Abstract  A great deal of resources is required in the course of building and running the E-Commerce Model B2B. In order to analyze whether the model B2B is successful or not, it is very necessary to conduct scientific evaluation on the model B2B. On the basis of thorough investigations and researches, this paper brings forward the necessity and presents the index system in the comprehensive evaluation of E-Commerce Model B2B. The index system consists of the index of B2B strategy evaluation, the index of market evaluation, and the index of application evaluation. With the help of the Analytical Hierarchy Process model, this paper builds the E-Commerce Model B2B, and analyzes some typical examples.

Key words  E-Commerce, comprehensive evaluation, index system

1  Introduction

A great deal of resources is required in the course of building and running the E-Commerce Model B2B. In order to analyze whether the model B2B is successful or not, it is critical to perform scientific assessment, and measure the benefit brought by the model B2B through economic index. Then these evaluation results need to be translated into requirements and standards to new systems, which is the significance of the evaluation of the model B2B.

The evaluation to the model B2B is complicated; it includes two parts as follows:

- Building the index system used in the course of the evaluation to the E-Commerce Model B2B.
- Building corresponding models and working out the different results by mathematical means.

Many scholars have researched the evaluation of economic benefit to the E-Commerce. Literature [1] advocated evaluating the economic gains brought by the E-Commerce by means of the gray evaluation. Literature [2] studied the evaluation to the financial aspects in the E-Commerce. Literature [3] investigated the logistic system applied in the E-Commerce. These studies provide thought and reference to the evaluation and research of the E-Commerce Model B2B.

This paper studies the model B2B’s evaluation method and builds the evaluation index system of the E-Commerce Model B2B. Building correspond computing means by mathematics model will be studied henceforth.

2  The Basic Concept of the Evaluation to the E-Commerce Model B2B

The commercial operation model of B2B is the embodiment of the value of the network sale economy at present phase. It not only provides perfect resolving scheme of enterprise sale to harmonizes the relations of a product’s supply and demand, but also offers a series of synthesis service including product information, quality assurance and transportation safety. The sale model of B2B brings various reformation of management for corporations, and accelerates the increase of economic benefit.

The evaluation to the model B2B is complicated work, which relates to many factors. The value of an enterprise is mainly measured by its capability of creating profit at present and future. Similarly, the value of the model B2B also lies on these factors which affect the capability of creating profit, such as income-current, market share? brand recognition, technical ability and so on.

The model B2B is a brand-new business model compared with traditional one. The characters of the evaluation index system are as follows:
(1) B2B will go through quite a long phase in which it invests greatly but returns slowly or produces negative profit. Up to now, even though in American where E-Commerce is most developed, there is not much successful and profitable E-Commerce Model B2B.

(2) The E-Commerce field is filled with furious competition. Under the principle that the winner takes all, the final survivals in the industry is merely a few.

(3) The indexes are different in weighting the profit foreground. Except finance index, technical ability and so on, index of clicking rate, number of users and resort time all take important roles.

(4) The value of the model B2B lies on the development foreground of B2B in the future, so it is very necessary to take into account the dynamic factors.

The key to the evaluation of the model B2B rests with the establishment of the right evaluation index system according to the model B2B’s characters, and then choosing the appropriate method to evaluate it based on various factors in the index system.

With the evaluation of the E-Commerce Model B2B we can generally estimate, analyze and checkup the model B2B, and then build the index system of the evaluation of the model B2B. We can analyze and confirm the difference between target and practice by evaluating various indexes, and at the same time put the entire evaluation to the economic benefit created by the commerce model B2B.

3 The Evaluation Index System of the E-Commerce Model B2B

The index system can directly reflect different attributions such as the evaluation target, content, and then compose ordinal masses in terms of subject connection and level principle. This paper will divide the index system of the E-Commerce Model B2B into three aspects by analyzing and researching some factors interrelated with the sale model B2B. They are subdivided into 16 targets, which are not completely independent of one another but have definite related, so we can consider them as a whole.

3.1 The Strategic Evaluation of B2B

(1) Economic environment in domestic and abroad

The international and domestic economic environment remarkably influences the market demand of certain commerce model B2B, and further impacts the value of the model B2B. The influence can be reflected by the growth rate of the global economy, main trade countries and the homeland economy. Development strategy and supervising policy of a country.

(2) National Development Strategy and Supervision Policy

Development strategy and supervising policy of a country will influence the development of the E-Commerce B2B in that country. Supervision to some special industries such as pharmaceutical, tobacco, education and so on will directly influence the development of some E-Commerce B2B, as well as the value of the commercial model B2B. This is a qualitative index, which mainly reflects the changes of the government’s development strategy and supervising policy.

(3) Integrality of the finance payment system

Integrity of the finance payment system may reflect the efficiency of fund-current of the E-commerce B2B. The payment system plays a key role in the course of development of the E-Commerce B2B. Integrality of the finance payment system can be reflected by the popularization of credit card, the popularization, convenience and security of fund transfer on web.

(4) Macroscopic goods flow delivery system

Goods flow is the one of three proportions (information flow, fund flow and goods flow) of the E-Commerce B2B. Integrality of macroscopic delivery system reflects the development of traffic and transportation establishments of a country and the current amount of delivery trench and delivery efficiency.

The index that measures the integrality of macroscopic logistic delivery system includes: the establishment in railway, road, aviation, and marine, the amount and scale of existing transportation enterprise in nation, and the time required from consignment to requirement.
(5) Scale of enterprise

The existing scale of enterprise will bring great influence to E-Commerce development. First, the existing brands and market occupancy will influence the competition force of its E-Commerce. Second, the economy scale determines the capability of large-scale investment, technique reconstruct and taking up the great charge of market sale.

The economic scale of an enterprise can be reflected by the index of its whole capital. The amount of investment and the investment in technique reconstruct can be reflected by the index of the total investment of E-Commerce.

3.2 Market Evaluation of B2B

(1) The potential of object market

The E-Commerce is the result of the development of computer, communication and information management and also a kind of new business model. Yet, it takes quite a long time for consumers to understand at large and accept the E-Commerce. Therefore, the choice of client groups will influence or decide the subsistence and development of B2B. The success possibility of an enterprise is large and its value is high if the client groups are well educated, willing to try new things, familiar with the Internet and enjoy the experience of shopping on the Internet.

The potential of object market can be measured by client’s age, education degree and so on.

(2) Market share

Market share mainly means the market occupancy of product and service, at the same time including the market sale capability, which is evaluated by the population of the sale departments and the quality of the sales personnel.

(3) Brand

The brand is important in network. Users will rely on trustworthy brands even though the named brand implies higher price. The brand of E-Commerce reflects the capability that attracts customers as the same as that of traditional business model.

The index measuring enterprise brand may utilize the rankings of some research institutions, while the number of users and clicking rate may also act as indirect index.

(4) Integrity of the delivery system

Integrity and validity of the delivery system reflect the efficiency of E-Commerce logistics. It is an important part of convenience to send commodity by multiple channels. There are more advantages for a company to send commodity by telephone or through branches than only through Internet. It will enhance competition power of E-Commerce B2B by establishing good partnership with senders. The multiple channel delivery systems are the trend of the development of E-Commerce.

The indexes measuring the integrity of delivery system are: the amount of delivery center, the sending velocity, the amount and quality of delivery trench of other partners.

(5) Scale of clients

The index can anticipate the income flow by measuring the visiting status of E-Commerce net common indexes of the scale of clients. It includes: the visiting quantum namely clicking frequency and its increasing rate; the staying time and its increasing rate; the amount of registered users and its increasing rate. Using these indexes special attention should be paid to their characteristic. For example, clicking rate of enterprise and individual, length of stopping in various communities represent different meanings and so on. Therefore, more refined index is required for measuring the scale of clients of E-Commerce B2B.

3.3 The Application Evaluation of B2B

(1) Degree of uniting or opening

Selectivity is one of basic characters of E-Commerce B2B and also embodies the value of the trade style of B2B. The structure of uniting or opening is one of the measures providing selectivity. The degree of uniting or opening of the trade style of B2B is one important factor that greatly influences the...
development of the trade style of B2B.

For delivery companies, the opening structure denotes providing product that they don't possess.
For special manufacturers, the combination of markets helps to increase the number of opening new accounts.

The measurement of the degree of uniting or opening includes two aspects as follows:

- Previous development. This is the change of uniting or opening degree (number of partnered companies and market scale) of the business style of B2B previously.
- Comparison in industries. This is to inspect the development of other business styles of B2B in the same industry, and compare the number of partnered companies and market scale with itself.

(2) Broadness of product or content

The larger the broadness of product or content provided by E-Commerce B2B is, the greater the selectivity and convenience the users can benefit. As a result, users visit the net more frequently and stay longer time, and the value of B2B is higher because of better brand.

The survival of direct clients rests with their favorable content, especially the width of product interrelated with information and product. For focus businessman, the depth of product is very important.

The index of the width of product and content includes: amount of product and content.

(3) Customer service

Good customer service is the sign of a successful E-Commerce B2B. Customer service includes scanning speed, response speed of calling service and individuation service. The individuation service is the only way of E-Commerce B2B.

The index of evaluating the service includes: scanning speed, response speed of calling service and individuation service.

(4) Database/technique ability

They are the indexes of evaluating total technique ability, including collecting and settling helpful data and building and running the function online.

E-Commerce B2B can succeed and the value of enterprise can succeed, only if it constantly adjusts its technique and improves database/technique ability meeting the demand of the customers and the change of technology.

The index of evaluating database/technique ability includes: structure of technical personnel, equipment capability and so on.

(5) Management’s capability

Management’s capability is the capability with which the management of this company carries out its strategy plan. Management should adjust current business strategy decision, and take E-Commerce as a business style instead of a business tool.

It is difficult to directly evaluate management’s capability. Possible indexes include: management’s educational level, working experience, technical skills and so on.

(6) Financial status

Financial status, i.e. income model and profit model of the business style of B2B, is largely the capability of gaining extra income except for in traditional income style. At present, it mainly includes the charge paid by clients for using net (membership fees, transaction expense) and the revenue from advertisement.

Income from advertisement plays a key role in most E-Commerce B2B now. Some business styles of B2B can charge the enterprises for setting up a homepage or link to selling trench on their network. These incomes will turn into important revenue of a company in the event of less profit of product and service.

The index of financial status includes: increasing rate of total income and each component (advertisement income, transaction expense, E-Commerce and so on); increasing rate of fund flow; market income rate (market price/total income); rising rate of total cost and each part cost; capital debt proportion, speed move rate and so forth.
The index system structure model of Analytical Hierarchy Process of E-Commerce B2B is shown in Fig. 1.

![Fig. 1  Structure model of Analytical Hierarchy Process of E-Commerce B2B](image)

### 4 Measure of evaluation

After having established index system of evaluation, it is essential to choose proper method for assessment. Whether or not the method chosen is proper will directly influence the accuracy of the evaluation result according to general theory and method of evaluation. Some common methods of evaluation are presented.

#### 4.1 Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process is a brief and practical systems analysis method, professor T. L. Saty who is an America operational researcher in the early 70s presents it. It decomposes a complex issue into various factors and forms hierarchy in terms of dominated relation, then confirms relative importance of decision-making scheme by double compare.

The basic thought is as follows: First, to delaminate the questions to be analyzed, these questions are decomposed into various elements according to the quality of questions and final goal. Second, a multiple model is formed to analyze the structure after organizing these questions in terms of mutual influence between these factors and secondary relation. At last, these questions are transformed to compare and arrange the lowest layer and highest layer.

AHP can translate the question that is difficult to analyze qualitatively into simple quantitative analysis.

AHP includes 5 basic steps: to found hierarchy model; to structure judge matrix; to arrange these layers singly and check consistency; to arrange these layers finally; to check the consistency of final sequence of these layers.

#### 4.2 fuzzy comprehensive evaluations

Fuzzy comprehensive evaluation is a kind of evaluation method aiming at the multi-object and
multi-layer index system. The thoughts are as follows: supposing there are two finite domains: \( U \) and \( V \), where, \( U \) called as the factor set represents the set composed of many factors in comprehensive evaluation; \( V \) called as the evaluation set represents the set composed by many kinds of evaluations. Generally, the influences which various factors put on to evaluate things are inconsistent, so the weight distribution of factor is a fuzzy vector on \( U \), marked as:

\[
A = (a_1, a_2, \ldots, a_n) \in \mathbb{E}^n
\]

Where, \( \mathbb{E}(U) \) is fuzzy set of \( U \), \( a_i \) represents the weight of the factor whose taxis is \( i \) in \( U \), and

\[
\sum_{i=1}^{n} a_i = 1
\]

Because the \( m \) remarks are not absolutely affirmation or negation, the evaluation after synthesizing can be regarded as a fuzzy set on \( V \), marked as:

\[
B = (b_1, b_2, \ldots, b_m) \in \mathbb{E}^m
\]

Where, \( \mathbb{E}(V) \) is fuzzy set of \( V \), \( b_j \) represents the status which the \( j \) remark is situated in the evaluation collectivity.

If there is a fuzzy relation form \( U \) to \( V \), \( R = (r_{ij})_{n \times m} \) we can gain a fuzzy transformation \( T \) using \( R \). The mathematical model of fuzzy comprehensive evaluation is derived as follows:

1. Factor set: \( U = \{x_1, x_2, \ldots, x_n\} \),
2. Evaluation set: \( V = \{y_1, y_2, \ldots, y_m\} \),
3. Fuzzy transformation: \( T_r : \mathbb{E}^n \xrightarrow{R} \mathbb{E}^m \), \( A \circ R \)

Where, \( R \) is fuzzy relation matrix from \( U \) to \( V \), \( R = (r_{ij})_{n \times m} \)

In this way, the \( (U, V, R) \) makes up of a model of fuzzy comprehensive evaluation.

At this time, if input \( A = (a_1, a_2, \ldots, a_m) \in \mathbb{E}^m \), a comprehensive evaluation is obtained as \( B = (b_1, b_2, \ldots, b_m) \in \mathbb{E}^m \). If \( b_k = \max(b_1, b_2, \ldots, b_m) \), \( b_k \) is the result \(^{[5][6]}\) of comprehensive evaluation.

### 4.3 The Technology of Neural Network

The technology of neural network is a newly founded technology. The network is consisted of many parallel neurons with simple function. These neurons are just like the ones in the neurology system of creature. Although these neurons are the ones with simple structure and limited function, the network system consisting large number of neurons can perform colorfully. Neural network achieves good effect as an evaluation method \(^{[7][8]}\). The founding of BP network is attributed to the acquirement of BP calculation method, which is the most famous multi-level neural network training method.

BP calculation method has the following calculation steps \(^{[9]}\):

1. Generally speaking, the weights are initially set to a small random number so that the network will not be over fitting and abnormal.
2. To choose proper training sample, enter the training number into the network and get the output result through training.
3. To calculate the difference between the output result and the anticipated result by the sample. The difference is then fed back into the network, and the network adapts its weights to reduce the difference.
4. To train each member of all training samples until the whole training error is acceptable by the researcher.

After training, the neural network can accurately show the relationship between input and output. When a certain input number is given, the output is accessible by using neural network.
We can get precise result of evaluation because of BP’s function on fitting nonlinear function. But the result and the process of learning are difficult to understand by users.

The above common evaluation methods all have advantage and disadvantage. Recently, some scholars proposed synthesizing all evaluation methods to obtain exact evaluation results. In practice, we can choose appropriate evaluation method according to the practical index system and evaluation purpose.

5 Conclusions

The market model of B2B, a kind of important business model of enterprise, can create new augment point and enhance the core competition force for the enterprise in the age of E-Commerce. As the evaluation of the model of B2B, it can help enterprise to weigh the income brought by the model of B2B. This paper introduced the basic concept of evaluation of the model of E-Commerce B2B and then built the index system of evaluation. At last it introduced some common evaluation methods briefly. This paper provides feasible thought and method for the evaluation of model of B2B.

Reference