

## **Design of customer evaluation model in the catering industry supply chain ecosystem**

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**Abstract:** In recent years, China's catering industry competition fierce increasingly, which dramatically accelerated the rapid evolution of the industry ecosystem and business development model. Reality, catering industry supply chain management services are moving towards specialization and diversification. However, there still confront many problems in the corporate positioning, selection of the operating and external business. First, starting from the definition of the catering industry supply chain ecosystem, this paper analyzes the different actors in the supply chain ecosystem. We discussed the process and characteristics of the supply chain in catering industry supply chain secondly. Then, the related evaluation model which impress on mathematical model is established between the catering industry supply chain service providers and customers.

**Keywords:** Catering Industry, Supply Chain, Ecosystem, Evaluation Model

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### **1. Introduction**

With the rapid development of Chinese economy, the development of Chinese catering enterprises face many brand-new questions brought by the fast transition, especially those about the management of supply chain. Although some professional supply chain service providers are showing gradually, but challenge from the domestic and foreign faced by the development mode is still alive. So in this traditional labor-intensive development mode, how to attain the value of supply chain service, build an enterprise's core competitiveness and long term development strategy rapidly is the main dilemma faced by those enterprises.

The process of enterprise's value creation consists by design, production, marketing, delivery and a series of mutual different and mutual associated economic activities, and it is called "value added work", a enterprise's value

chain is its sum. The source of a enterprise's advantage is activities of value creation and delivery, Potter said, competition among enterprises is just about the value chain.

Literatures about the research of the value and supply chain are quite a lot, but precedents about research puts enterprises into business ecosystem are few. Since 1993, Moore published an article on "predators and prey: a kind of new competition ecology" in the Harvard Business Review, the concept of business ecosystem was put forward at the first time. A series of foreign articles about it existed in the next ten years. For example, Maro Iansiti and Roy Lecien (2004) thought that features exist in biological and ecological system such as stability, persistence and productivity are exist in commercial network similarly, and they also thought that analogy between the two can make a scene in a certain degree. And Clip pinger (1999), Mirva (2004) devoted themselves into the research of enterprise's adaptability and diversity in business ecosystem.

China on the business ecosystem theory started relatively late, following that Baoqun Fan (2005) analyzed the effect of the commercial ecosystem competition on enterprises, national industrial planning, and technical standards and polices with the start point of the competition style evolution. Jinping Zhang and You Zhou (2005) took the advantage of ecological thinking and elaborated the process of the enterprises' development theoretically. Youhua Tian and Qingkai Nie (2006) classified the business ecosystem in the interaction between enterprises, and developed enterprises relationship by a series of models which were preliminary analyzed. Zhang (2007) defined commercial ecological theory of ecosystem health. Liu (2006) compared the distinction and connection exist between the population, value network and business ecosystem. On the basis of research results of domestic and foreign scholars on the business ecosystem and natural ecosystem, Du and Wang (2007) proposed a research framework which compares the two systems from 6 aspects and 27 study such as the external environment, and summarized two kind of system's similarities and differences though analysis and synthesis method.

It can be seen that the previous research on the business ecosystem is very full, but all proceed from a macro perspective. This article will be resolved catering enterprises supply chain ecosystem at the micro level for market positioning strategy and customer options.

## **2. Catering Industry's Supply Chain Ecosystem**

Moore thought, the so-called business ecosystem means: economic union based on the interaction of organizations and individuals. Customers, suppliers,

manufacturers and other relevant members of groups complement each other to produce goods and services, there also include the suppliers of funds, the industry association in charge of standards bodies, trade unions, government and semi-governmental organizations and other interested parties.

### **2.1. The Definition of Catering Industry's Supply Chain Ecosystem**

Business ecosystem is based on the interaction of organizations and individuals based economic community, and as time go on, they are jointly developing their own capacity and role, and tend to develop their own at the direction of one or more central corporate guidelines. Simply, the business ecosystem including the enterprise and its customers, market media, suppliers, these species can be viewed as the primary business ecosystem. In addition, a commercial ecological system also includes these owners and the primary species controllers, and related species in certain circumstances.

Collect the related businesses or organizations to adapt to each other and form a collaborative relationship. In order to adapt to the changing environment, it should create and maintain sustainable competitive advantage. And it will be the role of system both cooperation and competition in pursuit of co-evolution. In the system, everyone has their own clear objectives for creating their own competitive advantage. But individuals are difficult to sustainable develop in the market without the entire system improvement of competitiveness.

The article refers to the catering industry supply chain ecosystem, in essence, it is a value circle by the formation of those factors: the end customers of catering industry, the central kitchen of the catering companies, distribution centers, all organizations involved in the supply and individual, seed companies, including all relevant factors, as well as the interaction between factors interactions.

### **2.2. Participants of the Supply Chain Ecosystem**

Like species in nature ecosystem, many participants in the catering industry supply chain ecosystem can be divided in categorize, hierarchy and function. These participants are separated into four categories: lower participants, intermediates, top participants and consumers.

#### **Lower participants**

Like seed companies, breeding companies, R & D company of the new varieties, plant breeding, rural cooperatives and individual farmers. These participants are the ones who create valuable enterprises in this small ecosystem. Such professional lines of enterprises are high, but that lower the threshold of entering the market. Their catering market sensitivity is the lowest in the supply chain ecosystem, and there exist the most terminal by the bullwhip effect.

### **Intermediates**

Like production plants, logistics companies, warehousing companies, distributors, and IT services companies, capacity as partners in these enterprises, it is easy to form the symbiotic and competitive relationships. It also can form a symbiotic and competitive relationship between partners, a symbiotic relationship of mutual influence and mutual benefit. Based on the relationship of the competition, companies continue to improve their own competitiveness. If the symbiotic counterweight with the forces of competition, the evolution is harmonious, and supply chain ecosystem will be evolutionary. If the evolution of such individual factors discord, it may result in the destruction or reorganization of the supply chain ecosystem.

### **Top participants**

Like catering enterprises, shops, supermarkets, investment companies, the Government Association, the top participants including the supply chain-end enterprise customers, government agencies and industry associations, and play a role in guiding the development of the supply chain. Corporate customers are divided into many forms, the relationship between the client and the client is a parallel competition. This competition between catering companies improve their own competitiveness on the one hand, and save the cost of supply chain management on the other hand, this will lead the market called for supply chain service providers. There is no competition in government agencies and industry associations for any business on the supply chain. They just play a guiding role and policy support for the development of supply chain.

### **Consumers**

There just include the general public. They play a role as the equivalent of the ultimate decomposers and consumer in the ecosystem of the supply chain. The entire supply chain activities have value and meaning, because of the most common consumer individual.

There are differences between Supply chain ecosystem and nature ecosystem. All things are equal in nature ecosystem. But in the supply chain ecosystem, there have a leading enterprise of these participants for the value of integration. On the other hand the catering industry supply chain ecosystem participants can be broadly divided into three categories that stand on the angle of the leading companies: customers, partners and competitors.

One part of Competitors is the partners of leading business. In order to win customers and open up the market, they will also extend a number of other non-core businesses in addition to their main business. Only the professional of services is different. But they often obtain some of the favor of customers

because of its cheap. The other part is that the supply chain services already in the market, each supply chain service providers are likely to become the leading enterprises in their supply system. Resources and mode of operation is varying, even some customers may become competitors. Some of the larger catering companies build their own self-built central kitchen from the early stage of development. It has enough ability to provide supply chain services for other catering companies, because of longer operating time and grasping a certain amount of market resources. Supply chain operations have spare capacity.

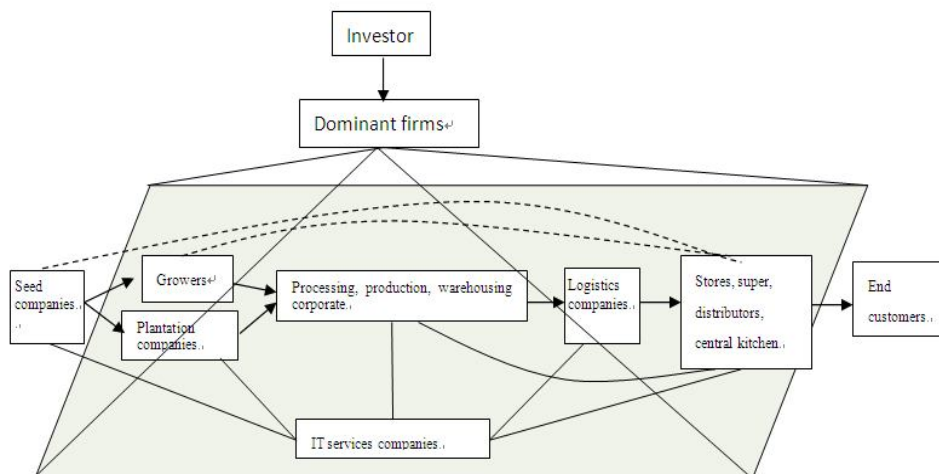


Fig.1: Catering industry ecosystem model

### 3. Catering Industry Supply Chain's Process and Characteristics

In the process of catering industry supply chain, there are physical products in the flow that from the supplier to the customer. In the flow process of the whole industrial chain, a primary solid product is attached on a series of economic value, such as processing, warehousing, distribution and other. But the flow from customer to supplier is demand information from shapeless market. Every specific individual needs or area demand combine with each other and become market demand information. This information convey to all stores or dealers. As a process of extraction, it is conveyed to the enterprise, then to the supplier. So in this huge industry chain, logistics and information flow are two important arteries of the industry chain, and the enterprise takes advantage of variety of resources, combine the two arteries, and support a smooth and harmonious industry chain ecosystem.

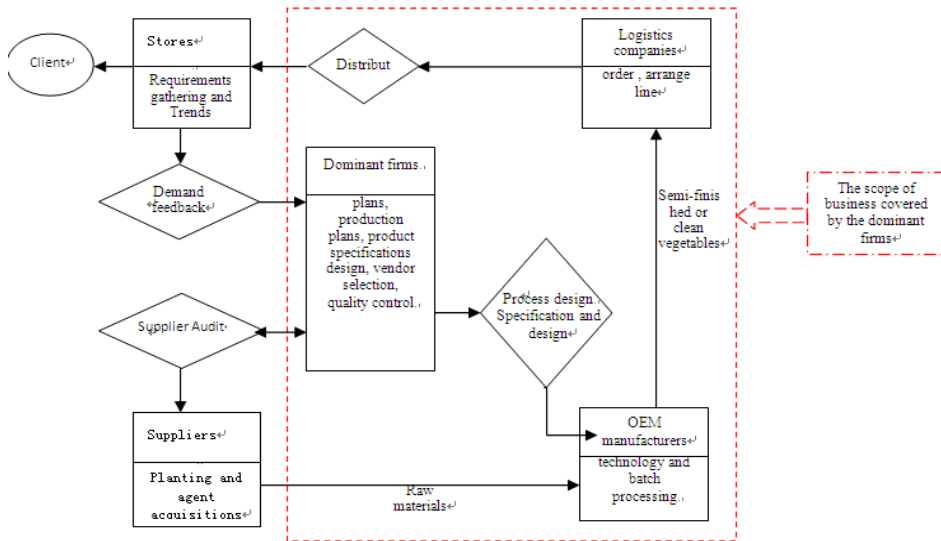


Fig. 2: The existing ecological diagram of supply chain business

Since the specificity of the catering industry products, catering industry supply chain will also show a corresponding feature. From the view of logistics point, the catering industry supply chain is characterized by: (a) quantity, variety; (b) logistics requirement due to seasonal animal and plant products; (c) low logistics profit and low price of produce; (d) logistics difficulties, warehousing, different packaging standards; (e) inevitable loss.

From the perspective of supply chain management, it can express the follow characteristics: (a) food and beverage service supply chain involves many kinds of goods; (b) catering enterprises are all sensitive to the price volatility in commodity, and market price volatility is inevitable; (c) food and beverage supply chain is full of enterprises; (d) the quality of employees at the basic level is low; (e) the cost is high to ensure the quality and avoid recontamination.

## 4. Design of Customer Evaluation Model

### 4.1. Customer Evaluation Model Overview

Customer evaluation model used for the leading enterprises of the supply chain ecosystem is based on the information platform and logistics platform. For an enterprise's supply chain, there are two arteries. One artery is the flow of information, another artery is logistics. So the first thing is to establish an open, transparent and convenient information platform to connect suppliers and distributors to end customers in order to achieve the supply chain of information transfer. Second, we establish a complete logistics system in the process of

circulation and circulation in order to reduce the loss of material.

In addition, there must establish the mode of operations for the enterprise development. The first mode is depends on demands of produce promotion to promote the progressive realization of the program management model between supply chain partners. Through sophisticated information platform, the program management of each partner infinitely closes to balance production and sales situation. The second model is based on customer-oriented, as the carrier of the project, the independent accounting management mode. Each client is as a project, financial accounting of each project team is independent, this could eventually find out which project is profitable, which project is loss. We also know how to select customer base, how to improve their own defects. The third model is a financial-based internal control mode. This is a construction of the financial-based internal control, production cost accounting and budgets and funds management model.

Finally, customers of planting farmers divided into four sections: planting and breeding plate, processing plate, logistics plate and distribution plate. These four sections divide the supply chain business into four parts, and link up the four sections of the business through the integration of the enterprise, re-engineering resources, optimize and ultimately achieve partner win-win situation.

Integrating all businesses and resources in the supply chain used to ensure smooth information flow, logistics, capital flow and business flow. In the future development, oriented enterprises create a transparent information platform in order to focus to the master knowledge and information-intensive business sectors. The flow of information and mutual trust between partners could create a harmonious supply chain ecosystem.

#### **4.2. Customer Analyses Under the Catering Industry Supply Chain Services**

Supply chain service providers face numerous of market clients. But the need of each client has its own particularity. It reflects the difference of needs between different catering enterprises. Supply chain service providers at some stage in their development process can only meet the needs of some customers. As its business development, supply chain service providers create value and there will be more customers attracted to join the industry value network. But in its early stages, the first thing is market segmentation, and then choose the enterprise who is a long-term cooperation and conducive to the balanced of ecosystem. At the same time, we also need to understand the actual needs of the enterprise.

When we subdivide the customer needs, it's not difficult to see that each

client has its most concern point. These concerned points are roughly divided into four aspects: price-sensitive, quality concerned, supply chain collaboration, supply outsourced. Such as price-sensitive customers joining enterprises have their own supply chain system, and are in the steady state of development. Most of the type of quality concern enterprises is a chain of direct enterprise requirements for high quality, and generally processed products. So draw the following five categories of indicators according to customer concerns and customer classification.

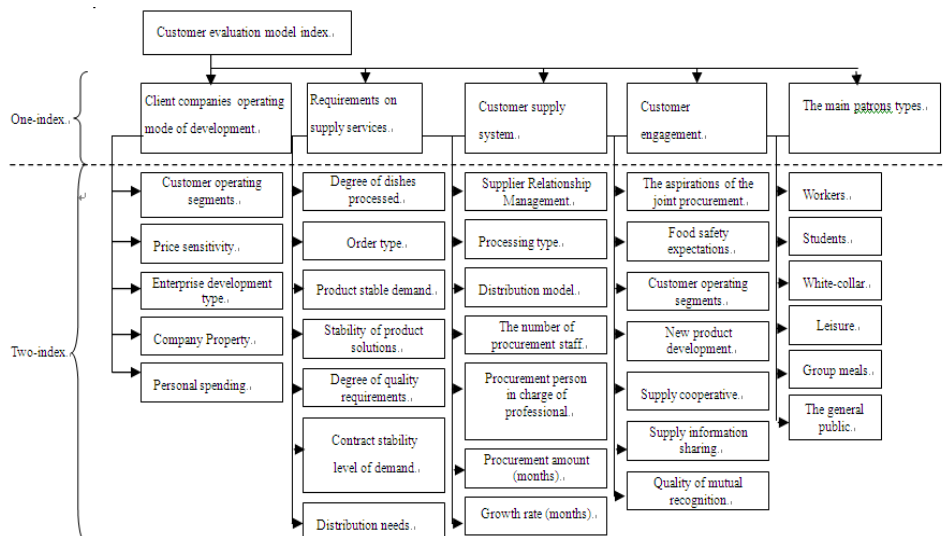


Fig.3: Customer segmentation to select the model index level diagram

### 4.3. Evaluation Model Indicators Determining the Weights

#### (a) The establishment of a hierarchical model

Use the theory of hierarchical analysis; the segmentation of customer evaluation index, as shown in Table 1, the index is divided into three levels. The factors of the same level as the comparison and evaluation criteria, dominant role for some of the factors from the next level, but it also is subordinate to the previous level factors.



Table1: Evaluation level indicator

target level	One-index	Two-index	Three-index
Customer classification and evaluation	Enterprise's own business development models $U_1$	Per capita spending $U_{11}$	High(more than 60 RMB) $U_{111}$
			Middle(30-60RMB) $U_{112}$
			Low(less than 30RMB) $U_{113}$
		Business classification $U_{12}$	Chinese fast food $U_{121}$
			Chinese meals $U_{122}$
			Western fast food $U_{123}$
			Western-style dinner $U_{124}$
			characteristic catering $U_{125}$
			Group meals $U_{126}$
		Price sensitivity $U_{13}$	very sensitive $U_{131}$
			Generally sensitive $U_{132}$
			Not sensitive $U_{133}$
		Business development $U_{14}$	directly managed $U_{141}$
			Individual joining $U_{142}$
			Group joining $U_{143}$
		Business type $U_{15}$	stable development $U_{151}$
			rapid expansion $U_{152}$
	Requirements for suppliers to supply services $U_2$	...	...
	Customer supply system $U_3$	...	...
	Customer engagement $U_4$	...	...

**(b) The judgment matrix**

The affiliation of factors between the upper and lower level have been identified after the establishment of a hierarchical model.

On this basis, we need to make a judgment often relative importance of each factor in each level. In the analytic hierarchy process, in order to make the judgment to quantify, those sentenced by the introduction of a suitable scale numerically expressed, written judgment matrix  $A$ . Determine matrix  $A$  means connection with the upper level factors, pair wise comparisons of the level with the relative importance between the relevant factors. Judgment matrix is usually a reference to the following 1-9 scale method:

Table2: Determining of the matrix scaling form

Scale $a_{ij}$	Meaning
1	$i, j$ two elements are equally important
3	$i$ slightly important than $j$
5	$i$ is obviously important than $j$
7	$i$ is obviously strongly important than $j$
9	$i$ is obviously extremely important than $j$
2, 4, 6, 8	Intermediate values of the adjacent judgment
Reciprocal( $1/a_{ij}$ )	$1/a_{ij}$ said the results of the compare between $i$ and $j$

Judgment matrix is usually written as formula (1) below

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \quad (1)$$

### (c) Calculate the weight of each index

In order to extract useful information from the judgment matrix group to achieve understanding of the law of things, to provide a scientific basis for decision-making, we need to calculate the weight vector of weight vector of each judgment matrix and the judgment matrix synthesis.

➤ seek the weight vector matrix of a single judge

Note of judgment matrix is  $A = [a_{ij}]_{n \times n}$ , if

$\forall i, j, k = 1, 2, \dots, n, a_{ik} = a_{ij}a_{jk}$  set up, we say  $A$  is a consistency matrix.

Sum of all elements of the  $A$  line judge matrix, formula (2)

$$\bar{w}_i = \sum_{j=1}^n a_{ij} \quad i = 1, 2, \dots, n \quad (2)$$

Standardization, have the right to re-vector, such as formula (3)

$$w_i = \frac{\sum_{j=1}^n a_{ij}}{\sum_{i=1}^n \sum_{j=1}^n a_{ij}} \quad i = 1, 2, \dots, n \quad (3)$$

➤ seek all the judgment matrix synthesis weight vector

The so-called synthetic weight vector, refers to the various elements of the lowest level (program level) on the top of the (target layer) of the right to re-vector each component share of the corresponding program in the target or specific gravity.

For different customers, not all indicators can spend corresponding indicators are calculated for different customers to choose the customers.

### 4.4. Fuzzy Evaluation of Customer

Due to the particularity of the evaluation of restaurant industry, each customer-facing indicators are different, evaluation to participate in a score of subjective

awareness, so the fuzzy comprehensive evaluation method to evaluate quantified.

**(a) The establishment of fuzzy comprehensive evaluation factor index set and evaluation criteria set.**

Assume that the evaluation factors (indicators) of  $n$ , denoted by  $U = \{U_1, U_2, \dots, U_n\}$ . By a collection of  $m$  judge rating standard, called the judge set, denoted by  $V = \{V_1, V_2, \dots, V_m\}$ .

If make the model of choosing Customers of the supply chain in this article as an example. The factors set can be chosen as:  $U = \{\text{Enterprise's own business development models, Requirements for suppliers to supply services, Customer supply system, Customer engagement}\}$ . Evaluation set to be chosen as  $V = \{\text{Trade, Concerned about services, Supply chain collaboration, Supply outsourced}\}$ .

**(b) Determine the fuzzy subset of the weights of evaluation factors Indicators.**

Under normal circumstances, the impact of various factors on the evaluation of the object is inconsistent, different factors according to where the whole evaluation system in the relative importance of assigning a value. Weight distribution of factors has been calculated by the analytic hierarchy process. Weight distribution of factor set is a fuzzy set on  $U$ , generally denoted as:  $\tilde{A} = (a_1, a_2, \dots, a_m)$ . Which  $a_i$  the  $i$  factors  $U_i$  weight, and satisfy the normalization condition:  $\sum_{i=1}^n a_i = 1$ . The evaluation result is a fuzzy relation between  $U$  and  $V$  matrix representation as follows:

$$\tilde{R} = \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{pmatrix} \quad (4)$$

Which  $r_{ij} (1 \leq i \leq n, 1 \leq j \leq m)$  on the  $j$  evaluation grade  $V_j$ , the evaluation of expert judgment made by the group on the  $i$  factor  $U_i$ .

**(c) Solving the judgment result set.**

Fuzzy comprehensive evaluation is built on the basis of the judge set  $V$ , and therefore judged that the result set should be a fuzzy set in  $V$ , denoted by  $\tilde{B}$ . The evaluation result set by fuzzy comprehensive evaluation model obtained:  $\tilde{B} = \tilde{A} \cdot \tilde{R}$ .

$$(b_1 \quad b_2 \quad \dots \quad b_m) = (a_1 \quad a_2 \quad \dots \quad a_n) \cdot \begin{pmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{pmatrix} \quad (5)$$

There the " $\tilde{A}$ " fuzzy weights, " $\tilde{R}$ " fuzzy relation matrix (evaluation) " $\cdot$ " is a fuzzy operation. Model by the fuzzy relation matrix factor vector transform fuzzy grade vector. And different definitions can be obtained by computing " $\cdot$ " fuzzy comprehensive evaluation of different mathematical models. Here using the maximum membership degree principle of the index corresponding to the fuzzy numbers in the reality of the membership of the state to determine the evaluation object. If  $b_0 = \max(b_1, b_2, \dots, b_n)$ ,  $b_0$  the corresponding evaluation set  $V = \{V_1, V_2, \dots, V_m\}$  element is the judgment result.

Subdivide according to customer demand, the Trading enterprises roughly divided into four types: Trade-oriented concerned about the services, supply chain collaboration and supply outsourcing enterprises.

By the fourth part of the formula:  $b_0 = \max(b_1, b_2, b_3, b_4)$  can draw the following conclusions:

If  $b_0 = b_1$ , the customer is price-sensitive;

If  $b_0 = b_2$ , the client is concerned about the quality;

And so on.

## 5. Conclusions

This article used the analytic hierarchy process indicators to give the right weight, but the weight of the same indicators will be different for different enterprises. We should pay attention to the score reasonable in the implementation process. The same type of customers can use the same index weight. In practical applications, the enterprise should combine its own development to have a reasonable choice of the customer base. Their own development should be established on the basis of the harmony and win-win business circle. In today's information explosion, the establishment of a transparent information-sharing platform and logistics platform will be the only way to create the market and customer.

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