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RESEARCH ARTICLE

ANALYSIS AND OPTIMIZATION STRATEGIES FOR LOGISTICS DISTRIBUTION ISSUES AT MIXUE

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Abstract

This study focuses on Logistics Distribution concerns at MIXUE, a beverage business in City. The study highlighted various issues with Logistics Distribution, such as the distribution mode is not appropriate, which are critical to its functioning. Different logistics distribution modes directly affect whether the delivery is timely, etc. To improve distribution efficiency and maximize earnings, it is critical to quickly identify and fix these challenges, as well as provide appropriate optimization techniques. First, adjust the logistics distribution mode, adjust the third-party logistics distribution mode to the mixed logistics distribution mode. Next, based on the distribution analysis of ABC classification method and combined with the actual sales data in the past, the distribution frequency can be adjusted to once A week for class A raw materials, once every two weeks for class B raw materials and once a month for class C raw materials, and a certain distribution quantity and distribution route are given. Then, According to an ancient phrase, "Food is the god of the people." The food and beverage industry are a key driver of national economic development. Among these, competition for the MIXUE beverage chain is very severe. As a result, by studying the Logistics Distribution for MIXUE, comprehending its actual status, recognizing existing difficulties, analyzing the causes, and developing relevant optimization measures, we can avoid the dangers associated with Logistics Distribution.

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This will improve distribution efficiency, while increasing benefits. Analytic hierarchy process (AHP) and fuzzy comprehensive evaluation method are commonly used methods in logistics distribution. AHP is a decision-making analysis method that organically integrates qualitative and quantitative analysis and obtains the ordering of logistics distribution modes, while fuzzy comprehensive evaluation method is an overall evaluation method that turns complex problems into simple ones, reduces subjectivity and improves the accuracy of decision-making^[1]. With the support of the above methods, the ratio and methods of logistics distribution mode should be changed and optimized to improve the efficiency of logistics distribution, reduce distribution costs and maximize benefits. Therefore, logistics distribution is a necessary condition for the sustainable development of catering chain enterprises, so the development of chain operation focuses on the development of logistics distribution system^[2].

Introduction:-

Current Status of Logistics Distribution:-

As of 2023, MIXUE has built five warehousing logistics distribution centers (CDC). In addition to the five central logistics distribution centers, MIXUE has also set up provincial logistics distribution centers (RDC) and several advance warehouses (FDC) in 22 provinces such as Henan Province, forming a sound warehouse logistics distribution logistics, shortening the logistics distribution time and solving the distribution problem of the last kilometer^[3].

The warehousing and logistics functions of MIXUE enterprise are provided by the Shangdao Intelligent Supply Chain Co., LTD., a subsidiary of MIXUE, which provides logistics and distribution services. The advantage of such third-party logistics and distribution services is that the enterprise can collect corporate funds to specialize in logistics and distribution services, and can reasonably use the existing resources of the enterprise to carry out corporate distribution services.

All raw materials are grown by suppliers and their own planting bases, and then sent to DaKa International Food Co., Ltd. for processing. After processing, the finished products are distributed by third-party logistics companies to five central storage centers (CDC), and then replenished and distributed according to the replenishment plan of each provincial storage center (RDC). After that, it is distributed to each advance warehouse (FDC), such as the material supply of all franchised stores in P City MIXUE is deployed and supplied by the warehousing center located in Fuzhou, and finally distributed by logistics to each store or consumer. Nowadays, most of them are cold chain logistics distribution, and special cars are special shops, and the related costs of logistics distribution are exempted.

In the logistics distribution link also need to consider other factors, such as: urban traffic conditions, loading rate and transfer order. ShangDao Smart Supply Chain Co., Ltd. will deliver according to the fixed distribution route and planned distribution time. However, it is inevitable to encounter safety problems related to food quality in the distribution, such as: bad weather, traffic congestion and other factors cause delivery delays, resulting in a series of chain reactions, and ultimately increase the possibility of risk.

Issues with Logistics Distribution:-

In recent years, with the rapid development of China's economy, China's logistics system is constantly improving and improving, making the development of catering franchise enterprises has also made certain progress, among which MIXUE catering franchise enterprises in the beverage market due to the early establishment, occupy a certain important position in the market, has achieved good performance. The company's logistics distribution process also has a certain level, but compared with the logistics distribution of relatively mature international chain enterprises, MIXUE still has a big gap and shortcomings to be improved, mainly in the following aspects:

Lack of logistics distribution evaluation model:-

Although MIXUE was founded in 1997, its initial business varieties are relatively complex, including Chinese food and Western food, etc. The donation event of Henan flood in 2021 really entered the public's vision. Therefore, in the early stage of real entrepreneurship, MIXUE's planning and development plan for logistics distribution in restaurant chain operation are not mature. It is only passively developed under the promotion of the existing market, and there are still certain defects in the theoretical and practical research of the logistics system, which lacks a perfect logistics system that belongs to itself and suits itself. The existing logistics system has not assessed the performance in the logistics distribution process, and the cooperation and development of various processes in the logistics distribution is not mature.

High distribution cost:-

Although there are 22 distribution warehouses of MIXUE in the country, there is only one distribution warehouse in Fujian Province, located in Fuzhou, and its location is relatively remote. The role of this distribution warehouse is to distribute all stores of MIXUE in Fujian Province, which leads to a more complicated distribution route and a longer distribution distance, and the timeliness from warehouse to store cannot be guaranteed. Secondly, starting from 2021, the headquarters of the city of snow cold chain transport, so in the logistics and distribution process, most of the use of refrigerated trucks, and refrigerated trucks and ordinary distribution vehicles compared, the cost of the vehicle and the distribution process of refrigeration and other costs are proportional to the distance, therefore, the cost caused by high costs. Finally, the logistics distribution is unreasonable. The implementation of the cold chain is the special car shop special purpose, that is, the car only pull the goods of this store this time, if the order quantity of some stores is not large, which leads to the vehicle loading saturation rate is not high, the phenomenon of empty load, but its distribution costs remain unchanged; On the other hand, in the case of a small order quantity, if the order is combined with other stores, it also makes the distributor have to go back and forth between several stores, which leads to the total cost of vehicle transportation, but also increases the labor cost of the distributor and some hidden costs.

Low efficiency of information sharing and lack of relevant platform system support:-

The management of MIXUE has a strong sense of internal hierarchy and pays more attention to the process, but its management lacks detailed planning for the overall supply process, such as business process and information sharing process, which leads to the delay in the exchange and update of relevant data, resulting in the increase of work duplication and the error rate of information transmission, and ultimately the low information sharing. At the same time, there is a lack of relevant platform systems within MIXUE, such as: material classification management system and demand management system, which affects the logistics distribution of P City MIXUE to a certain extent.

First, the daily sales data of the store will be reflected in the computer system, but only the store manager and some of the management of the MIXUE can see, while the warehouse center and other relevant personnel can not see. Second, the person in charge of the store will take stock of the goods from time to time, but the number of inventory is basically only noticed when there is a shortage or out of stock of a certain goods. At the same time, although there are corresponding processes for receiving and inspecting the goods, they are currently carried out statistics and analysis based on Excel software and manual inventory, which makes the workload in the process of inventory, receiving and inspection larger. In addition, it is also prone to errors, and the difficulty of verification is increased. Third, based on the perspective of commercial security and confidentiality, the headquarters of MIXUE will not provide relevant information, data and resources to material suppliers, so that material suppliers know the inventory information and retail information of MIXUE, which causes the amount of materials and inventory needs to be estimated or predicted by relevant personnel, and ultimately affects all aspects of logistics distribution. Fourth, within the company, the communication between the relevant parts of operation, procurement and finance is not timely, which makes the phenomenon of out of stock and out of stock, therefore, the efficiency of information sharing needs to be improved and improved.

Fifth, the store orders of P City MIXUE must be responsible for the store person in charge, but most of the store person in charge is the first time to join the chain catering enterprises, and there is no relevant ordering experience, can only be rough orders based on sales experience, and the distribution of P City MIXUE stores is relatively scattered, and the corresponding consumer needs are not the same. As a result, the materials of each store cannot meet the current needs of the store. Therefore, when the information technology is more mature in the 21st century, it is necessary to make up for the shortcomings of the effective information platform system. Sixth, P City MIXUE has more products, making its distribution of material products are also more, such as equipment, related appliances, ice cream powder, bottled or canned fruit honey, molasses and strawberry jam, etc. Therefore, there are strict requirements in logistics distribution, such as temperature control and hygiene requirements during transportation and storage. Due to the lack of a certain material classification management system and demand management system support in the development stage of P City MIXUE, the distribution of more materials cannot achieve a more ideal service level and effect.

The regional configuration of the distribution center is not mature:-

Although MIXUE was founded in 1997, its corporate positioning is a catering enterprise focusing on Chinese and Western food. At the same time, the enterprise focus of MIXUE is on the revenue and establishment of stores, mainly focusing on the exploration of store positioning and product sales, and its support for logistics, such as: The

efficiency and satisfaction of logistics and distribution are not very concerned. The food processing plant of MIXUE - DaKa International Food Co., Ltd. was founded in December 2013, 16 years after the establishment of MIXUE, and the 22 warehousing and distribution centers of MIXUE were deployed and put into use in recent years. Due to the unstable market and the impact of demand in the early stage of the establishment of MIXUE, the number of its stores is small, and the logistics distribution capacity can still meet the raw material supply demand for its stores. However, with the rapid development of MIXUE from the second half of 2021 to now, the number of stores has surged to more than 22,000. Because the original logistics system did not get enough attention and scientific management and layout in the early stage, the logistics distribution problems occurred frequently.

The punctuality rate is low:-

There are some irrationalities in the planned distribution route, such as the lack of reasonable time arrangement and the inability to adjust the distribution route accordingly, which affects the low efficiency of distribution, and what's more, the punctuality of distribution cannot be guaranteed. For each franchised store in MIXUE of P City, the distribution of normal temperature materials needs to be delivered to each store in accordance with the previously agreed time point. However, due to the unreasonable distribution route, the distribution time is too long, resulting in the shortage of materials in franchised stores, which affects the company's reputation and customer satisfaction. Similarly, for the distribution of the cold chain, because the franchise stores in P City MIXUE will not change greatly in the short term, but the demand for materials in each store will affect the change of the route, if the reasonable route design is not carried out, the punctual delivery rate is low, and ultimately affect the normal operation of each franchise store.

Analysis of the Causes of Logistics Distribution Issues:-

Logistics distribution is the key to the normal operation of P City MIXUE. Due to the variety of materials distributed by the company and the different conditions, more logistics distribution problems will be caused, and the analysis and study of the causes of these distribution problems can reduce the cost of the company to a certain extent. The overall service level, logistics distribution efficiency, material turnover and resource integration progress will be improved to some extent.

The Third Party Logistics Distribution is Not Perfect:-

The logistics distribution mode of P City MIXUE is mainly provided by a third party, supplemented by independent distribution of enterprises. P City MIXUE is mainly engaged in beverage series, and the materials are mainly frozen and refrigerated products, so all cold chain distribution is adopted in the distribution process after the internal reform of the enterprise in October 2022. At present, the relevant problems in the cold chain are important safety problems in logistics distribution. Through analysis and research, we can see the main reasons for the above problems are as follows:

First, the third party logistics service delivery mode is not perfect. The product storage temperature requirements of P City MIXUE are different, but due to cost and other factors, it has not been a good classification and distribution. The disadvantage of commonly used refrigerated trucks is that they cannot guarantee the corresponding refrigeration or freezing mode for the distribution of goods with different temperature requirements, and only carry out a simple co-temperature distribution mode, which has a certain adverse impact on the food safety and quality of materials with special temperature requirements. The other is the room temperature van, the overall distribution of goods at room temperature distribution, the food with relevant temperature requirements only uses the "foam box + ice pack" type of simple thermal insulation operation, for the increase of cold chain food, this method is temperature abuse in the process of product distribution.

Second, the supervision of third-party cold chain logistics distribution is insufficient. Although most of the refrigerated vans are used for logistics distribution, and the cars are also equipped with corresponding temperature control systems to control the temperature, the staff does not check and monitor the temperature of the cars at irregular intervals, which will cause temperature errors and various unpredictable problems. If each franchised store of P City MIXUE finds material damage and other problems when receiving goods, it will give feedback to the relevant personnel of Fuzhou Warehousing center, but it will not be responsible for the third-party logistics distribution partners. In addition, because the temperature abuse problem of some materials in the transportation process will not be immediately reflected when the franchisee receives goods. Rather, when the quality of the franchisee's storage deteriorates, it cannot be determined and held accountable. Third, the third-party cold chain logistics evaluation is unreasonable. ShangDao Smart Supply Chain Co., Ltd. provided project data and conducted

review, but P City MIXUE and its franchisees did not participate in the project and did not receive relevant feedback. Therefore, the third-party cold chain logistics evaluation is unreasonable^[4].

No electronic information system has been established:-

The more important thing in food supply chain is the support of electronic information technology. At present, the informatization of procurement, storage and logistics transportation of P City MIXUE has been established, and the sales information system of each franchised store has also been established. However, since logistics distribution is entrusted to third-party enterprises, the informatization and third-party enterprises built inside P City MIXUE are two sets of independent information systems. While affecting efficiency, it will also adversely affect the product safety of the entire supply chain.

The information system created by the third-party distribution partners can only see the ordering information of the franchised stores and the product information that needs to be distributed, but cannot understand the relationship between the actual use quantity of the products in the franchised stores and the sales volume, the inventory quantity and other relevant information through the system. Due to the fact that the franchisees of the P city MIXUE do not understand the inventory quantity and replenishment cycle and replenishment quantity of the relevant products of the Fuzhou warehousing center, they will worry about the occurrence of problems such as out of stock and out of stock, so they will stock up as much as possible in the case of sufficient funds, resulting in inventory overstocking and other problems.

Supplier management mechanism to be improved:-

The product loss is large, the price fluctuation is large, it is difficult to accurately estimate the required quantity, the lack of unified product quality inspection standards and other related factors will affect the difficulty of product quality control. For P City MIXUE, its gross profit margin is about 65%, the other 35% is the cost of food raw materials, in addition, plus store funds and labor costs, which is the three major costs of P City MIXUE, resulting in its net profit of about 35%, therefore, from the cost and profit level analysis, food procurement is very important to P City MIXUE.

Establish the distribution mode decision model:-

When choosing logistics distribution mode, P City MIXUE will comprehensively consider the advantages and disadvantages of matrix graph decision-making method and qualitative analysis decision-making method, and then combine the characteristics of the enterprise itself to find a distribution mode decision-making model suitable for the logistics distribution needs of the enterprise. As the logistics distribution mode of P City MIXUE has the characteristics of small demand, high frequency and diversification, which is different from other industries, therefore, the choice of logistics distribution mode of this enterprise is affected by many factors, and corresponding analysis and research should be carried out, such as: the characteristics of raw materials, business processes, logistics distribution costs and services.

P City MIXUE in the decision of logistics distribution mode, can start from the following aspects: first, macro environment analysis. The selection of logistics distribution mode should consider the influence of internal and external environment. In China, due to the gap in development level between the east and the west, and the difference in economy and resources between different provinces and different regions within the same province, the development of logistics distribution cannot be balanced. Among them, the most obvious one is the third-party logistics distribution enterprise cooperating with P City MIXUE. Due to the limited development, shortage of funds and small logistics distribution volume of MIXUE in the early stage of its establishment, Considering the cost and its financial strength, we cannot support the establishment of an independent distribution center. Therefore, it is necessary to analyze the existing logistics distribution mode of cooperation with the third party, and find a distribution model that is more suitable for P City MIXUE's own cooperation proportion. The second is multi-factor analysis. There are many factors affecting the choice of distribution mode of MIXUE, which need to be considered and measured comprehensively, such as the attribute of materials, distribution cost, distribution service level and the comprehensive environment inside and outside of MIXUE in P City. Third, comprehensive decision-making. Through comprehensive consideration of several alternative distribution modes and accurate judgment, the logistics distribution mode suitable for P City MIXUE is finally selected.

Relevant scholars put forward a model about the connection between enterprises, customers and competitors, and through analysis, it can be obviously found that P City needs to have a certain cost advantage or value advantage in order to obtain a certain dominance in the existing competitive market environment. The choice of logistics

distribution mode should consider the service level and distribution cost in logistics distribution, it is best to choose a distribution mode with both cost and value advantages, in order to create the best quality service with the lowest operating cost, so as to seize the market.

If you only consider the service level and distribution cost of distribution when choosing the logistics distribution mode, it is certainly unreasonable, but also consider the characteristics of the material, the internal and external market environment and economic environment of the enterprise.

Logistics Distribution Optimization Strategy:-

Based on the demand forecast results of P City MIXUE, combined with the order quantity, order point and the characteristics of the product itself, the evaluation index system of "factors affecting the distribution mode of cold chain logistics companies" is constructed, and the index weight of the distribution mode of MIXUE is determined by the analytic hierarchy process. Based on the fuzzy comprehensive evaluation method, the author evaluates and makes decisions on the three distribution modes of self-operated distribution, mixed distribution and third-party distribution. Finally, the mixed distribution mode (i.e. self-operated + third-party proportional distribution) is selected and the corresponding logistics distribution scheme is formulated, which brings certain positive effects on the enterprises of P City MIXUE to improve distribution efficiency, reduce distribution costs and improve resource utilization.

The choice of logistics distribution mode:-

Establishment of evaluation index system:-

First, The idea of system establishment:-

The establishment of the evaluation index system focuses on the selection of indicators, which will have a great impact on the target level. In the selection of indicators, the author draws on the relevant principles of cold chain logistics and the existing research on distribution methods, and comprehensively considers the development of P City MIXUE with the company's current operating conditions. The method of analysis and synthesis is adopted, and the theory and practice are organically combined, and then the suggestions of experts and scholars in the field of logistics, enterprise management and the person in charge of franchised stores are solicited, so as to determine the preliminary indicators^[5]. The process of system establishment is shown in Figure 1.

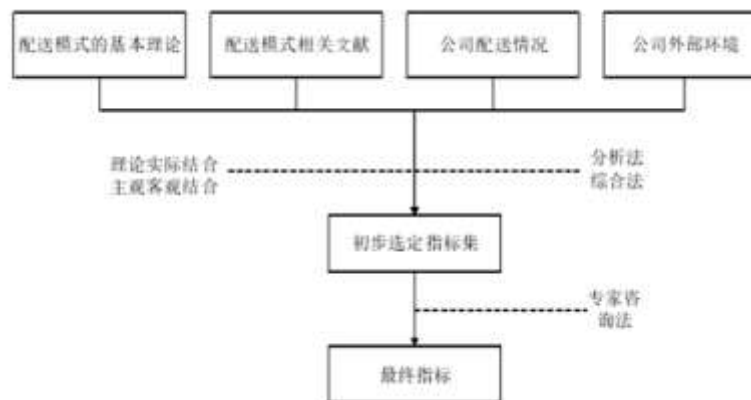


Fig.1 Index system construction ideas

Second, Establishment of index system:-

If an enterprise wants to achieve a leading position in the fierce market competition, the first thing to pay attention to is the cost and service quality of the enterprise [6]. In view of the characteristics of cold chain distribution and the attributes of distributed goods, the model is incorporated into the characteristics of the product itself, the impact of commodity vulnerability on the model is added to the index layer, and the timeliness and accuracy of distribution are emphasized.

From the analysis of the theory of distribution mode and the current situation of the company's distribution mode, we can find that in the study of the choice of distribution mode, it is also necessary to consider the operating situation. In order to ensure that the evaluation results will not be one-sided, this paper selects the level of local

logistics market and the current scale and strength of the company as the index factors for the selection of distribution mode.

After studying the relationship between distribution mode and supply chain of cold chain logistics enterprises, combined with the actual situation of MIXUE in P City, a set of evaluation index system of "the relationship between supply chain mode and supply chain mode" is established, and it is divided into target layer (L), criterion layer (G) and index layer (H). On this basis, this paper puts forward a cold storage supply chain management system suitable for our country. The target level is the impact factor (L) that affects the cold chain logistics distribution mode, and the criterion level is the four factors that most affect the cold chain transportation mode, including the distribution cost (G1). The indicator layer contains 15 subfactors, including the distribution operation cost (H1). See Figure 2 for the specific indicator system.

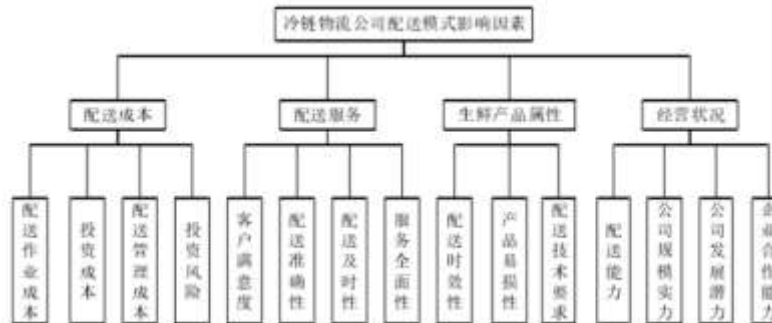


Fig.2 Distribution mode decision system hierarchy diagram

Operation of distribution mode selection model:-

First, Clarify the weights of the indicator system:-

This paper intends to use the AHP method to cluster the evaluation indicators, compare the evaluation factors, and obtain the weight vector of each evaluation factor by using the mathematical average method, and verify the compatibility of each evaluation factor. Among them, the priority between G and L is determined, and the corresponding calculation formula is given. On this basis, the evaluation matrix of exponential layer H to G is constructed with the same method. A questionnaire is used to score each factor index and get the average value. Table 1 shows the judgment matrix of layer G about layer L, and Table 2 shows the judgment matrix of layer H about layer G.

Table 1 L's judgment matrix about G

L	G1	G2	G3	G4
G1	1	1	3	4
G2	1	1	3	2
G3	1/3	1/3	1	2
G4	1/4	1/2	1/2	1

Through the analysis of L and G two evaluation matrices, the corresponding weights are obtained, and their consistency is checked.

(A) For the four factors G1, G2, G3 and G4, the weight vector W is obtained by means of mathematical mean value method.

$$W = (0.40 \ 0.34 \ 0.15 \ 0.11)$$

(B) Consistency test is carried out on the judgment matrix.

The maximum eigenvalue $\lambda_{\max} = 4.12$ is calculated

$$CI = \frac{\lambda_{\max} - n}{n - 1} = 0.039$$

It can be seen from the table that when the criterion layer is a fourth-order matrix: $RI = 0.9$

$$CR = \frac{CI}{RI} = 0.045$$

Since $CR < 0.1$, it meets the conformance check.

Similarly, the judgment matrix of layer H to layer G is given in the following table:

Table 2 H's judgment matrix about G

G1	H1	H2	H3	H4
H1	1	1/2	6	1
H2	2	1	3	3
H3	1/6	1/3	1	1/3
H4	1	1/3	3	1
G2	H5	H6	H7	H8
H5	1	3	3	5
H6	1/3	1	2	3
H7	1/3	1/2	1	2
H8	1/5	1/3	1/2	1
G3	H9	H10	H11	
H9	1	1/3	3	
H10	3	1	3	
H11	1/3	1/3	1	
G4	H12	H13	H14	H15
H12	1	1/3	3	1
H13	3	1	2	2
H14	1/3	1/2	1	1/3
H15	1	1/2	3	1

Through the analytic hierarchy process calculation method, the maximum eigenvalue and corresponding eigenvector of layer H about layer G are found out respectively, and their consistency is tested. The weighted vector results and consistency test results of layer L and layer G are summarized, as shown in Table 3.

Table 3 Vector and consistency test results

index	W1	$\Lambda_{\max}$	CI	RI	CR	Consistency check
L	(0.40, 0.34, 0.15, 0.11)	4.12	0.039	0.9	0.045	possess
G1	(0.28, 0.43, 0.09, 0.20)	4.24	0.082	0.9	0.092	possess
G2	(0.52, 0.24, 0.15, 0.09)	4.06	0.019	0.9	0.023	possess
G3	(0.29, 0.57, 0.14)	3.13	0.068	0.58	0.078	possess
G4	(0.23, 0.46, 0.08, 0.23)	4.24	0.078	0.9	0.087	possess

Through the calculation of the weight vector and ratio, the consistency test was passed, indicating that the calculated results were correct. The primary and secondary indexes were summarized, as shown in Table 4.

Table 4 Index weight comprehensive judgment matrix table

Primary index	proportion	Secondary index	proportion
Distribution cost	0.40	Distribution operation cost	0.28
		Investment cost	0.43
		Distribution management cost	0.09
		Investment risk	0.20
Delivery service	0.34	Customer satisfaction	0.52
		Distribution accuracy	0.24
		Delivery timeliness	0.15
		Service comprehensiveness	0.09

Fresh product attributes	0.15	Delivery timeliness	0.29
		Product vulnerability	0.57
		Distribution technical requirements	0.14
Operating condition	0.11	Distribution capacity	0.23
		Enterprise scale strength	0.46
		Company development ability	0.08
		Enterprise cooperation ability	0.23

Second, The selection of logistics distribution mode based on fuzzy comprehensive evaluation:-

Analyze the internal and external environment of P City MIXUE, and analyze the feasibility of each distribution mode. At the same time, based on the theory of logistics distribution mode, we can choose from three modes of self-operated distribution, mixed distribution and third-party distribution for the logistics distribution of P City MIXUE. In order to make the survey more objective, 15 experts in the field of logistics distribution (5 experts and scholars, 5 managers related to the industry, and 5 franchise owners) made qualitative evaluations of each index through field visits and telephone consultations, and converted the evaluation results into scores (a total of 5 points). Through the comprehensive analysis of the survey data, the average data of the survey data is obtained to ensure the objectivity and accuracy of the survey results. Table 5 shows the survey results.

Table 5 Each index of the three distribution modes is marked

index	Third party logistics distribution mode	Mixed logistics distribution mode	Self-operated logistics distribution mode
Distribution operation cost	3.0	3.5	3.2
Investment cost	3.5	3.4	3.2
Distribution management cost	3.6	3.3	3.4
Investment risk	3.6	3.4	3.2
Customer satisfaction	3.3	4.3	4.5
Distribution accuracy	3.3	3.5	4.0
Delivery timeliness	3.5	4.3	4.2
Service comprehensiveness	3.7	3.5	3.2
Delivery timeliness	3.4	4.4	4.5
Product vulnerability	3.5	3.6	3.8
Distribution technical requirements	3.8	4.1	4.7
Distribution capacity	4.0	3.9	3.6
Enterprise scale strength	3.2	3.8	4.0
Company development ability	3.2	3.8	3.7
Enterprise cooperation ability	4.0	3.9	3.7

The single factor evaluation matrix is established according to expert scores as follows:-

$$I_1 = \begin{bmatrix} 3.0 & 3.5 & 3.2 \\ 3.5 & 3.4 & 3.2 \\ 3.6 & 3.3 & 3.4 \\ 3.6 & 3.4 & 3.2 \end{bmatrix} \quad I_2 = \begin{bmatrix} 3.4 & 4.3 & 4.5 \\ 3.3 & 3.5 & 4.0 \\ 3.5 & 4.3 & 4.2 \\ 3.7 & 3.5 & 3.2 \end{bmatrix}$$

$$I_3 = \begin{bmatrix} 3.4 & 4.4 & 4.5 \\ 3.5 & 3.6 & 3.8 \\ 3.8 & 4.1 & 4.0 \end{bmatrix} \quad I_4 = \begin{bmatrix} 4.0 & 3.9 & 3.6 \\ 3.2 & 3.8 & 4.0 \\ 3.2 & 3.8 & 3.7 \\ 4.0 & 3.9 & 3.7 \end{bmatrix}$$

Fuzzy comprehensive evaluation by index weights:-

(A) Each subsystem index vector: $B_i = W_i \cdot I_i$

Through calculation, we can get:-

$$B_1 = (3.3 \quad 3.4 \quad 3.2)$$

$$B_2 = (3.4 \quad 3.8 \quad 4.0)$$

$$B_3 = (3.5 \quad 4.5 \quad 3.2)$$

$$B_4 = (3.5 \quad 3.8 \quad 3.8)$$

(B) Fuzzy evaluation matrix under three distribution modes of the whole system:-

$$Z = W * \begin{bmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{bmatrix}$$

Among them: $W = (0.40 \quad 0.34 \quad 0.15 \quad 0.11)$

According to the calculation formula, calculate the Z-values of various modes:-

$$Z = (0.40 \quad 0.34 \quad 0.15 \quad 0.11) * \begin{bmatrix} 3.3 & 3.4 & 3.2 \\ 3.4 & 3.8 & 4.0 \\ 3.5 & 4.5 & 3.2 \\ 3.5 & 3.8 & 3.8 \end{bmatrix} = (3.40 \quad 3.76 \quad 3.55)$$

Finally, according to the weight of AHP method and the score of fuzzy comprehensive evaluation, the total Z value is obtained.

Result Analysis:-

By analyzing the factors that affect the distribution mode of P City MIXUE, AHP method is used to weight each index, and fuzzy comprehensive evaluation method is used to score the distribution mode of self-run logistics, mixed logistics and third-party materials, as shown in Table 6. Through the evaluation of the three modes, the evaluation conclusion of comprehensive logistics mode is drawn, and the highest conclusion can be divided into mixed logistics distribution mode ^[7].

Table 6 Score for each distribution mode

Distribution mode	Judge the score Z value	sort
Mixed logistics distribution mode	3.76	1
Self-operated logistics distribution mode	3.55	2
Third party logistics distribution mode	3.40	3

Based on the detailed analysis of the actual situation of P City MIXUE, this paper proves the feasibility of mixed distribution from three directions on the basis of considering the number and location of customers.

First, improve distribution efficiency. With the continuous expansion of the beverage market in P City and the development of third-party cold chain logistics, the company can adjust its own distribution method according to its own needs. In the urban area, the company will adopt the self-distribution method and use its own vehicles for distribution. The cooperation with customers in the nearby towns and villages will cooperate with a professional cold chain enterprise, their vehicles will shuttle back and forth between the city and the town every day, with a special transportation team and technical personnel, so that they can send the goods to the place they need in the shortest time, so as to reduce the logistics burden of enterprises, but also improve the efficiency of logistics.

Second, reduce distribution costs. By partnering with third party logistics, adjust the proportion of cooperation with third party logistics companies, so that the savings can be used to upgrade vehicles or equipment. Although outsourcing will also consume a certain amount of funds, compared with self-owned logistics distribution, using the dedicated line of third-party logistics for distribution can effectively solve the problem of no-load return trip in the process of self-owned distribution, and can also improve the utilization rate of vehicles, thus reducing the cost of the company. The cost saving includes distribution operation cost, investment cost, service cost and distribution cost.

Third, rational use of resources. The participation of the third party enables the company to maximize its own advantages and concentrate its limited human and financial resources to develop its own core business. Because the traffic of the surrounding towns is small, the company can outsource the transport services of the towns to reduce the transportation costs of enterprises and maximize the use of public transport vehicles. At present, we need to put our limited manpower and financial resources into the development and maintenance of customers, and when the suburban customers reach a certain scale, we can sell through our own logistics distribution mode.

Through the analysis of the distribution mode of P City MIXUE, the analytic hierarchy process and fuzzy comprehensive evaluation method are used to conduct quantitative research on it. After the research, the conclusion obtained is consistent with the current actual situation, which shows that the selected model is feasible, scientific and reasonable. In addition, in order to achieve self-owned + third-party logistics distribution, enterprises should cooperate more with third-party logistics, improve the management level in the distribution process, maximize the use of the distribution center's vehicle allocation function, redistribute distribution customers, outsource suburban counties to third-party logistics, and provide relevant guarantees for them.

Distribution analysis based on ABC classification:-

Concept introduction:-

ABC classification: A method to determine the management mode according to the economic characteristics of materials and their importance, in which class A is the raw materials with high value and large demand, and class C is the raw materials with low value and small demand.

Delivery quantity: The quantity of goods delivered to the specified place on time according to demand.

Delivery frequency: The number of times the delivery unit has used to provide the goods to the franchisee in a certain period of time.

Delivery varieties: The types of goods distributed in this paper are divided into three categories: ABC. Among them, class A takes molasses as the analysis object, class B takes ice cream powder as the analysis object, and class C takes jam as the analysis object.

Delivery cycle: The time from order confirmation to delivery of goods.

Distribution route: The route through which each delivery truck delivers to each user has a direct impact on the distribution speed and distribution cost, and its judgment methods include empirical judgment method and comprehensive evaluation method.

Safety stock: In order to cope with the lack of inventory caused by uncertain factors, it is necessary to ensure that the enterprise holds a certain amount of inventory to cope with the situation of stock shortage. Once the situation of

stock shortage occurs, it will have a great impact on customer loyalty and satisfaction. The safety inventory has a great relationship with the raw material demand of the product and the degree of customer service.

Data analysis based on the actual sales volume from 2018 to 2020:-

In this section, since there are many kinds of products in the type of fast selling products, we divide the raw materials of the products sold into three categories: A, B and C. Among them, Class A raw materials take molasses as an example, Class B raw materials take ice cream powder as an example, and Class C raw materials take jam as an example. On this basis, we analyzed the historical sales data from January 2018 to December 2020, so as to conduct a summary study of the logistics distribution plan.

Collecting and sorting past data. The real sales data (in tons) of A, B and C raw materials for a total of 36 months from January 2018 to December 2020 are collected, as shown in Table 7.

Table 7 ABC Third class sales volume data details

Year	Sales volume			Year	Sales volume			Year	Sales volume		
	Class A	Class B	Class C		Class A	Class B	Class C		Class A	Class B	Class C
2018/1	258	129	73	2019/1	248	128	65	2020/1	264	132	67
2018/2	263	140	69	2019/2	265	134	72	2020/2	263	135	68
2018/3	158	86	45	2019/3	156	76	39	2020/3	158	83	42
2018/4	153	83	40	2019/4	159	80	41	2020/4	154	79	39
2018/5	152	78	38	2019/5	145	72	32	2020/5	155	76	38
2018/6	214	102	52	2019/6	220	111	63	2020/6	219	108	55
2018/7	265	131	64	2019/7	253	130	66	2020/7	270	140	71
2018/8	272	134	71	2019/8	269	135	69	2020/8	273	142	71
2018/9	221	110	56	2019/9	223	109	54	2020/9	222	118	62
2018/10	218	107	53	2019/10	216	112	65	2020/10	219	113	55
2018/11	155	76	39	2019/11	150	79	42	2020/11	158	87	43
2018/12	143	72	34	2019/12	149	83	44	2020/12	149	84	42

EXCEL software can be used to calculate the sum of the historical sales volume from 2018 to 2020, the annual average and the monthly average, and make a table, as shown in Table 8.

Table 8 Monthly sales volume data breakdown

	2018s	2019s	2020s	Three-year total	Annual mean	Monthly mean
Class A	2472	2453	2504	7429	2476	206
Class B	1176	1249	1297	3722	1241	103
Class C	634	652	653	1939	646	54

Result Analysis:-

For Class A raw materials (taking molasses as an example), each store of P City MIXUE orders roughly once a week, and its purchase quantity is about 206 tons/month; Class B raw materials (take ice cream powder as an example), roughly biweekly order frequency, its purchase quantity is 103 tons/month; Class C raw materials (taking jam as an example) are roughly ordered once a month, and their purchase quantity is about 54 tons/month. Due to the short distance between each franchise store of P City MIXUE and Fuzhou warehouse center, and the one-to-one distribution mode is adopted, the distribution cycle is 2 days, as shown in Table 9.

Table 9 The results of each factor were analyzed

	Class A raw material	Class B raw material	Class C raw material
Distribution variety	molasses	Ice cream powder	jam
Delivery quantity	206 tons/month	103 tons/month	54 tons/month
Delivery frequency	4 times/month	2 times/month	Once a month
Delivery cycle	2 days		
Distribution route	Fuzhou Warehouse Center -- P City store		

Conclusion:-

By analyzing the factors that affect the distribution mode of P City MIXUE, AHP method is used to weight each index, and fuzzy comprehensive evaluation method is used to score the distribution mode of self-run logistics, mixed logistics and third-party materials. Through the evaluation of the three modes, the evaluation conclusion of comprehensive logistics mode is drawn, and the highest conclusion can be divided into mixed logistics distribution mode. So the mixed distribution is feasible. Meanwhile, for Class A raw materials (taking molasses as an example) orders roughly once a week, and its purchase quantity is about 206 tons/month; Class B raw materials (take ice cream powder as an example), roughly biweekly order frequency, its purchase quantity is 103 tons/month; Class C raw materials (taking jam as an example) are roughly ordered once a month, and their purchase quantity is about 54 tons/month. Due to the short distance between each franchise store of P City MIXUE and Fuzhou warehouse center, and the one-to-one distribution mode is adopted, the distribution cycle is 2 days.

MIXUE, a beverage firm in City P, has Logistics Distribution challenges such the logistics distribution mode is not appropriate, which are important to its operation. the logistics distribution mode is not appropriate may cause low distribution efficiency. To boost profits, these flaws must be identified and fixed quickly, coupled with appropriate optimization measures. First, adjust the logistics distribution mode, adjust the third-party logistics distribution mode to the mixed logistics distribution mode. Next, based on the distribution analysis of ABC classification method and combined with the actual sales data in the past, the distribution frequency can be adjusted to once A week for class A raw materials, once every two weeks for class B raw materials and once a month for class C raw materials, and a certain distribution quantity and distribution route are given.

According to an ancient saying, "Food is the deity of the populace." The food and beverage industry drives national economic growth. The MIXUE beverage chain in P City faces stiff competition. Thus, by reviewing MIXUE's Logistics Distribution in P City, understanding its current state, identifying obstacles, analyzing the underlying causes, and developing appropriate optimization strategies, we can Improve distribution efficiency and benefits will increase .

Analytic hierarchy process (AHP) and fuzzy comprehensive evaluation method are commonly used methods in logistics distribution. AHP is a decision-making analysis method that organically integrates qualitative and quantitative analysis and obtains the ordering of logistics distribution modes, while fuzzy comprehensive evaluation method is an overall evaluation method that turns complex problems into simple ones, reduces subjectivity and improves the accuracy of decision-making. With the support of the above methods, the ratio and methods of logistics distribution mode should be changed and optimized to improve the efficiency of logistics distribution, reduce distribution costs and maximize benefits. Therefore, logistics distribution is a necessary condition for the sustainable development of catering chain enterprises, so the development of chain operation focuses on the development of logistics distribution system .

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