

## Utilization of ABC/XYZ analysis in stock planning in the enterprise

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**Abstract:** *Utilization of ABC/XYZ analysis in stock planning in the enterprise.* Utilization of ABC and XYZ analysis in the process of product stock management in trade enterprise is presented. Basing on the product list and information connected with the sale level, the goods were grouped into categories and priority levels in the decision problem solving were pointed out in order to achieve better financial results.

*Key words:* stock, stock planning, ABC/XYZ analysis.

### INTRODUCTION

The object subjected to analysis is an enterprise that sells the goods of household, radio and television and multimedia. The firm has been operating on the market since 2002 and is situated in Mazovian province. It is an administration subject within the private sector and is represented by natural person; according to valid classification [Chmielewski 1997] it can be counted among the small enterprises. It operates the branch retail trade that is limited to household goods and electronic equipment. The enterprise's organization structure has not expanded form and all employees are directly subordinated to the owner.

### METHODOLOGY

In undertaken activity connected with stock management there can be distin-

guished several stages. The first one includes observations and collecting information on the sale level of offered goods within the investigated month. At this stage there are obtained numerical data that are characteristic for the demand for particular products offered by the enterprise. Interpretation of these data enables to obtain the valuable information for working out the strategy for further activity and possibility of enterprise development. The ABC/XYZ analysis is one of the methods used in this respect. The collected data were arranged according to cumulated value and sale's volume. The analysis principle was based on the Lorenz curve diagram. One of the two described models for restocking of the selected products was assumed on the basis of classification. Considering that the small storage area in the analyzed enterprise limits the stock volume needed to assure a high level of customer's service, the rational stock management becomes especially important.

### METHOD FOR RESTOCKING

Apart from the two main methods for restocking (the system that uses a constant order volume and the system of periodic inspection) there exist the modified versions of models, including the method of

constant volume and constant intervals of orders, applied at the known demand. Considering uncertain level of demand, the investigated enterprise uses the irregular volume and irregular time intervals between orders. This method is based on the “pull” system that considers, first of all, the demand size [Bardi et al. 2002], as opposed to the “push” system that considers mainly the demand prognosis. Restocking in this system is performed according to timetable undertaken in advance, thus, it is better organized. It is most often used at the dependent demand and when delayed supplies can occur [Bowersox et al. 1986].

The „pull” system is used mainly at independent demand. The most important advantage of restocking models based on this system is the ability for efficient responding to the market needs. If the stock of certain product is too small or totally used up, the subsequent order is submitted. In respect of coordination, this system comes true in the single sale shops far better than in the expanded nets of distribution. On the other hand, such method does not provide a high level of customer service, since the order submitted in reaction to the lack of a given product does not assure its continuous availability; this method for restocking can bring about the negative effects of possible stock exhaustion.

#### ANALYSIS OF DEMAND FOR THE SELECTED PRODUCTS

The point of issue for determination a good restocking system should be the detailed analysis of demand to get information on particular products and trends of changes [Pierścionek 1997].

The demand can depend on the price for a given good; the lower it is, the more often a product can be purchased [Koptiew et al. 2002]. It is also shaped by incentives independent of the dealer, e.g. income level of society, number of potential consumers on the market, competition in the form of substitute goods availability [Wojciechowski 2007]. The initial stage of demand analysis can be the ABC/XYZ analysis, that describes the nature of changes in selling the products.

#### ABC/XYZ ANALYSIS

The main task of all enterprises is making large selection of products in sufficient quantities available to the customers [Błaszczuk 2005]. The enterprise offers a wide assortments of goods. Management of many items calls for division into goods of lower and higher strategic importance for the enterprise. Such need was first observed by H.F. Dicky, who found that such classification can be performed in order to determine the purchase policy, production planning and store management [Brown 1982]. The ABC/XYZ analysis that serves this purpose consists of ABC analysis and XYZ classification.

#### ABC ANALYSIS

The ABC analysis facilitates arrangement of products or materials into sets in consideration of a given criterion. It enables to manage the assortment groups without consideration to single elements that can be in large quantities. The assignment can be made according to following criteria: value of sale, demand for

a give product or rotation [http://www.logisticala].

Data for ABC analysis were worked out for 50 items (Tab. 1) of the sale offer; as a criterion of division the sale income was assumed. There was made a list containing the values of sale ( $W_s$ ) arranged in the column starting from the biggest one, calculated on the basis of unitary price ( $C_j$ ) and number of sold products ( $S$ ). The obtained value were the basis for determination of the percent share ( $uW_s$ ) of particular products in the sale volume and cumulated sale values ( $sW_s$ ). No full names or designations of analyzed pro-

ducts are given in the Table, with respect to constraints connected with data confidentiality.

In the obtained cumulated sale value one can distinguish three groups of products:

- Group A – includes 13 products (26%) of sale share 80.08%;
- Group B – includes 19 products (38%) of cumulated share value 14.54%;
- Group C – includes 18 products (36%) of cumulated share value 5.38%.

It confirms the Pareto's principle, which says that in empirical problems usually about 20–30% of reasons lead to

TABLE 1. Distribution of trade offer products according to ABC analysis

No	Product	Unitary price ( $C_j$ ) [zł]	Sale ( $S$ ) [pcs]	Sale value ( $W_s$ ) [PLN]	Sale ratio $W_s$ [%]	Cumulated share $W_s$ [%]	Group
1	2	3	4	5	6	7	8
1	TV LCD	1 449.0	29	42 021.00	18.48	18.48	A
2	Refrigerator-freezer	1 399.00	22	30 778.00	13.53	32.01	
3	Washing machine	959.00	18	17 262.00	7.59	39.6	
4	Washing machine	999.00	16	15 984.00	7.03	46.63	
5	TV LCD	1 699.00	8	13 592.00	5.98	52.61	
6	Microwave cooker	329.00	35	11 515.00	5.06	57.67	
7	Iron	279.00	37	10 323.00	4.54	62.21	
8	Vacuum cleaner	299.00	33	9 867.00	4.34	66.55	
9	Monitor	369.00	23	8 487.00	3.73	70.28	
10	Iron	189.00	42	7 938.00	3.49	73.77	
11	Computer loudspeakers	269.00	29	7 801.00	3.43	77.2	
12	Microwave cooker	349.00	10	3 490.00	1.53	78.73	
13	Hair cutter	99.00	31	3 069.00	1.35	80.08	
14	Refrigerator-freezer	1 099.00	2	2 198.00	0.97	81.05	B
15	Kettle	199.00	11	2 189.00	0.96	82.01	
16	Kettle	99.00	22	2 178.00	0.96	82.97	
17	Cooker	1 059.00	2	2 118.00	0.93	83.9	
18	Dryer	49.00	43	2 107.00	0.93	84.83	
19	Dryer	189.00	11	2 079.00	0.91	85.74	
20	Dish-washer	999.00	2	1 998.00	0.88	86.62	

Table 1. (continued)

1	2	3	4	5	6	7	8	
21	Electric shaver	99.00	20	1 980.00	0.87	87.49	B	
22	Juice extractor	189.00	10	1 890.00	0.83	88.32		
23	Hair straightener	52.00	35	1 820.00	0.8	89.1		
24	Kettle	249.00	7	1 743.00	0.7	89.89		
25	Headphones	169.00	10	1 690.00	0.74	90.6		
26	Curler	75.00	22	1 650.00	0.72	91.3		
27	Camera	749.00	2	1 498.00	0.66	92.01		
28	Electric shaver	119.00	12	1 428.00	0.63	92.64		
29	Freezer	1 289.00	1	1 289.00	0.57	93.21		
30	Camera	279.00	4	1 116.00	0.49	93.7		
31	Dish-washer	1 099.00	1	1 099.00	0.48	94.18		
32	Toaster	59.00	17	1 003.00	0.44	94.62		
33	Kitchen robot	499.00	2	998.00	0.44	95.06		C
34	Mixer	249.00	4	996.00	0.44	95.5		
35	Vacuum cleaner	319.00	3	957.00	0.42	95.92		
36	Extension cable 5 m	27.99	34	951.66	0.42	96.34		
37	Blender	189.00	5	945.00	0.4	96.75		
38	Home cinema	899.00	1	899.00	0.4	97.15		
39	Cooker	869.00	1	869.00	0.38	97.53		
40	Vacuum cleaner	119.00	7	833.00	0.37	97.9		
41	CD-RX discs	16.99	49	832.51	0.37	98.27		
42	Monitor LG	799.00	1	799.00	0.35	98.62		
43	Toothbrush	79.00	10	790.00	0.35	98.97		
44	Vacuum bottle	54.90	12	658.80	0.29	99.26		
45	Batteries Duracell	9.99	57	569.43	0.25	99.51		
46	HP device	189.00	3	567.00	0.25	99.76		
47	Toaster	179.00	2	358.00	0.16	99.92		
48	Ventilating hood	189.00	1	189.00	0.08	100		
49	Washing machine	1 469.00	0	0.00	0	100		
50	TV LED	2 469.00	0	0.00	0	100		
	TOTAL			<b>227 412.40</b>	<b>100</b>			

Source: own elaboration.

about 70–80% of results [Hendrick 1985]. In the case of investigated enterprise, the sale results (numerical or financial) can be determined by a small part (26%) of products offered.

Information from the above Table can be presented graphically for better illustration. Dependence of total sale value

on the number of assortment items is presented on the diagram in the form of Lorenz curve (Fig. 1).

The carried out ABC analysis and the obtained results enable to group the products into categories. By identification and evaluation of significance of the analyzed problems, the results provide the

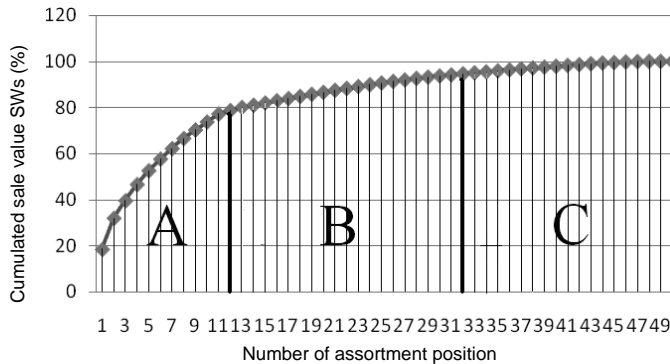


FIGURE 1. Lorenz curve for analyzed assortment items (own elaboration)

basis for determination priority levels in solving of the decision problem to achieve better effects. It is evident from the analysis that basic concentration of activities should be focused on a small set of 13 products (26%) that provide the enterprise with about 80% of the sale value. The group B includes 19 products (38%) that bring smaller profit to enterprise (14.54% of the sale value). Products of this group are less important for the enterprise, thus, it should be considered if activities towards improvement of situation (demand analysis, evaluation of the reasons for low sale, evaluation of the market and competitors, etc.) should not be performed in a later period. The analysis also pointed out at 18 products (36%) of small effect on the sale value (5.38%), where undertaking activities that force the enterprise to financial or organization efforts could be inexpedient or should be preceded with the economic or organization analysis. However, it happens that incorrect conclusions are drawn from the ABC analysis, e.g. when the whole attention is paid to group A, while groups B and C are treated casually. In the case of a trade enterprise it can result in situation, when the product

stock of these two groups are inaccessible for the customers. In addition it is possible that at the change in demand structure, the non-assignable products of C group will be sold in future in far bigger quantities. It means that a proper importance should be put down to particular groups in order to be informed on current situation and be able to use appropriate solutions in stock management in the nick of time. Besides, in the case of availability of data that cover the longer period, it is possible to investigate the demand changes with time and the potential trends or seasonal changes.

## XYZ CLASSIFICATION

The XYZ classification is a modification of ABC analysis and consists in classification of products (in the case of a trade enterprise), based on the structure (rate) of their selling; therefore, it provides with the knowledge essential in decision making in stock management. Apart from the assumed criterion according to the value (BC analysis), to achieve better segmentation of products one should divide them also according to the sale quantity. To this end the XYZ classifica-

tion was used; the product assortment items were divided into three groups:

- group X – goods of high selling rate;
- group Y – products of average selling rate;
- group Z – goods of low selling rate (sold occasionally).

Taking into consideration the above guidelines and data collected in investigations, the following sale intervals for particular items were determined:

- 31–50 pcs – group X;
- 11–30 pcs – group Y;
- 0–10 pcs – group Z.

The ABC analysis and XYZ classification carried out previously resulted in division of products into nine groups, from AX to CZ groups. The results of ABC/XYZ classifications are presented in Table 2.

The carried out analysis uses the input data obtained during investigated period.

TABLE 2. Division of products according to ABC/XYZ classification

	<b>X</b>	<b>Y</b>	<b>Z</b>
<b>A</b>	Microwave cooker (6) Iron (7) Vacuum cleaner (8) Iron (10)	TV LCD LG (1) Refrigerator-freezer (2) Washing machine (3) Washing machine (4) Monitor (9) Computer loudspeakers (11)	TV LCD (5) Microwave cooker (6)
<b>B</b>	Hair cutter (13) Dryer (18) Hair straightener (23)	Kettle (15) Kettle (16) Dryer (19) Electric shaver (21) Hair straightener (26) Electric shaver (28) Toaster (32)	Refrigerator-freezer (14) Cooker (17) Dish-washer (20) Juice extractor (22) Kettle (24) Headphones (25) Camera (27) Freezer (29) Camera (30) Dish-washer (31)
<b>C</b>	Extension cable (36) Discs CD TDK (41) Batteries (45)	Vacuum bottle (44)	Kitchen robot (33) Mixer (34) Vacuum cleaner (35) Blender (37) Home cinema (38) Cooker (39) Vacuum cleaner (40) Monitor (42) Toothbrush (43) HP device (46) Toaster (47) Ventilating hood (48) Washing machine (49) TV LED (50)

Source: own elaboration (in parentheses the product positions in assortment according to Tab. 1).

These information show the demand size for the products per month. In drawing conclusions of the analysis one should consider also other aspects (depending on peculiarity of a given branch), e.g. the costs resulted from management of the product group. In investigated enterprise the main criteria included only the sale value and quantity; on this basis the following was assumed:

- Products of groups AX, AY, AZ and BZ, CZ should be ordered according to the system based on the information level;
- Products of groups BX, BY, CX and CY should be ordered according to periodic inspection. In respect of fairly high demand and relatively small value of these products when compared to other items, the enterprise will afford their regular purchase.

## CONCLUSIONS

The proposed system of restocking enabled to formulate the following conclusions:

- The carried out ABC/XYZ analysis enables to arrange the goods according to selected criterion. Supplementation of assortment division according to total sale value with the division that considers the demand size gives more accurate evaluation of the enterprise's results.
- The undertaken activities with the use of ABC/XYZ analysis enable to identify the products of the enterprise offer that do not bring the expected financial profits, and allow for introduction the appropriate corrections.
- The XYZ classification enabled to classify the products on the basis of their sale quantity structure; it provided with

the knowledge needed for decision making in the stock management. The distinguished groups of goods enable to determine the way of their ordering correlated with the demand.

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**Streszczenie.** Wykorzystanie analizy ABC/XYZ w planowaniu zapasów w przedsiębiorstwie. Artykuł przedstawia sposób wykorzystania analizy ABC/XYZ do planowania zapasów w przedsiębiorstwie handlowym. Na podstawie wyników analizy pogrupowano towary w dziewięć grup i wskazano wyroby znajdujące się w ofercie, które nie przynoszą oczekiwanych korzyści finansowych. Wydzielone grupy towarów pozwalają określić sposób ich zamawiania skorelowany z popytem.

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