

# Research on the Application of Expansion of EIQ-ABC in the Warehouse Management

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**Abstract** Warehouse Management is increasingly attach importance to managers. Many scholars have carried out a great deal of research and resulted in a number of encouraging results. Through the comprehensive analysis of other scholars, study, this paper makes a new type of research methods - the expansion of the EIQ-ABC method. This paper makes the corresponding model and a case study. The authors hope that this model can provide a powerful warehouse management method for help.

**Key words** ABC analysis; EIQ method; EIQ-ABC method

## 1 Introduction

Warehouse management is critical to the logistics management. It is directly related to production costs and corporate management costs. So warehouse management optimizing has become one of the most important works. Many scholars have conducted in-depth research, resulting in a large number of research results. There are many of the theories and methods of warehouse management, such as ABC analysis, EIQ methods. However, these methods are some flaws.

## 2 ABC Warehousing Analysis

ABC analysis is a transformation method from the Pareto curve analysis .In 1897, when the Italian economist Pareto engaged in the study of the distribution of income and wealth in Milan, Italy. He found that 80% of the wealth is owned by 20% of the people and the remaining 80% of the majority of the people account for only 20% of minority wealth. Pareto call it relations of "the key of the minorities and the majority of secondary ", used to indicate that the unequal distribution of wealth and known as Pareto charts distribution curve<sup>[1]</sup>. This basic method is used in the enterprises management, known as "ABC analysis." The key points are the classification of complex economic phenomena, and finding the small number of the most critical, then focusing on the small number of key, and then having a multiplier effect. When ABC analysis is applied to warehouse management, it was known as the ABC analysis method.

Traditional ABC analysis is very simple and widely used, but the classification criteria is too simple in practical applications, inventory items were classified by the share of funds or product sales, it does not take many factors into account, such as the ease of purchasing of products, or the procurement lead time.

To address this problem, many scholars have done many researches. Such as the Li Huijie and LI Huijuan, they proposed expansion of the ABC model and Gao Shaojie proposed the double-decker ABC management model .all of these are very good solution of the problem of traditional ABC analysis.

But whether it is the traditional ABC analysis or the expansion of the ABC analysis, all are from the view of the interests of the seller to manage warehouse, ignoring the demand characteristics of products.

## 3 EIQ Method

In order to adapt varied demand characteristics, Zhang Gui Min introduced EIQ analysis. EIQ analysis is an analytical method, created by Mr. David Suzuki, the authority logistics experts in Japan, through more than 40 years experience of actual combat.

EIQ analysis which starts from the enterprise order carried out an orders analysis of different levels to get receiving, storing, shipping characteristics of the goods, according to customer demand characteristics and combined with the entire PCB and ABC cross-category analysis<sup>[2]</sup>. EIQ analysis can provide a scientific basis for warehouse management.

The basic steps of EIQ analysis: 1. Book-to-bill data sampling 2. Book-to-bill data decomposing. 3. Data statistical analysis. Commonly used statistical methods include: on average, the largest minimum value, the total number, Plato's analysis, frequency distribution 4. Chart data interpretation and analysis,

including EQ analysis, IQ analysis, EN analysis, IK analysis.

Through EIQ analysis, enterprises can get a lot of useful information and provide effective data support for the management of enterprise. However, it ignores many Seller characteristics, such as the ease of procurement, procurement leading time. Shortage costs and so on. it leads contradictions with the ABC analysis in the classification, so that A-type products should not be the focus of management.

#### 4 EIQ-ABC Method

Many scholars also explore EIQ-ABC methods, but most of all separate ABC analysis of EQ, EN, IQ, IK<sup>[3]</sup>. There is no comprehensive consideration of these four factors on the storage management. This method only applies ABC analysis in the EIQ, and neglect the seller characteristics, resulting in the conflicts with ABC analysis in the classification.

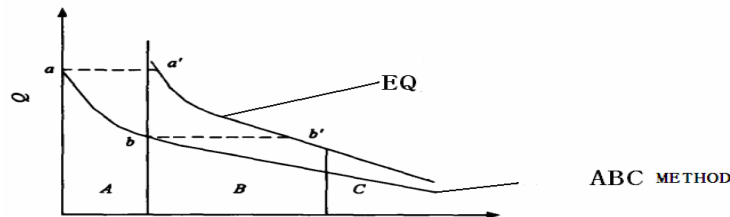


Figure 1

In the above Figure, according to the expansion of ABC analysis, A-type products should be included in paragraph a-b curve. However, according to EQ-ABC classification analysis, you found significant differences existing.

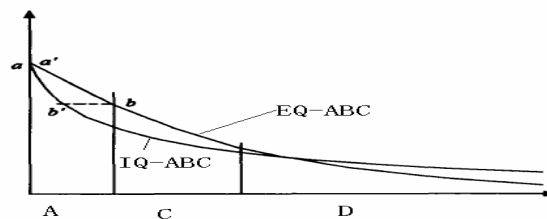


Figure 2

Do an analysis using EQ-ABC and IQ-ABC; we can see that there is a certain lack of co-ordination.

#### 5 EIQ-ABC Expansion Analysis

Expansion of the EIQ-ABC analysis is different from the traditional analysis of the EIQ-ABC. It overcomes the traditional shortcomings of the EIQ-ABC, and absorbs the traditional advantages of ABC analysis. It is a comprehensive warehouse management method.

##### 5.1 Comprehensive evaluation index of warehouse management system

1) The value of goods

Traditional ABC analysis normally bases on proportion to the share of funds to carry out the classification, and now it is still an important factor which must be considered in inventory management. If other factors are in certain circumstances, the more the value of goods, the more important it should be. Value of goods = Share capital items / total value of inventory items

2) The procurement leading time

Procurement lead-time is the procurement time. If other factors are in certain circumstances, the longer procurement lead-time is, the more important it should be .then the item should focus on management, in order to prevent out of stock.

3) Shortage Costs

Shortage Costs is known as the result of external and internal disruption of supply. If other factors are in certain circumstances, the greater the product out of stock cost is, the more important it should be. The product should focus on management to prevent shortage of goods.

4) Ordered frequency of item

Ordering frequency of item refers to the frequency of items to be ordered in a certain period of time.

$$\text{Ordered frequency of item } j = \sum_{i=1}^n (IK)_{ij} / \sum_{i=1}^n (EN)_i, \text{ which } i \text{ is } i \text{ orders, } j \text{ for the product } j. \text{ If}$$

other factors are in certain circumstances, the higher the order frequencies are, the more important it should be. Then enterprises should focus on the items.

5) The proportion of items in order

$$\text{The proportion of items } j \text{ in order} = \sum_{i=1}^n (IQ)_{ij} / \sum_{i=1}^n (EQ)_i, \text{ which } i \text{ is the } i \text{ orders, } j \text{ for the product}$$

j. If other factors are in certain circumstances, the greater the proportion of items, the more important it should be. Items should be focused in the warehouse management.

Many factors should be considered in warehouse management course. This paper only mentions a few of the most important factors. The weight of each factor responses the importance of factors in the warehouse management.

How to properly determine the weight of each factor is related to the classification results.

**5.2 Determine the weight of each factor**

AHP is a kind Combination of qualitative analysis and quantitative analysis. This paper uses AHP to determine the weight of various factors, the steps are as follows.

1) To establish the hierarchical structure

Warehouse Management hierarchical structure is as follow

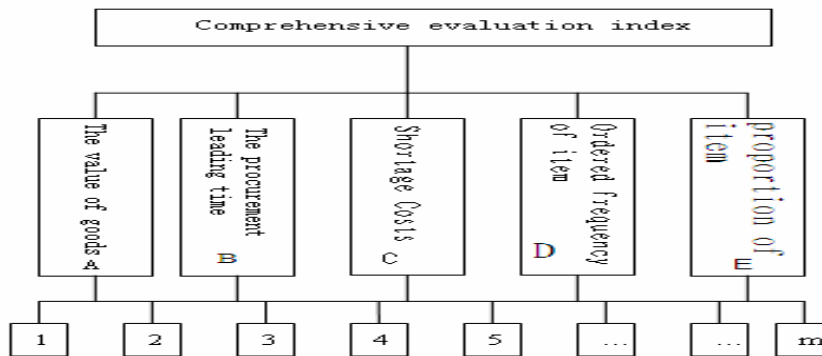


Figure 3

2) Building Judgment Matrix

The structure of Judgment Matrix as shown in the table

A	1	2	.....	m
1	$b_{11}$	$b_{12}$	.....	$b_{1n}$
2	$b_{21}$	$b_{22}$	.....	$b_{2n}$
.....	.....	.....	.....	.....
m	$b_{m1}$	$b_{m2}$	.....	$b_{mn}$

Figure 4

$b_{ij}$  Stands for in terms of A, i am on the relative importance degree of j, usually made from 1, 2, 3 ... ..

9 and the inverse.

3)Single hierarchical arrangement and consistency check

Seek out relative weight value of elements of the same level to a elements on the upper level

Consistency check index  $CI = \frac{\lambda_{\max} - n}{n - 1}$

4)Total hierarchical arrangement and consistency check

The structure is shown in the table

hierarchical	A	B	C	D	E	weight
$\alpha_j$	$\alpha_1$	$\alpha_2$	$\alpha_3$	$\alpha_4$	$\alpha_5$	
1	$x_{1A}$	$x_{1B}$	$x_{1C}$	$x_{1D}$	$x_{1E}$	$\omega_1$
2	$x_{2A}$	$x_{2B}$	$x_{2C}$	$x_{2D}$	$x_{2E}$	$\omega_2$
.....	.....	.....	.....	.....	.....	.....
m	$x_{mA}$	$x_{mB}$	$x_{mC}$	$x_{mD}$	$x_{mE}$	$\omega_m$

Figure 5

Consistency check index  $CI = \frac{\lambda_{\max} - n}{n - 1}$

**5.3 Classify items**

First, sort  $\omega_1 . \omega_2 \dots \omega_m$  from biggest to smallest. And then calculate weight sum Q. When  $65 \% < Q < 85\%$ , and these items are into the A category. And the left can be continued to classify B and C or D .E.....

**6 Conclusion**

Through analysis of the ABC and EIQ traditional methods, Author makes a new type of research methods - the expansion of the EIQ-ABC method, hoping that this model can provide a powerful warehouse management method for help.

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