



Application of EIQ-ABC Analysis Method in Warehouse Management of X Cold Chain Logistics Distribution Center

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Abstract: In recent years, China's cold chain logistics has gradually strict requirements on timeliness and quality, and cold chain logistics enterprises are faced with the challenge of how to rationally plan distribution centers to quickly respond to and meet the diversified needs of consumers. As a key node in the cold chain logistics system, the overall cargo management and storage efficiency of the cold chain distribution center play an important role in ensuring the efficiency and quality of cold chain logistics distribution. In order to scientifically plan the warehousing management of the cold chain distribution center, this paper takes X cold chain logistics distribution center as the research object, combines EIQ method and ABC classification method, makes statistical analysis of its customers' order data, and scientifically classifies customer orders and goods, so as to rationally optimize the storage of goods and order selection methods, aiming at improving the warehousing efficiency of the distribution center. In order to meet the needs of customers efficiently and with high quality.

Keywords: cold chain distribution center; EIQ analysis method; ABC classification

1. Introduction

China has entered the era of consumption upgrading, under the change of people's consumption concept, cold chain logistics enterprises need to ensure product quality on the basis of meeting the demand of service aging. As an important node in the cold chain logistics system, the warehouse management level of the cold chain distribution center is the key to ensure the quality and efficiency of the cold chain logistics. With the development of the distribution center outbound orders to small batches, high frequency, and multiple varieties, it has become urgent to improve the efficiency of warehousing operations.

However, at present, the cold chain distribution center generally has the problem of low storage efficiency caused by improper storage management, which has been deeply studied by scholars. In terms of the overall cargo management research, by analyzing orders from different dimensions, Fen S puts forward targeted suggestions on cargo space planning and optimized cargo management strategies [1]. Liu et al. [2] used order data to build EIQ-ABC analysis model and put forward planning and layout suggestions for finished products in the distribution center; Aiming at the order selection process, Zhi-Duan Shen et al. formulated the selection strategy by using EIQ analysis method [3]. In general, the comprehensive analysis of order characteristics and scientific storage management has become an important research issue for cold chain logistics distribution centers.

Therefore, in view of the common problems in cold chain distribution centers, this paper uses EIQ-ABC method to comprehensively analyze orders, and takes X cold chain logistics distribution center as an example for application. Based on the analysis of the current situation of distribution centers and customer orders, this paper optimizes cargo management and develops effective picking strategies, so as to improve the efficiency of warehousing operations and the overall service level.

2. Overview of EIQ-ABC analysis method

EIQ analysis method was first proposed by Japanese logistics expert Suzuki Zhen [4]. By studying the entry of order, item, quantity and their changes, this method helps to reveal the inherent law of the order of the distribution center, so that decision makers can make decisions in the selection method, storage planning, storage strategy and so on [5].

ABC classification is also often called Plato analysis or Pareto analysis, through the analysis of the relevant characteristics of classified objects, with A, B, C three categories to clarify the primary and secondary analysis of objects, and to determine different management models.

EIQ-ABC uses charts and other means to intuitively analyze and judge the data, and carries out IQ-IK cross analysis on the basis of IQ and IK analysis. It classifies the goods ABC according to the results, and reasonably plans the cargo storage area to clarify the specific picking method. It can analyze the historical orders more comprehensively, and avoid the failure

to effectively classify the goods properly due to the complex business data.

3. Analysis of problems existing in X cold chain logistics distribution center

X Cold Chain logistics distribution Center is committed to providing services for catering chains, fresh retail and food production and trade enterprises. The types of goods stored by X Cold chain Logistics distribution Center include frozen food, prepared vegetables and other products, which are used to meet the market demand in some areas of C City.

At present, the Center has relatively fixed customers, but due to its numerous and cumbersome business orders, the main problem is that the low efficiency of warehousing operations is difficult to meet the needs of customers with high quality.

After further analysis of the warehousing operation process of the distribution center, it is found that its low efficiency is mainly caused by the following operations: (1) the problems such as time-consuming acceptance, low efficiency of cargo handling, and chaotic stacking during warehousing;(2) Insufficient inventory of main goods in the warehouse, excessive inventory of secondary goods (3) the picking time of outbound orders is too long, affecting the accuracy and timeliness of goods out of the warehouse.

To sum up, the main reason for the low efficiency of the center is that there is no reasonable division of the goods location, which affects the efficiency and accuracy of the inventory. Moreover, the product classification standard is single, and the degree of circulation of the goods is not analyzed and classified, resulting in the lack of appropriate management of the goods and the formulation of appropriate picking methods.

4. Application and planning suggestion of EIQ-ABC analysis method in practice

4.1 Data collection and establishment of EIQ data analysis table

At present, the operation time of X distribution center is relatively short. This paper selects customer order data in October 2023 after its business volume reception is relatively stable for analysis. The overall order quantity during the period from October 18 to October 24, 2023 was more balanced, with the average shipment value being close to the average daily shipment value in October, so the sample data was locked into these seven days for analysis. A total of 1710 items of data were collected, involving 540 customer orders and 251 items of goods. The shipment counting unit was box, covering a wide range of customers and items, and having high data reference value. After systematically combing, calculating and analyzing the data, the EIQ analysis table is formed, as shown in the following table:

Table 1. EIQ analysis table

E (Entry of order)	I (Item)			EQ (The shipment quantity of the order)	EN (The number of outgoing items in the order)
	I1	I2	...		
E1	10	0	...	10	1
E2	0	2	...	6	3
...
IQ (Quantity shipped per item)	343	127	...	29129	-
IK (The number of shipments per item)	17	15	...	-	1467

4.2 IQ-ABC analysis and recommendations

According to the EIQ data analysis table, the shipment volume and proportion of a single item can be obtained according to the descending order of the shipment volume of a single item, and the IQ-ABC analysis chart is drawn accordingly, as shown in Figure 1.

As can be seen from the figure above, the shipment quantity of a single item presents a polarized distribution, indicating that the quantity fluctuation range is large. The more significant the polarization distribution is, the easier the classification planning principle is to apply. Therefore, ABC classification method is suitable for item management.

There are 51 items with shipments of more than 150 boxes, which only account for 20% of the total number of items, but the total shipment accounted for 66.25%. Therefore, these 51 items should be managed as Class A goods. There are 79 items of single item shipments accounted for 23.64%, accounting for 31.5% of the total number of goods, the overall is relatively medium, as class B for sub-key management; The remaining 121 items are Class C management goods, and the shipment quantity only accounts for 10.12% of the total, but the number of items accounts for 48.21%, which can be used for non-key storage management.

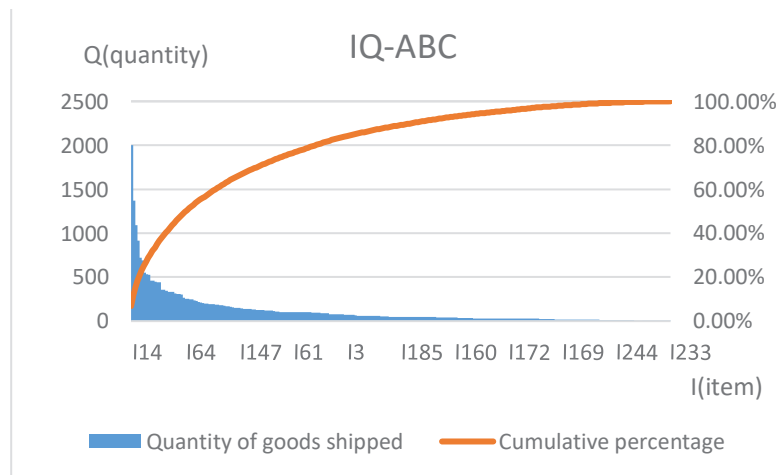


Figure 1. IQ-ABC analysis diagram

4.3 IK-ABC analysis and suggestions

According to the number of shipment times of individual goods in descending order, reflecting the shipment times and proportion of each item, we can understand the frequency of customer demand for goods, and further carry out ABC analysis of the item.

There are 54 kinds of single product shipments more than 10 times, accounting for 21.51% of the number of items, but the cumulative number of shipments accounted for 70.48%, such goods with frequent demand and high turnover rate are classified as Class A goods; The number of shipments of 83 items accounted for 21.75%, and the corresponding number of items accounted for 33.07% of the total, which was more balanced than the overall balance, and was used as a secondary key storage and management of goods; The remaining 114 kinds of goods are divided into Class C goods, the shipment times are once, the cumulative proportion of 7.77%, the number of items accounted for 45.41%, the number of items is large but the demand frequency is low, can be used as non-key goods.

4.4 IQ-IK cross analysis and suggestions

In order to enhance the comprehensiveness and objectivity of the analysis results, it is also necessary to conduct IQ-IK cross analysis on the basis of the above two analyses to deeply study the storage location and cargo classification. The analysis shows that IQ and IK are positively correlated, although the overall trend is similar, there are still some differences. The IQ value of goods with high IK value is generally high; However, a high IQ is not necessarily a high IK. Therefore, this paper focuses on the analysis results of IK-ABC to determine the ABC classification of goods.

Based on the classification results of ABC, the storage areas of different types of goods can be divided: Class A goods are placed in the area I closest to the inlet and outlet of the warehouse. This kind of goods should be replaced by machines and carried out batch selection and classification. Class B goods are placed in the middle area II near the entrance and exit of the warehouse, using the general sorting method; Class C goods are placed in the farthest area III from the entrance and exit of the warehouse, and the way of order segmentation and consolidation is adopted when picking, and attention should be paid to the goods with the largest shipment frequency in each area are located in the most convenient golden location.

In addition, due to the constant updating of the demand for goods, its classification is recommended to adjust flexibly according to the demand on a regular basis to ensure that the goods can be placed in the most suitable storage area.

5. Summary

At present, EIQ-ABC analysis method has been widely used in the logistics industry, providing guidance for the overall planning and operation of distribution centers. In this paper, X cold chain logistics distribution center is taken as the application object of EIQ-ABC analysis method. Firstly, customer orders are analyzed, order frequency and shipment of various goods are counted, and then the classification of goods is combined with ABC classification method, and the location is reasonably planned, and the selection methods of different categories of goods are formulated to ensure efficient and orderly cargo management. Through the application of EIQ-ABC method, I have effectively mastered the operation rules of X distribution center, optimized its warehouse management, saved the time of cargo handling and picking, improved the accuracy and timeliness of warehouse delivery, and finally improved the warehousing efficiency of X distribution center.

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