The Evaluation of Status Quo of Growth Capacity in Chinese Logistics Enterprises

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Abstract Growth force plays a decisive role in the growth and choices of growth path of logistics groups. It's better to identify the status quo and choose the appropriate nurturing path when evaluations of growth force of logistics groups have been done. The article, by means of AHP, constructs a model evaluation index system so as to analyze and evaluate the status quo and its main influencing factors of growth force of a branch of logistics groups with typical cases. Finally, suggestions of enhancing growth force and nurturing path of the logistics group will be provided.

Keywords AHP; logistics enterprises; growth capacity; evaluation of status quo; typical case

1 Introduction

Internationally, logistics industry is regarded as the artery and basic industry in national economic development, its development degree become one of the important marks to measure a country's modernization degree and comprehensive national strength, logistics industry is described as "accelerator" and the "third profit source" of promoting economic growth. After the outbreak of the global financial crisis in 2008 we accelerated the development of the economic transformation in China, the modern logistics industry was listed as important backbone industry of modern industrial structure adjustment and upgrading, our country provided a good external development environment for industry development by continuously issuing a number of supporting industry revitalization planning and support policy^[1]. Along with the rapid development of electronic commerce becoming mature, the logistics enterprises also encountered unprecedented opportunities, only one day on November 11, 2012, taobao's turnover reach up to 19.1 billion yuan and the orders quantity is 110 million, it means that only one day logistics company had 110 million orders, by this token, the logistics company's market prospect is very good. But since 2011, along with the acceleration of the debt crisis, the domestic industrial upgrading and macroeconomic regulation and control, domestic logistics enterprises faced business costs increased profit declined and increased competition and so on, restricted the industry

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development. How to speed up the development of domestic logistics enterprises, improve the level of enterprise development, realize the logistics enterprise transformation and upgrading is the real challenge of domestic logistics enterprise. Then how to know how a logistics enterprise growing, it requires an evaluation scale, this article tries to use the analytic hierarchy process to evaluate logistics enterprises growth.

2 The selection of evaluation method of Logistics enterprises growth and the construction of evaluation index system

Enterprise growth refers to development process under the condition of market economy, enterprises as the main body of the micro production of the national economy, as a separate legal entity, start from scratch, from weak to strong, from passive to active, self development, self accumulation, self-renewal^[2]. The development of enterprise growth is a comprehensive concept, it refers to that in the dynamic environment, creating the greatest social value and achieving sustained growth is the enterprise's management idea, on the basis of certain resources, it continues to improve profits and realizes the ability and potential of the quantity expansion and quality. From a static perspective, enterprise growth force is a description of the growth status and potential of a enterprise, it can be used to measure the growth of the enterprise; from a dynamic perspective, it is not only a reflection of current situation of the enterprise, but also predict the future development of a enterprises, it is the dynamic performance of a enterprise development process^[3].

People always think that the enterprise growth is the enterprise competitiveness, actually there are some differences and relations between them. Enterprise growth and competitiveness are both on behalf of the ability of the enterprise, but enterprise growth force is the prediction of the enterprise vitality and development potential in a period of time in future, it is the characterization of the development trend and potential of the enterprise; while enterprise competitiveness is the characterization of survival ability and the ability to access resources in their existing condition^[4]. Enterprise competitiveness is the relative strength of the enterprise relative to other companies in the same industry, it is comparative ability; enterprise growth has reflected the comprehensive factors such as industry status, macro environment, micro environment, etc, it is an absolute ability^[5]. Although the concept of enterprise competitiveness and growth are different, they are inextricably linked. When the market competition is sufficient, there is no monopoly situation, in the same industry the stronger the enterprise competitiveness is, the greater the enterprise growth is. In the same industry and the same external environment, if the two companies have the same competition and one enterprise growth is greater, the enterprise strength will increase faster in the same period in the future and the development space will be bigger. So after a period of development, enterprises competitive situation will occurs some change.

2.1 The choice of evaluation method

Because enterprise growth force has a decisive role to enterprise growth and selection of enterprise growth path, some scholars have launched research to the evaluation of enterprise growth force, such as Zhao Ran and Jiang Yuntong^[6] studied constraints of enterprises growth

in each stage of life and constructed a evaluation index system and evaluation model of business growth force; Wang Qin and He Jun^[7], Liu Lin^[8] respectively build the evaluation index system of enterprise growth. But the evaluation index system is too general, consideration is not comprehensive, ignore the study of the formation process of enterprise growth and the difference uniqueness of influencing factors in different industriesdifferent levels and different environment, its operational and practical evaluation effect is general, especially for logistics enterprise in our country which are in growth stage, it is lack of practical guiding significance.

AHP is proposed by an American Operations Research Professor of University of Pittsburgh named Saaty^[9–10] in the early 1970s, when he studied the project of “according to the size of each industrial sector’s contribution to the national welfare and distribute the electric power”, he used the theory of network system and muti-objective comprehensive evaluation method and then proposed the hierarchical weighted decision analysis method.

As a practical muti-criteria decision making method, a complex issue can be represented as an orderly structure by AHP^[11], through the judgment of decision by people, then sort in order^[12]. Compared with other methods, the biggest advantage of AHP is that it can combine quantitative methods and qualitative methods, it can deal with many actual question which can not be managed by traditional optimization technology^[13]. That is also the reason why this paper use AHP to evaluate the logistics enterprises growth.

The basic steps of AHP:

- (1) establish a hierarchy model of the system;
- (2) construct judgment matrix;
- (3) consistency check;
- (4) Calculate and sort the weight vector.

2.2 The construction of evaluation index system

Using the AHP to comprehensively evaluate the logistics enterprises growth, firstly we must determine the index system which reflects the strength of logistics enterprise growth, and establish a hierarchy of evaluating logistics enterprises’ growth force according to the requirement of the overall goal and nature^[14]. Based on the factors which affect the growth of the logistics enterprises, we evaluate enterprise growth from three aspects: the growth environment, growth ability, growth potential.

(1) Growth environment: It is an important guarantee for the expansion of production and logistics enterprises, which highlights the external link of enterprise growth, it is the major premise condition of logistics enterprise survival. Growing environment mainly includes the national policy, the state environmental protection policy, logistics industry growth.

(2) Growth ability: It is the key to the growth of the logistics enterprise in a certain period of time and is the core part of the development of the company, it can not be ignored and abandoned, this part can highlight the current competitiveness of logistics enterprises to grow. Growth ability subdivision factors include market share growth, net profit growth, logistics service growth, enterprise scale growth.

(3) Growth potential: It is the source of the sustained growth of logistics enterprises, which is part of the outstanding future attributes of enterprise growth, it determine the future growth rate of enterprises and it is also a measurement scale. The main factor of the growth potential

segments includes business equipment and technology, information technology, asset security, marketing capabilities, the enterprise personnel quality.

According to the analysis of various levels index, we can establish a comprehensive evaluation index system of logistics enterprise growing hierarchy, as shown in Figure 1.

3 Case study

A group company is a large multinational direct selling enterprises. Daily necessities in China face several big problems is the vast sales, branches scattered distribution, market change fast, effective management of logistics operation has become each enterprise's difficulty. As the world's largest direct selling enterprises of the group companies, since entering the Chinese market have developed rapidly, the Chinese company's sale account for one-third of the group company's global sale and far ahead for many years. The magic weapon for winning of the group company in China is not only the high quality product, but also the immensely logistics system. Even so, the development of its logistics branch still needs to be improved to cope with the future market demand, through investigation and observation, found that there are some issues affecting their growth. In this paper, the group company logistics company as an example, using AHP to evaluate the status quo of its logistics growth force.

Figure 1 The evaluation index system of logistics enterprise growing

3.1 Construct judgment matrix

After the establishment of a hierarchical model, affiliation between the upper and lower levels of factors was determined. On this basis, need to determine the relative importance of each factor in each level. In the analytic hierarchy process, in order to make quantitative judgment, the judgment by the introduction of appropriate scale numerical representation and write judgment matrix, the judgment matrix representation for a level to some factors, the hierarchy and the related factors of relative importance are compared^[15]. Judgment matrix is usually refer to the following 1~9 scaling method, as shown in Table 1.

Table 1 Scale definition of judgment matrix

Scale	Definition
1	Compared with the two indexes, they are the same important
3	Compared with the two indexes, the former is a little important
5	Compared with the two indexes, the former is obvious important
7	Compared with the two indexes, the former is strongly important
9	Compared with the two indexes, the former is extremely important
2, 4, 6, 8	The intermediate value of judgment
reciprocal	If the importance of the latter than the former is 3, then the importance of the former than the latter is 1/3

3.2 Single-level sorting and consistency test

The maximum eigenvalue $\lambda_{\max}$ of judgment matrix corresponding to feature vector, after normalizing the corresponding factors is the same level to a level of the relative importance of factors of a sort of weight, a process known as single hierarchy sort. It is very important to keep the consistency of critical thinking when use AHP, lest appear such contradiction as more important than B_2 , B_1 , B_2 is more important than B_3 , and B_3 is more important than B_1 ^[16]. Therefore, judgment matrix provided by the experts, it is necessary to make a consistency check, to decide whether to accept it.

Hierarchical order sorting and consistency check steps are as follows:

- (1) Calculate the product M_i of each row of judgment matrix and calculate the n -th root.

$$W_i = \sqrt[n]{M_i}.$$

Normalized relative importance vector w'_i

$$W'_i = \frac{W_i}{\sum_i W_i}.$$

- (2) Normalize vector W , then get the desires of the corresponding weight.

- (3) Calculate the maximum characteristic root of the judgment matrix $\lambda_{\max}$.

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n \frac{\sum_{j=1}^n a_{ij} W_j}{W_i}.$$

- (4) Calculate the consistency index CI

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

- (5) Calculate the proportion of consistency CR

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

Among them, we need to find the corresponding average random consistency index RI, as shown in Table 2.

Table 2 Average random consistency index

N	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

When $CR < 0.10$, think that the consistency of judgment matrix is acceptable, otherwise the judgment matrix should be amended. The structure of judgment matrix and the important degree of each factor calculation and consistency inspection results are shown in Table 3~6.

Table 3 The calculation of important degree and consistency inspection results of judgment matrix A-B

A	B ₁	B ₂	B ₃	W_i	W'_i	λ_{mi}	
B ₁	1	$\frac{1}{5}$	1	0.585	0.143	3.000	$\lambda_{\max} \approx \frac{1}{3}(3.000 + 3.001 + 3.000) \approx 3.0003$ $CI = 0.000 < 0.1$
B ₂	5	1	5	2.924	0.714	3.001	
B ₃	1	$\frac{1}{5}$	1	0.585	0.143	3.000	

Table 4 The calculation of important degree and consistency inspection results of judgment matrix B₁-C

B ₁	C ₁	C ₂	C ₃	W_i	W'_i	λ_{mi}	
C ₁	1	7	3	2.759	0.633	3.165	$\lambda_{\max} \approx \frac{1}{2}(3.165 + 3.132 + 2.897) \approx 3.065$ $CI = 0.033 < 0.1$
C ₂	$\frac{1}{7}$	1	$\frac{1}{5}$	0.306	0.070	3.132	
C ₃	$\frac{1}{3}$	5	1	1.291	0.296	2.897	

Table 5 The calculation of important degree and consistency inspection results of judgment matrix B₂-C

B ₂	C ₄	C ₅	C ₆	C ₇	W_i	W'_i	λ_{mi}	
C ₄	1	3	3	$\frac{1}{3}$	1.316	0.274	4.311	$\lambda_{\max} \approx \frac{1}{4}(4.311 + 4.308 + 4.310 + 4.209) \approx 4.285$
C ₅	$\frac{1}{3}$	1	$\frac{1}{3}$	$\frac{1}{3}$	0.439	0.092	4.308	
C ₆	$\frac{1}{3}$	3	1	$\frac{1}{3}$	0.760	0.158	4.310	$CI \approx 0.095 < 0.1$
C ₇	3	3	3	1	2.280	0.475	4.209	

Table 6 The calculation of important degree and consistency inspection results of judgment matrix B₃-C

B ₃	C ₈	C ₉	C ₁₀	C ₁₁	C ₁₂	W_i	W'_i	λ_{mi}	
C ₈	1	1	3	3	$\frac{1}{5}$	1.125	0.177	5.350	$\lambda_{\max} \approx \frac{1}{5}(5.350 + 5.147 + 5.255 + 5.503 + 5.458) = 5.343$
C ₉	1	1	3	3	$\frac{1}{3}$	1.246	0.196	5.147	
C ₁₀	$\frac{1}{3}$	$\frac{1}{3}$	1	$\frac{1}{3}$	$\frac{1}{5}$	0.375	0.059	5.255	$CI = 0.086 < 0.1$
C ₁₁	$\frac{1}{3}$	$\frac{1}{3}$	3	1	$\frac{1}{3}$	0.644	0.102	5.503	
C ₁₂	5	3	5	3	1	2.954	0.466	5.458	

3.3 The total sorting of level and consistency test

Using the results of the single sort of the same level in all levels, you can calculate importance weights of all the elements of this level aimed at the up level, which is referred to as a hierarchy total ordering. Hierarchy total ordering need to be done step by step from top to bottom in order. For the highest level, the level of single order is the total order.

Set up the level total sorts weight of the three elements B₁, B₂, B₃ of the level (B layer) as

b_1, b_2, b_3 . Each element hierarchy total weight of C layer $C_1, C_2, \dots, C_{12}$ is calculated as:

$$C_j = \sum_{i=1}^3 b_i C_j^i, \quad j = 1, 2, \dots, 12$$

Here, when there is no connection between C_j and B_j , $C_j^i = 0$. Normalizes the results, then get the hierarchy total ordering of elements in the C layer, which is named total importance degree, the calculation process are shown in Table 7.

Table 7 The calculation table of important degree of each factors

C_j	B_i			$C_j = \sum_{i=1}^3 b_i C_j^i$
	0.143	0.714	0.143	
C_1	0.633	0	0	0.091
C_2	0.070	0	0	0.010
C_3	0.296	0	0	0.042
C_4	0	0.274	0	0.196
C_5	0	0.092	0	0.066
C_6	0	0.158	0	0.113
C_7	0	0.475	0	0.339
C_8	0	0	0.177	0.025
C_9	0	0	0.196	0.028
C_{10}	0	0	0.059	0.008
C_{11}	0	0	0.102	0.015
C_{12}	0	0	0.466	0.067

Through the calculation and analysis of the table, the main factors that affect the branch of group logistics growth force is its growth ability, growth ability is the key to the growth of the branch of logistics company within this stage, and it is the core part of the development of the company.

3.4 The evaluation of growth status of one group logistics company

The lack of AHP is that people's subjective factors on the impact of the entire process is great from the establishment of a hierarchical model to give pairwise comparison matrix. In addition, when the problem is very complicated, the judgment matrix does not satisfy the consistency, it is difficult to make accurate choices^[13]. In order to make the evaluation of the current situation of logistics branch company growth more realistic, we can use the growth power index to represent the comprehensive growth of logistics branch, the computation formula of growth index is as follows:

$$G = \sum C_i \cdot X_i, \quad i = 1, 2, \dots, 12.$$

The G in the formula represents the growth power index of the logistics branch, C_i represents the total weight of the indicators in C layer, X_i represents the assessment scores of influence degree to the growth power of logistics enterprise.

The assessment scores of influence degree to the growth power of logistics enterprise are shown in Table 8.

Table 8 The table of evaluation of logistics enterprises growth force factor

Factors that affect the logistics branch growth	The assessment scores of influence degree		
	300	200	100
The national logistics policy X_1	Very coincident	General coincident	Not coincident
This group company is Chinese largest direct selling company, after the storm of pyramid selling in 1998, the company actively cooperate with the government's policy to transform and play a leading role, the direct selling law is supported by the national policy, $X_1 = 300$			
The national environmental protection policy X_2	Very coincident	General coincident	Not coincident
The logistics branch should follow environmental policy and environmental policy, $X_2 = 100$			
The national logistics industry growth X_3	strong	general	weak
National logistics industry needs to develop, attaches great importance to the development of logistics services, make a lot of strategy, industry growth is strong, $X_3 = 300$			
The market share growth X_4	high	middle	low
The market is vast, Amway company's turnover increase every year, it can easily increase the market share, $X_4 = 300$			
Net profit growth X_5	high	middle	low
Due to the late start, a lot of advanced technology, equipment not yet introduced, it is difficult to improve the enterprise net profit, $X_5 = 200$			
Service growth X_6	high	middle	low
Company's logistics management, technology, personnel, etc. need to be improved, the efficiency of logistics services is not high, and the growth is low, $X_6 = 100$			
Scale growth X_7	high	middle	low
The company's main markets concentrated in the coastal provinces, the market share in the west is not high, the scale is not great, $X_7 = 200$			
Equipment technology advanced X_8	high	middle	low
Enterprise scale is small, now too advanced equipment is not suitable for development scale, advanced is in the medium, $X_8 = 200$			
Information level X_9	high	middle	low
Company started lately, it's development is not very fast, it is scarce of logistics information, the level of information is general, $X_9 = 200$			
Assets safety X_{10}	high	middle	low
The vast majority of business is headquarters, the logistics cost is small, debt ratio is low, asset security is general $X_{10} = 200$			
Marketing ability X_{11}	strong	general	weak
The logistics branch marketing ability is determined by the group company's performance, when the company's sales volume is high the marketing ability of logistics branch is strong, at present the group company product sales are growing faster and the growth is general, $X_{11} = 200$			
Personnel quality X_{12}	strong	general	weak
At present the logistics branch is small-scale logistics enterprises and lack of high-tech talent, the growth is low, $X_{12} = 100$			

We can know that from the Table 7 and Table 8:

$$\begin{aligned}
 G = \sum C_i \cdot X_i &= 0.091 \times 300 + 0.01 \times 100 + 0.042 \times 300 \\
 &\quad + 0.196 \times 300 + 0.066 \times 200 + 0.113 \times 100 \\
 &\quad + 0.339 \times 200 + 0.025 \times 200 + 0.028 \times 200 \\
 &\quad + 0.008 \times 200 + 0.015 \times 200 + 0.067 \times 100 \\
 &= 174.4.
 \end{aligned}$$

We use Li Baizhou enterprise growth evaluation standard to judge the strength of the logistics branch growth force, enterprise growth evaluation criteria are shown in Table 9:

Table 9 The evaluation standard of enterprise growth

The scope of the growing index G	100~166	167~233	234~300
Strength of enterprise growing growth	weak	general	strong

The $G = 174.4$ shows that the logistics branch growth is at the medium level.

4 Conclusions and recommendations

This paper has established logistics business growth force evaluation models and algorithms based on AHP combines typical case to analyze the main factors influencing the growing force on a logistics company. The results showed that: the development of the logistics branch is still in the initial level, as well as its growing force. There is a large gap comparing with the advanced logistics enterprises. It is necessary to develop appropriate strategies to foster and enhance the logistics of the company's growing force levels and promote the healthy and rapid growth starting with the main factors influencing this from the impact of logistics enterprises, combining with the specific circumstances of the logistics branch.

Firstly, we lay the foundation and then expand the scale. The logistics branch was established earlier while small. Its business mainly depends on the group company. Although little risk, but there are some limitations such as the pace of development cannot be too fast. On the other hand, the capacity of small-scale enterprises is weak to adapt to environmental changes. Growing force will also be limited. It is difficult to demonstrate strong business growth momentum therefore. So a solid foundation must be laid early, and then to seek large-scale expansion. Only in this way could the enterprise be invincible.

Secondly, keep abreast of the market, steadily increase its market share. High Market share can promote the rapid development of enterprises to bring high profits. While the company occupies a huge market, its market share of the logistics branch is relatively small. It is a more appropriate choice to enhance the growth of the logistics branch level and foster the growth of the force strength though expanding their business outside the group appropriately and improving the market rate.

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