decisions in their business, which they have to make accordingly. The reason for this are the turbulent conditions under which the business is carried out. The market is in constant expansion, which also affects the rise of competition as well as the creation of a struggle for market position. All these factors have led to the creation of a new way of efficient and effective performing business that relates to the introduction of the term “optimal”.

In the former business exsisted a rule that said “maximum = efficient”, however, the term “maximum” was replaced by the term "optimal" in production as wel as in other spheres of business. In order to achieve market success and reach the target level of profit, the company business must be equated with optimal, which in this case can be presented in the form of equilibrium “optimal business = successful business”.

What is meant by the concept of optimal business is to look at not only the production, costs and profits but the entire range of the company. Of course, one of the most important item in the business is production, however, one of the essential items that represent the link of the end-use with production are the inventories. The notion of “supplies” is “stored materials used to ensure normal production and meet customer needs” (Majstorović, 2001). Unless it is a JiT (Just in Time) production, the optimal level of inventory is what the enterprise should be oriented to. The optimal level of inventory involves a well-regulated inventory management system so inventory should not exceed the optimal amount required

or fall below the permitted amount, thereby disrupting the company's operations. In the past, inventories were not considered primary business concerns, and thus were being neglected. The modern system of business puts planning and inventory control in the top position, because of the conclusion that it is too expensive to keep excessive stocks (Beker, 2011).

ABC method has been developed as one of the most effective techniques for analysis and stock control. The ABC method is a well-known technique for both planning and stock control based on storage units that are classified into three categories (Keith et al., 2008). The aim of this paper is to introduce ABC analysis as a stock control system in distribution companies which can provide more efficient, effective and flexible managing the company.

2. LITERATURE REVIEW

ABC analysis is one of the most frequently used stock management techniques where classification of items is carried out in three predefined and ordered categories: A (very important items), B (moderately important items) and C (relatively irrelevant items) (Kubasakova et al., 2015; Mohamed et al., 2016). That the conventional ABC analysis uses only one classification criterion, and this is mainly the "annual use of the dollar" (Torabi et al., 2012). The ABC method is the most successful only when inventory items are fairly homogeneous and the main difference between items is in their annual dollars (Ramanathan, 2006). Such an analysis provides a mechanism for identifying items that will have a significant impact on total inventory costs while providing a method for identifying different inventory categories that will require different management and control policies (Liu et al., 2016). In practice, all inventories can not be controlled with equal care, therefore the objective of inventory management is to make decisions about the appropriate level of inventory (Ching-Wu et al., 2008). An organization may have an inventory list with hundreds or thousands of items. For effective management, an inventory manager requires a logical classification of inventory for planning and controlling a large number of items where application finds ABC analysis (Sanders, 2013).

The literature is rich with modifications and upgrading of conventional ABC method. One of the most important improvements of ABC is the ability to use different criteria in the same tame for classification (Ching-Wu et al., 2008). Then, besides the annual use of the dollar, storage costs, durability, existence of replacements, procurement time, the quantity of individual procurement, quantities required at annual level, warehouse capacities, etc, can be considered as criteria (Ramanathan, 2006). The purpose of using ABC analysis in this way is that helps to categorize products by using different criteria and also the criteria can have different weights and importance. It allows the aggregation of multiple scores of different criteria in a single score for each product and further classification of inventory items into groups (Ng, 2007). For successful determination of criteria weight, different multi-criteria decision making models (MCDM) are used to improve the quality of made classification (Scholz-Reiter et al., 2012; Plinere et al., 2015; Kutyba et al., 2017).

3. METHODOLOGY

Inventories are physical goods that contain economic value and are being retained in different forms by the organization, where packing, processing, transformation, use or sale is awaited in the future (Rajesh et al., 2016). As such, the stocks represent one of the main drivers in the supply chain management (Balaji et al., 2014). They can be found in the following forms (Škarić Jovanović, 2007; Balaji et al., 2014):

1. Raw materials;
2. Semi-finished products;

3. Unfinished production;
4. Finished products;
5. Works in progress.

The fact is that stocks represent a key link between suppliers and the customer, their management is crucial for each type of industry.

ABC is known as a practical classification based on the Pareto principle. For example, Group A inventory items are those that make up about 70% of the company, but only take 10% of the inventory. They are critical to the functioning of the company. Group B items are those that account for about 20% of the company's business and take about 20% of the inventory. Group C items are those that represent only 10% of enterprises, but take about 70% of the stock (Lung 2007). The appearance of the ABC analysis diagram is shown in Figure 1.

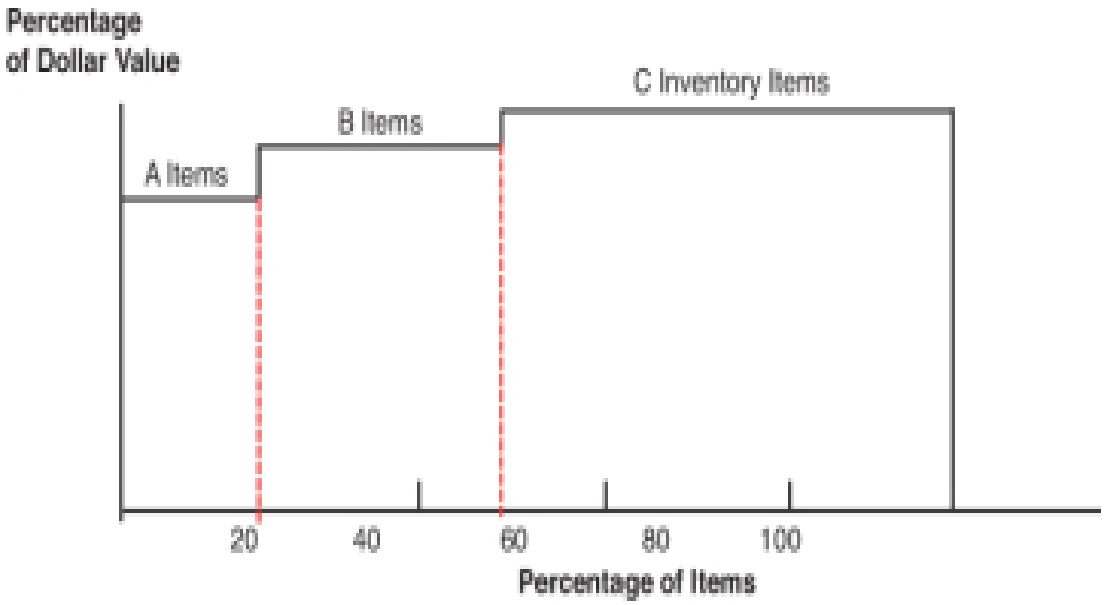

Figure 1. Diagram of ABC analysis (Sanders, 2013)

In order to be able to do ABC analysis, it is necessary to implement the following steps:

1. Determine annual use or sales for each item;
2. Determine the percentage of total consumption or sales per object;
3. Ranking items from the highest to the lowest percentages;
4. Classification of items by group.

3.1. Case study „Nelt" company

For the purposes of this paper, a survey was conducted and the data was collected in the leading distribution company "Nelt". The business structure of this company is divided into several divisions. Some of the divisions are:

- Chemistry;
- Neoplanta;
- Milka;
- Cigars;
- Drugs.

The products that will be processed in this work are in the field of chemistry. Based on the nomenclature of chemical products, a part of the P & G products products, which belong to a special distribution group, have been isolated. A compiled list of "Bonux" products and

their planned annual quantity is shown in Table 1. This paper presents the application of the ABC method for the optimal analysis and classification of inventories.

Table 1. Distribution plan of department „P & G“ for product „Bonux“

Serial number	Product label	Product name	Planned quantity pcs
1	**P1**	BONUX 300 gr magnolia = 3 washings	2.880
2	**P2**	BONUX 300 gr lilac = 3 washings	1.404
3	**P3**	BONUX 300 GR MANGOLIA = 3 washes	1.440
5	**P4**	BONUX 2 kg 2in1 mangolia = 20 washings	1.404
6	**P5**	BONUX 2kg rose & garden = 20 washings	336
7	**P6**	BONUX 2 kg 2in1 lilac = 20 washings	336
9	**P7**	BONUX 3 kg active regular = 30 washings	224
11	**P8**	BONUX 4 kg rose & garden = 30 washings	224
12	**P9**	BONUX 4 kg 2in1 mangolia = 40 washings	180
13	**P10**	BONUX 4 kg 2in1 mangolia = 40 washings	168
14	**P11**	BONUX 6 kg rose & garden = 60 washings	112
15	**P12**	BONUX 8 kg 2in1 mangolia = 80 washings	96
16	**P13**	BONUX 8 kg 2in1 lilac = 80 wash	96
17	**P14**	BONUX prof regular 12 kg = 120 washings	60
18	**P15**	BONUX prof 2in1 rose 14 kg = 140 washings	60
IN TOTAL			9.020

It is necessary to perform ABC analysis for a year interval, based on a rough market analysis and available capacities, in order to be achieved a next distribution plan for the department “P & G” in the business distribution system “Nelt” for the product “Bonux”, Table 2. The objective is that the number of products is reduced as much as possible and that the individual distribution volumes increase. In the market analysis, it was concluded that the sales opportunities for all products can be increased by 25%. The total volume of distribution is limited by the available capacity and can not be changed. It's necessary:

a) Carry out the selection of the production plan by the criterion of production volume. Group A to be determined so that the possible increase in the volume of distribution from it generates the total planned volume of distribution.
b) Display the selection of the distribution program graphically.
c) Define the distribution plan.

4. RESEARCH RESULTS

Since there is a large assortment of products in the initial distribution plan (P1, ..., P15), the goal is to distribute a smaller number of products but to distribute them in a larger quantity so that the distribution volume remains 9.020 pcs. Since the amount of each product can be increased by 25%, and after the increase, 9.020 products remains, the BEGINNING QUANTITY of the product in group A must be:

$$\frac{\sum_{i=1}^{15} Qi}{1.25} = \frac{9{,}020}{1.25} = 7{,}216\ pcs/year \quad (1)$$

So, group A should be formed to find 7.216 products, to increase their production by 25%, to 9.020. The next step is to form a table in which the products are sorted according to representation in the total volume of distribution, Table 2.

Table 2. Formation of the product

Rang	Product label	Product name	Planned quantity pcs	Total quantity pcs	Total %	Group
1	**P1**	BONUX 300 gr magnolia = 3 washings	2.880	2.880	31.93	**A**
2	**P3**	BONUX 300 gr lilac = 3 washings	1.404	4.284	47.49	
3	**P2**	BONUX 300 GR MANGOLIA = 3 washes	1.440	5.724	63.46	
4	**P4**	BONUX 2 kg 2in1 mangolia = 20 washings	1.404	7.128	79.02	
5	**P5**	BONUX 2kg rose & garden = 20 washings	336	7.464	82.75	**B**
6	**P6**	BONUX 2 kg 2in1 lilac = 20 washings	336	7.800	86.47	
7	**P7**	BONUX 3 kg active regular = 30 washings	224	8.024	88.96	
8	**P8**	BONUX 4 kg rose & garden = 30 washings	224	8.248	91.44	
9	**P9**	BONUX 4 kg 2in1 mangolia = 40 washings	180	8.428	93.44	
10	**P10**	BONUX 4 kg 2in1 mangolia = 40 washings	168	8.596	95.30	**C**
11	**P11**	BONUX 6 kg rose & garden = 60 washings	112	8.708	96.54	
12	**P12**	BONUX 8 kg 2in1 mangolia = 80 washings	96	8.804	97.61	
13	**P13**	BONUX 8 kg 2in1 lilac = 80 wash	96	8.900	98.67	
14	**P14**	BONUX prof regular 12 kg = 120 washings	60	8.960	99.33	
15	**P15**	BONUX prof 2in1 rose 14 kg = 140 washings	60	9.020	100.00	
IN TOTAL			9.020			

It is obvious that the sum of the first four products is in Table 3, 7.128 (which is approximately the required production volume). these products are grouped into group A. The following 5 following 5 products are grouped into group B, while the remaining 6 products are grouped into group C. In order to graphically display the distribution program by groups a Table 3 is formed.

Table 3. Program selection by group

Group		**A**	**B**	**C**	**Total**
Number of Products	quantity	4	5	6	15
	%	26.67	33.33	40.00	100.00
Product Quantity	quantity (pcs)	7.128.00	1.300.00	592.00	9.020.00
	%	79.02	14.41	6.56	100.00

The selection of the production plan based on Table 2 can be shown graphically on Figure 2.

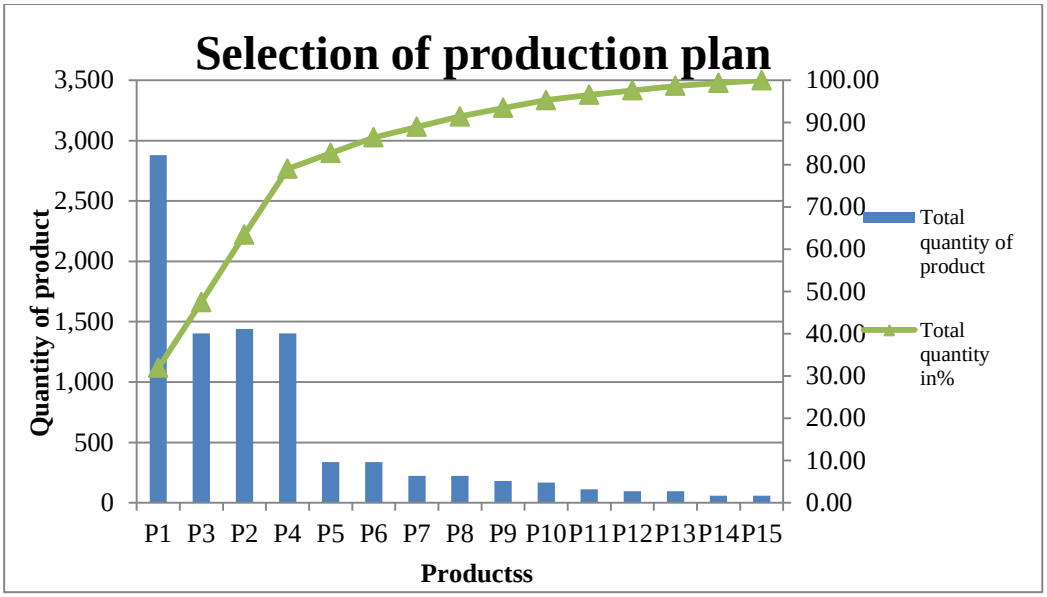

Figure 2. Selection of production plan - Pareto diagram

The graphic presentation of the distribution plan divided by groups is given in Figure 3.

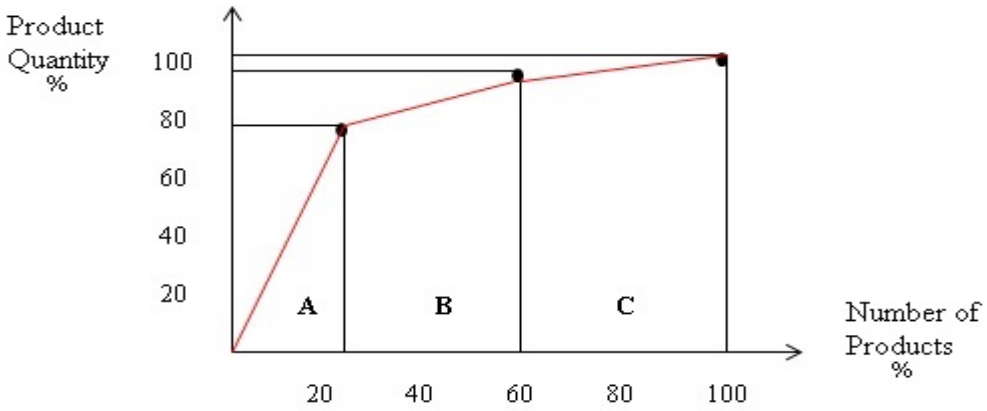

Figure 3. Program selection by group

A new basic distribution plan has been calculated and presented in Table 4.

Table 4. New distribution plan

Serial no.	Product label	Product name	Planned quantity pcs	Increase in volume%	New volume
1	**P1**	BONUX 300 gr magnolia = 3 washings	2.880	25	3.600
2	**P3**	BONUX 300 GR MANGOLIA = 3 washes	1.440	25	1.800
3	**P2**	BONUX 300 gr lilac = 3 washings	1.404	25	1.755
4	**P4**	BONUX 2 kg 2in1 mangolia = 20 washings	1.404	25	1.755
IN TOTAL			7.128	25	8.910

Obviously, the new production volume is slightly smaller than the given (8.910 <9.020). The market conditions dictated that the maximal increase can be 25%, which means that increasing the quantity of all four products by 25% can be managedand without exceeding the distribution and storage capacities.

5. DISCUSSION OF RESULTS

The data from the previous calculations show that it is possible to increase the product range A of the total optimal amount of distributed products per year. In Figure 4, can be seen the new appearance of the distribution assortment expressed in percent, for all four products of group A.

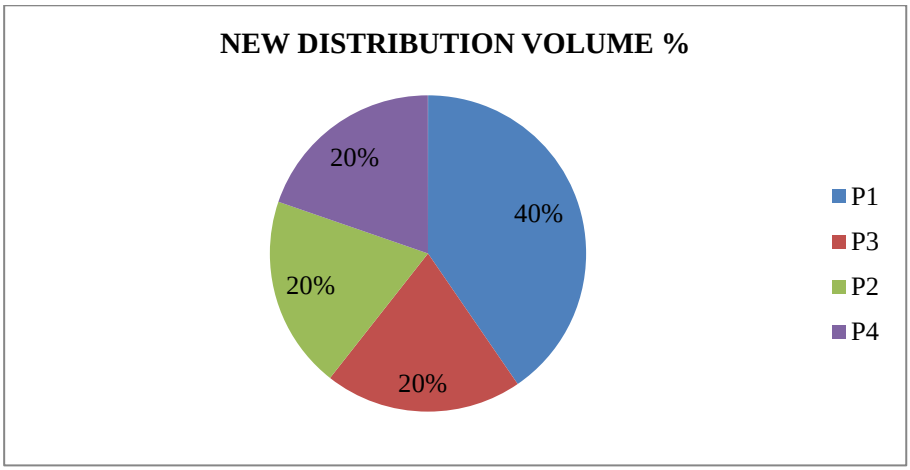

Figure 4. New volume of distribution

In the diagram can be seen that the new volume of distribution will be reduced to four products whose distribution will make a whole new volume. Product P_1 will include 40% of new product range, product P_3 20%, product P_2 20% and product P_4 also 20% of the entire assortment.
On the basis of the calculations, can be concluded that the Pareto principle applied through ABC analysis is an appropriate method for both, planning the future supply volumes and for controlling inventories in distribution companies.

6. CONCLUSION

In this study, ABC classification of inventories is proposed for distribution companies. Due to incorrect product distribution and inefficient inventory planning and control, there was a major problem where the assortment of distribution products was too large, and therefore the stock levels were too high. By using the ABC method, successfully is reduced the range to the four best-sized products on the market that will form a new range of P & G distribution channels. By reducing unnecessary stocks, the costs of storing and transporting if the stocks are reduced, which can significantly contribute to the improvement of the performance of the business entity.
For this reason, the ABC analysis for planning and control of inventory is adequate and easily aplicable in productive as well as in distributive companies.

ABC ANALIZA KAO TEHNIKA KONTROLE ZALIHA U DISTRIBUTIVNIM KOMPANIJAMA

Jelena Kovačević
Univerzitet u Beogradu, Tehnički fakultet u Boru, Odsek za inženjerski menadžment
Bor, Srbija

Izvod

U nekadašnjem poslovanju, važilo je pravilo da je "maksimalno = efektivno", međutim, pojam "maksimalno" zamenjen je pojmom "optimalano" u proizvodnji i svim ostalim poljima poslovanja. Ovo novo pravilo se takođe primjenjuje i kada su u pitanju zalihe. U prošlosti inventar je bio zanemaren, ali u današnjem poslovanju on predstavlja prioritet. Kaže se da je suviše skupo držati prekomerne zalihe, i zbog toga treba primeniti "optimalno" pravilo za njih. Da bi se pravilo primenilo, potrebno je kontrolisati i planirati obim inventara. Jedna od najefikasnijih tehnika kontrole zaliha je ABC metoda. Cilj ovog rada je testiranje ABC tehnike na zalihama u distribucionim kompanijama. Studija je zasnovana na prikupljenim podacima o inventaru, iz srpske distributivne kompanije "Nelt". Rezultati su pokazali da manji broj elemenata treba da bude u optimalnom asortimanu posmatrane kompanije.

***Ključne reči**: zalihe, optimalne zalihe, kontrola zaliha, ABC tehnika*

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