



## INFLUENCE OF THE ABC ANALYSIS ON INVENTORY MANAGEMENT

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### Abstract

The basis of frequency inventory analysis is ABC analysis. It is one of simple tools that can be applied in a variety of modifications and various fields such as in management of assets and liabilities, management of completion in production, sales management. The major use of the ABC analysis is in the inventory management of the company. The objective of the ABC analysis is that the company consistently increases its attention to important areas. It is inappropriate to pay the same attention and to monitor and to manage closely in detail all the purchased and stocked items. That's the main aim of the presented paper. On the contrary, it is better to differentiate the different groups of stocks at all stages of the purchase process, i.e. when designing the management of purchasing, when forecasting, purchasing and managing inventory. The aim of the article was to point out the potential that ABC's analysis has and on its various modifications that are well-used in practice to reduce inventory costs.

**Keywords:** ABC, inventory, criteria, analysis

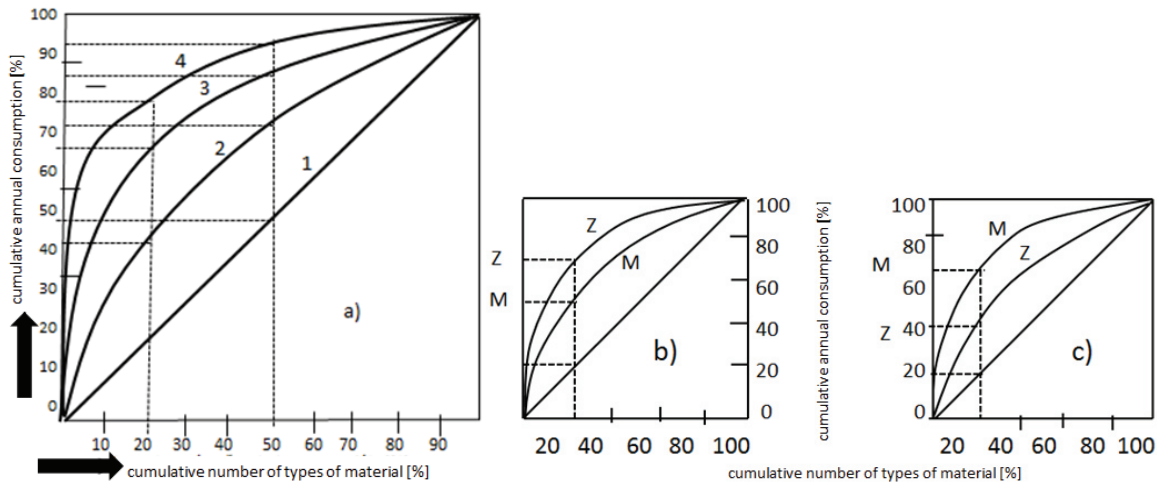
### 1. INTRODUCTION

Frequency inventory analysis is analysis that aims to sort individual inventory items according to predetermined criterions. The importance of categorization in the process of analyzing but also controlling and regulating inventories is primarily in a different approach to individual items that an enterprise buys, stores, handles and sells. The goal is to create inventory portfolio by differentiating individual items according to the impact of the selected criteria on the final result [1-3]. The most important and most used method is the ABC method, based on Pareto's principle (80/20 rule, which was founded at the University of Lausanne of his research on the population structure of property in Milan: the result was that 80 % of assets accounted for 20 % of the population) and M. O. Lorenzo, which were first used in theories of management [4-6].

### 2. IMPORTANCE OF ABC'S ANALYSIS IN INVENTORY CONTROL AND MANAGEMENT

The purpose of frequency analysis of inventory is to determine the most important items in terms of the criterion under review and focus on these items (ABC method is group A and B). The graphical processing of the analysis is shown in the so- Lorenz's curve, this can help in finding hidden reserves in the company's purchasing strategy. Optimal is when the Lorenz curve is copying a diagonal. The greater the concentration of consumption in a smaller number of items, the more important is the detailed analysis of the items in Group A, as the greatest reserves are present in relation to the optimization of costs related to the inventory, **Figure 1** is a comparison of the Lorenz consumption and supply curve, it can be stated [4,6,7].:

- inventory curve is above the consumption curve - it is a higher accumulation of inventory in the decisive items, thus prolonging the turnover of these items compared to the average turnover of the inventory as a whole, it is creating the possibility of reducing inventory turnover by lowering inventory maintenance costs,
- inventory curve is below the consumption curve - the cumulative amount of inventory is lower than consumption, i.e. turnover of inventory of critical items is shorter than average.



Analysis of the Lorenz curve:

- a) different concentration of inventory consumption:
    - (1) 20% of items and 20% of inventory consumption
    - (2) 20% of items and 45% of inventory consumption
    - (3) 20% of items and 69% of inventory consumption
    - (4) 20% of items and 80% of inventory consumption
  - b) inventory curve is above the consumption curve, i.e., concentration of inventories in decisive items is greater,
  - c) inventory curve is below the consumption curve, i.e. inventory concentration is lower
- Z - stock, M - material consumption

**Figure 1** Graph of Lorenz curve [4, 5]

Research has shown that in most cases, with 20 % of the products it is possible to reach up to 80 % Application of the analysis is concentrated mainly into material management to determine the extent of purchase by material groups, according to the supplier's turnover, according to the acquisition of materials (delivery time), suppliers according to respecting the time of delivery, materials according to the inventory (stock-turn), division by capacity, quality, purchase prices, etc. ABC analysis is based on the mentioned steps with the help to which an overview of the following is formed:

- what products and services are most important for the company turnover,
- customers who are the most important ones for the company thus key customers,
- purchased spare parts in connection with the acquisition are of the greatest importance.

Main steps in process of items classification according to ABC analysis are [4]:

- 1) parameter selection i.e. factor that best captures the essence of issue tracking,
- 2) calculation the percentage of items on total value and of the total number of items,
- 3) items sorting after the calculated percentage in step 2,
- 4) graph creation in the coordinate's % of the total number of elements -% of the total value of the parameter,
- 5) items separation into groups A, B, C for selected factors,
- 6) processing the results of ABC analysis using Lorenz curves.

Application of methodology for classification of material items by analysis ABC/XYZ and the creation of the material portfolio is processed in literature [5].

Prerequisite for successful implementation of the ABC analysis in the manufacturing plant is to meet some basic conditions [2-6]:

- *to establish a complete order and clarity in the labelling of material types*, to develop an overview with all the terms and to introduce systematic numerical characters,
- *to enhance the material standardization* that is to examine assortment in terms of needs in design and

technology department and in terms of sales requests and comments in purchasing department, to eliminate technically replaceable (substitution) and economically disadvantaged materials, to develop an obligatory material assortment standard of the company,

- to adjust the flow of information with regard of material group classification and the difference in signalling and inventory management.

The ABC analysis can be carried out depending on a number, resp. a range of factors examined:

- **one - factor analysis**

The application of this method is relatively simple because only one factor is taken into account when assessing and no further calculations need to be carried. For example: "a purchase price" as a subject of the study - various entities of the acquisition such as materials, parts, services have different purchase price. When considering only the purchase price as the assessing factor then the following dividing can be achieved by this analysis:

**A** = entities of the acquisition with high purchase prices,

**B** = entities of the acquisition with moderately high purchase prices,

**C** = entities of the acquisition with low purchase prices.

Decision between A, B and C is made with respect to these class limits. Another crucial factor in assessing can be for example "delivery time" - various entities of the acquisition have usually different delivery times. When considering only the delivery time as the assessing factor then the following dividing can be achieved by using the ABC analysis:

**A** = entities of the acquisition with long delivery times,

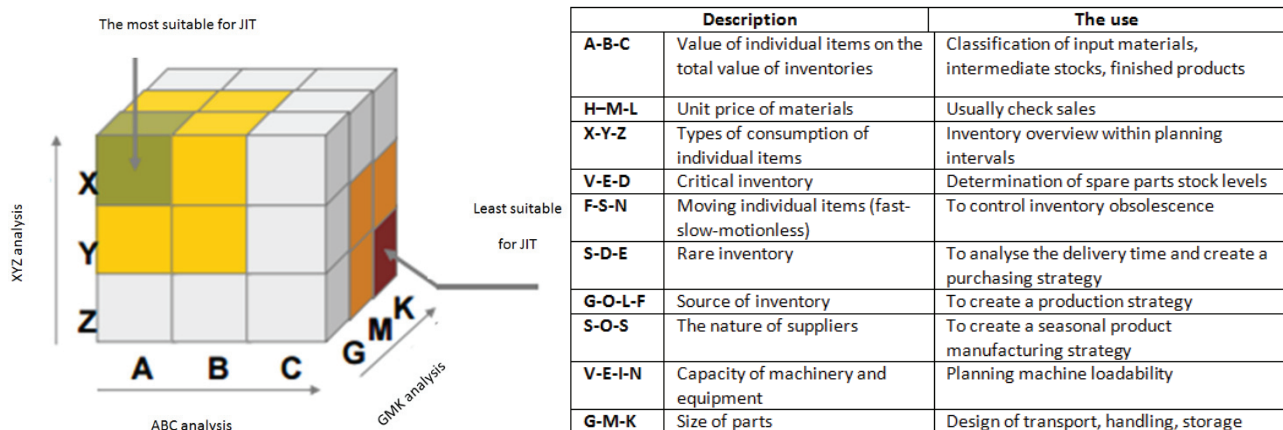
**B** = entities of the acquisition with moderately long delivery times,

**C** = entities of the acquisition with short delivery times.

- **two - factors method**

This method takes into account two assessing factors e.g. an amount and a purchase price. By multiplying the amount and the purchase price as a unit of quantity (e.g. a piece) it is got a value range of current entities purchased in the acquisition.

- **more-factors method** - most often, it takes into account the value, the purchase risks, the nature of consumption of a specific item, the possibility of substitution, the consequences of the deficit, **Figure 2.**



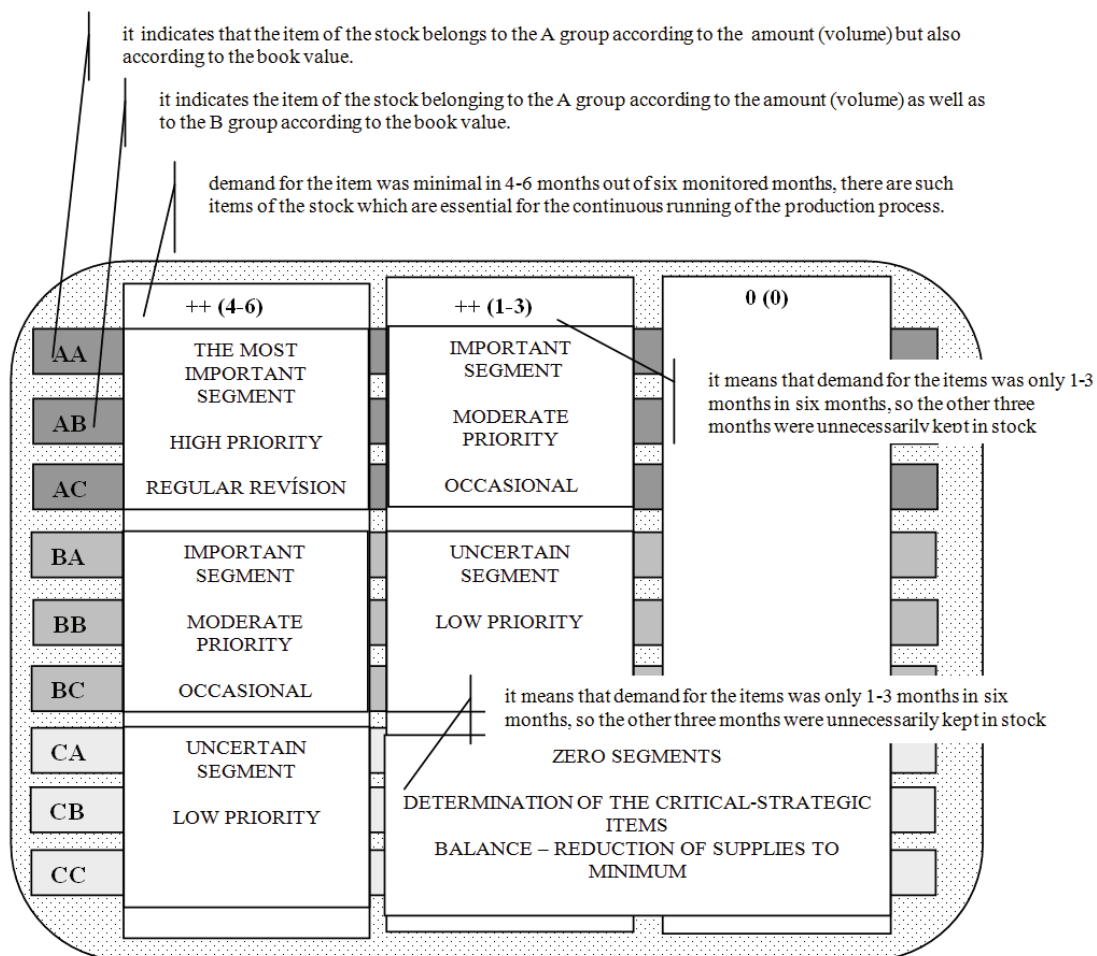
**Figure 2** Schematic view of combination of selected analyses [modified by 4, 6]



It is possible to differentiate assortment and inventory according to different criteria by using the ABC analysis (according to quantity: the volume of items, frequency of consumption, according to the book value: the use of so-called stock prices, the full production cost, selling price, according to the covering contribution: added value, margin). Combined analyses of ABC/XYZ focused on analysis of consumption frequency and the size of inventory is a great importance for warehouse management.

Improvement of the classical approach in stock by using ABC / XYZ methods is so-called **EW matrix** (developed by a consulting company Economic Wizard). EW matrix (**Figure 3**) segments a complete portfolio of the company stocks. It is suitable for inventory management of raw materials, materials and semi-products as well as the final products. The result is a matrix of nine rows which are the results of the ABC analysis. The columns show the division of items according to the results of the structure of stock analysis. EW matrix thus includes the following analyses [4-7]:

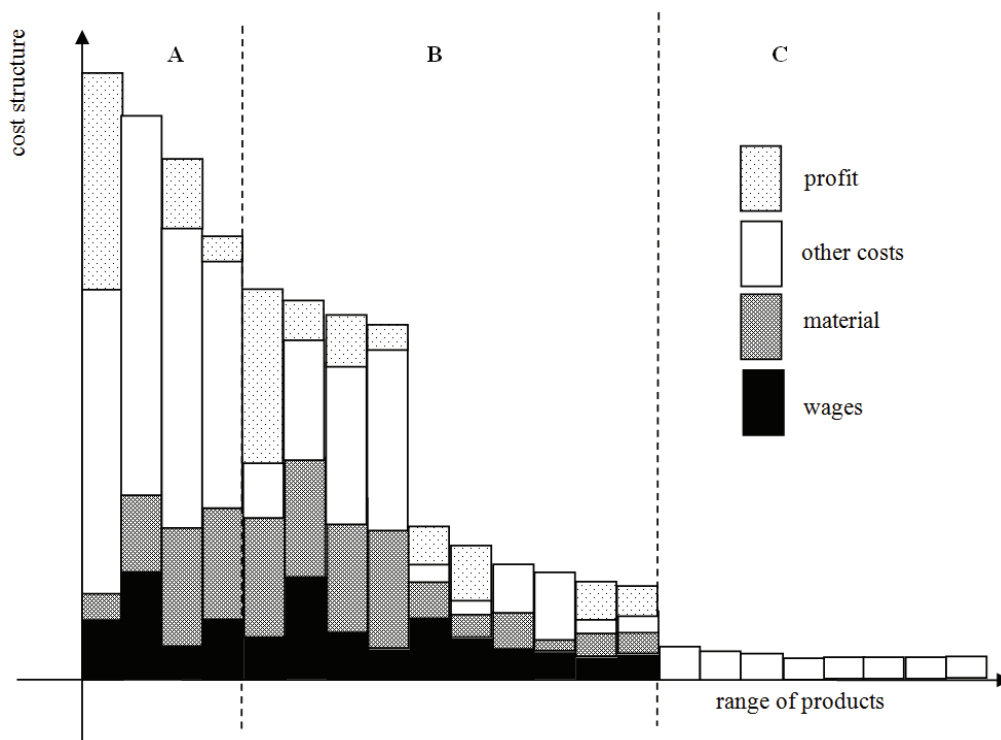
- ABC analysis according to the amount (volume, a number of taken supplies)
- ABC analysis according to the book value (use of the full cost of their own)
- ABC analysis by covering contribution (added value, margin)
- analysis of the stock structure: an analysis of turnover and trend analysis (identification of the consumption stability, determination of the main trend: increase, decrease, a constant process of consumption)
- forecast of demand (used to forecast the future potential strength of material security of the company).



**Figure 3** EW matrix - a sample application of the matrix by Economic Wizard focused on the structure of the company stock during the previous 6 months [modified by 4]



Another use of the ABC analysis is within the structuring the production program i.e. **P-Q graph**. The structure assessment of the production programme takes place mainly in terms of the size of production volume of particular assortment items expressed in physical units. Such a comparative factor depending on the goals and objectives of the production unit can be e.g. labour content of each product expressed in standard hours, or material intensity, but also value categories as the own full costs, a level of prices, etc. [4, 7-10]. According to the importance of those aspects, the range of products is divided into three basic product groups in compliance with the rules of the ABC analysis. Such realization of the analysis then provides an overview of supporting and developing elements of the production programme (A and B group). At the same time the PQ graph can be used as a supporting tool for further analysis. On the ground of the economic analyses it is possible to indicate in the graph e.g. the cost structure for particular assortment items. An example of the P-Q diagram is shown in **Figure 4**.



**Figure 4** The cost structure of products expressed in the P-Q graph [modified by 4]

### 3. DISCUSSION ABOUT POTENTIAL OF ABC ANALYSIS AND MODIFICATION

By the optimization of the inventory control and management process it is necessary to know the entire process and try to make it more effective, thus to focus on the specific areas that appear as potential for further improvement [4, 7-10]:

- the structure of purchasing process - its organization and realization of the particular stages,
- realization of the plan assessment and its comparison with the reality in the system with IT support - functionality improvement so to increase flexibility and streamline of planning and evaluation process
- purchasing strategy - improvement of scheduling: a production plan, purchase and sales plans, consumption and inventory plans, a plan of additional costs, of income statement, of balance sheet and a financial plan and the optimization of flows throughout the entire logistic chain,
- the operational purchasing behaviour,
- obtaining relevant information for evaluation of suppliers, leading negotiations,



- transparent purchase - precisely defined materials to be procured through the framework agreement and how they are ordered.

It is always necessary by optimization to perform a thorough analysis of the entire acquisition process, thus when the need arises through the approval of requests and orders, communicating with suppliers up to supplying material to the actual warehouse (or directly to production). The main criteria for the material procurement are a price of the material and quality of a supplier. It is not necessary to take a choice by each order. Based on previous orders it is possible to do a list of real, long-term ordered materials and conclude them in a contract. It is actually a contract of intent with agreed framework conditions for each material. When realizing individual requirements it is no longer needed to search for suppliers and subsequent price offers. This represents a significant time reduction of acquisition. Another significant change can occur in the transfer of powers to the competent staff who operate with information on the specific characteristics and requirements for ordered material. According to the negotiated conditions defined in contracts for the duration of the contract negotiated in advance by customers, these concrete employees can order through amendments to the contract material of their choice without the need for further approval. Transfer of responsibility to professional departments reduces the load from employees of purchase while maintaining their full control over the purchase process.

## CONCLUSION

The ABC analysis can be implemented to meet different objectives for different types of a particular area e.g. by inventory it is another goal for the input items, for unfinished production and for stocks of the finished products. The aim of the ABC analysis for the input items is the management optimization and planning of the items in terms of production continuity, ensuring a sufficient number of inputs to solve the current production requirements, reducing the risk of deficiency or the accumulation of unusable inventory. The aim for stocks of unfinished production is focused more on the optimal use of production capacity (ensuring the coverage of free time in production), reducing the risk of lacking in items for further processing derivable from the excessive length of continuous period of production. Concerning the finished products it monitors and reflects the development of a particular market segment. The common aim of all these areas is generating the output report providing an update on those items needed for the management.

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