

# Enterprise Supply Chain Asset Valuation— A Case Study of Langbo Technology's Downstream SCA

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**Abstract:** The progress of science and technology and economy makes the development of enterprises into an era of rapid development. After being encouraged by the state, many small and medium-sized enterprises have joined the market. Former traditional businesses have also been greatly encouraged. It is almost impossible for a large company to control every link in the supply chain. There are quite a few companies involved in the manufacturing of products. Because of geographical location, production level and management ability, It forms a complex network of product production supply chains. The supply chain assets owned by enterprises are particularly important. This paper is based on the widely used method of intangible assets evaluation: Income approach. It as a theoretical basis for research and combined with previous studies. On this basis, further research and integration are done. Firstly, how to define supply chain assets in enterprises and the characteristics of supply chain assets different from other intangible assets are analyzed. Secondly, choose the right method. Due to the limitation of the current market environment and personal ability, all the research in this paper is based on theory. It is hoped that this method can make a contribution to the asset appraisal industry when evaluating the value of related supply chain assets.

**Keywords:** *Intangible assets, Revenue Method, Supply chain assets, Value Assessment*

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## I. INTRODUCTION

Economic development brings better living space for enterprises, where there are enterprises, there is cooperation, and where there are people, there are interests. Progress at the economic level brings hope to various industries, and enterprises of all sizes have emerged to shoulder the big network connecting production and sales, and the supply chain network of product production for enterprises is becoming more and more complex.

The value assessment of enterprises has always been a considerable project, with many tangible and intangible assets, constituting a value card belonging to the enterprise, and the value assessment of supply chain assets is still very little in the public's view. As the product supply chain network is getting bigger and bigger, the valuation of supply chain assets is becoming more and more difficult. Theoretical research is very weak, not to mention the few cases in practice. The lack of a standardized valuation approach has made supply chain assets invisible to the general public.

Due to the growing economy, the number of companies using multinational operations is increasing. In manufacturing, every place has the potential to be a part of it. Products can be designed in France, raw

materials can be sourced in India, components can be made in the United States, then assembled in Japan, and finally sold elsewhere. In fact, because of the increasing globalization, the number of companies involved in the manufacture of products is increasing. As different companies operate and produce different products, with different levels of technology and even geographic locations, a complex network of product production supply chains is formed.

The development of modern technology has advanced the economic development of the times, and many large, medium and small enterprises have sprung up, so that the upstream and downstream choices of the supply chain of enterprises have become more and more numerous, so that many enterprises have greatly improved the supply chain structure, and the supply chain level has become more and more complex. With more enterprises entering the market in groups, there is no shortage of traditional industry giants behind them, and the increasingly fierce competition in the market also allows enterprises to get greater development and progress. And nowadays, in the market competition, it is almost impossible for a large enterprise to control every link of the supply chain, from the source of goods to the distribution of products, and some enterprises occupy core advantages, expand their dominant position and develop core competitiveness through horizontal development and resource gathering. The modern supply chain will be subject to the constraints of these enterprises with core advantages, thus the supply chain assets of enterprises are particularly important, and even related to the future development, rise or fall and even survival of enterprises.

Assessing the value of a company's supply chain is more complex than assessing the value of a company's physical assets. An enterprise does not have only one supplier, so how to analyze the supply chain value from it is still not enough for China's asset valuation industry. Theoretical studies are very weak, not to mention the few cases in practice. Therefore, this paper hopes to expand the research ideas and development space of supply chain asset valuation methods through an objective and reasonable approach to enterprise supply chain valuation research, and to provide a theoretical basis for the practical application of supply chain valuation, which is of great theoretical and practical significance.

In this paper first collected and organized some related literature and explained the definition of supply chain assets. Then, an index system is established based on the characteristics of this type of assets, and after calculating the weights of relevant influencing factors using hierarchical analysis, the valuation of enterprise supply chain assets is modeled in combination with the income approach.

The purpose of this paper is to study the valuation methods of enterprise supply chain assets, establish a standardized valuation system, and provide some theoretical help for enterprises when they need to value supply chain assets in terms of cooperation, competition, acquisition, and mergers.

## **II. LIRERATURE REVIEWS**

It is obvious that supply chain assets have no physical form, and the supply chain sustains the operation of an enterprise, and it is continuously useful. At the same time, since it is closely related to the production and sales, it brings economic benefits to the enterprise, and essentially it should belong to intangible assets, which belong to the customer relationship category. At present, there is a lack of examples in assessing the value of such assets, and professional asset valuation agencies have to take up this "burden". Since there are

almost no valuation methods specifically for corporate supply chain assets under current conditions, and comparable examples in the market are hard to find, we can only start from a general perspective of intangible asset valuation. With the development of the asset valuation industry and the emergence of new intangible asset enterprises, a large number of domestic and foreign scholars have further researched and improved the valuation methods of intangible assets based on the traditional three major methods: market method, revenue method and cost method.

## **2.1 Status of foreign research**

Asset valuation first originated in the UK, and the theoretical research on asset valuation abroad far exceeds that in China, and is more profound in the valuation of intangible assets.

The first point to make is Grace and Tang's research<sup>[1]</sup> on intangible asset valuation, where they argue that they believe that valuation relying only on financial statements is very prone to bias and that studying the relative value distribution of intangible asset firms should be more accurate and appropriate than studying enterprise value. They argue that the drivers or attributes of value largely determine how the virtual value of these intangible assets is created for the company. And it is found that the traditional three major methods are not as practical as the analytic hierarchy process.

In the aspect of cost method, there is an in-depth study of cost theory by Rand<sup>[2]</sup>. Wilson and Donald published a new theoretical hypothesis on the cost method. Robert, Eric, and Mak<sup>[3]</sup> have combined theory and practice based on the existing practical case base, and discussed some of the theories in the present-day intangible asset cost method from an empirical perspective. Intangible assets as light assets, moreover, have emerged in the last two decades, and their own costing is more complicated, so the application of cost method in intangible asset valuation receives great limitation and relatively fewer research cases.

In the aspect of Market Method, Newman and Timothy<sup>[4]</sup> studied the direct method. Ellsworth and Richard<sup>[5]</sup> completed the analysis and study of the comparative method in the market Method. Mitchell, Philip and Mak<sup>[6]</sup> conducted an innovative study on the comparative indicators in the comparative method in the market Method. The market Method differs from the Revenue Method in that it is more inclined to assess the current value of the asset, rather the market Method is less restrictive and more convenient in its application and has a wider scope of application.

As far as the revenue method is concerned. The merits of the revenue method have been studied in depth by Dougherty, James, Mac<sup>[7]</sup>. Asquita Modaland<sup>[8]</sup> of the New York University School of Business, USA, discussed in some detail the practical methods of the Revenue Method, including the discounted cash flow method, which is widely used today, in her book Valuation. In addition to the theoretical derivation of the various methods, the book also provides an in-depth study of the problems that may be encountered in the application of these methods to real-life situations.

## 2.2 Current status of domestic research

The China Asset Appraisal Association issued a new practice standard in 2017<sup>[9]</sup>. In this new standard, intangible assets are defined as those that do not have physical form, are owned or controlled by a specific subject, can function continuously in a specific subject, and can bring economic benefits to a specific subject. The new standard defines an intangible asset as a resource that does not have a physical form, is owned or controlled by a specific entity, can function continuously in a specific entity, and can bring economic benefits to a specific entity. Compared with the old standard, the new standard has once again improved the definition of intangible assets, which also symbolizes the development of domestic intangible assets valuation, although it is still very backward compared with the foreign research, and domestic scholars are going forward to conduct in-depth research on this.

### (1) Study on the valuation of intangible assets

Qiu and Xiao<sup>[10]</sup> proposed that intangible assets can be special long-term assets that are acquired for a fee without physical form, can be used for a long time, will bring excess cascading returns, and have a high degree of variability. This is also used as a basis for proposing the disembodied, paid, variable, excess return, and dependent nature of intangible assets. Wang<sup>[11]</sup> classified intangible assets into six categories according to different classifications: conventional intangible assets and non-conventional intangible assets, technical intangible assets and relational intangible assets, book intangible assets and off-book intangible assets, purchased intangible assets and self-created intangible assets, recognized intangible assets and disputed intangible assets, and corporate intangible assets and government intangible assets. Tang<sup>[12]</sup> states that from the existence of intangible assets, intangible assets are presumed to be special rights that are not physical in nature with long-term benefits granted by law or contract. Maintaining the capitalized value of specific economic resources associated with residual profits, which in turn increases the use of intangible assets on intellectual capital, intellectual capital, and human resources. Yu<sup>[13]</sup> considers intangible assets as ownership or control of a specific entity, non-tangible, resources that can generate income. Further, the concept of intangible asset is a big intangible asset is proposed. Wu<sup>[14]</sup>, for the first time in China, put the concept of assets in academic terms before the public, and further explained the form of intangible assets on this basis. Asset valuation is the assessment of the "value" of an asset, and the purpose and function of the valuation should be emphasized in the valuation. Jiang<sup>[15]</sup> states that the capitalization treatment of the profitability of an asset represents the value of intangible assets. Intangible asset valuation is the estimation of the value of such capacity under specific conditions. Pang and Zhang<sup>[16]</sup> proposed that the value of intangible assets has the characteristics of virtual and weak correspondence, and its value composition is different from that of general assets. Since intangible assets come in a variety of forms, the influencing factors of the value assessment process should be given more consideration.

### (2) A study on the basic methods of intangible asset valuation

Liu<sup>[17]</sup> proposed that the three main methods of intangible asset valuation differ in many aspects, and each method has its advantages and disadvantages. With the advent of the knowledge-based economy, intangible assets account for an increasingly large proportion of corporate assets, and when conducting intangible asset valuation, it is important to choose a suitable method for valuation based on the actual situation to ensure

that the intangible asset valuation process is fair, objective and accurate. Zhang and Chen<sup>[18]</sup> pointed out that by determining the characteristics of intangible assets, the income approach should be used as the main method and the preferred method. Wang and Wu<sup>[19]</sup> argue that importance should be attached to the use of analytical tools in the valuation process, and how to optimize these analytical tools to be more suitable for the cost, market, and income approaches is the current focus of intangible asset valuation. Ren<sup>[20]</sup> proposes that in current life, there are some assets that are affected by different influences that lead to their overvaluation or undervaluation, and then we have errors in the value of the business assets assessed out. How to reduce the occurrence of this situation? We need to pay extra attention in how to choose the method, how to collect reasonable and accurate data, how to reduce personnel errors and the influence caused by subjectivity, etc. Luo and Chen<sup>[21]</sup> proposed the double discounted cost-benefit method, i.e., the double discounted historical cost and present value of excess earnings method, which is a method to determine the price of the intangible asset under appraisal based on the discounted historical cost of the intangible asset under appraisal, plus the present value of the accumulation of value and excess expected earnings during its use, minus deductible depletion or depreciation.

### (3) About the problems and solutions in the process of intangible asset valuation

Li<sup>[22]</sup> suggested that many intangible assets were evaluated without selecting the correct appraisal object and appraisal scope. Scientific appraisal methods are not selected. And the information of intangible asset appraisal report needs to be further complete. Xie, Li, and Xie<sup>[23]</sup> point out that the selection of specific valuation parameters using the traditional income approach is very one-sided for intangible asset valuation and can affect the accuracy of the valuation.

### (4) A study on a new approach to intangible asset valuation

Zhan<sup>[24]</sup> proposed the composite cost approach, where the historical cost or replacement cost is not fully considered when valuing intangible assets, but also scarcity as well as usefulness. Xie, Li, and Xie<sup>[25]</sup> point out that there are problems when using the traditional income approach, and the appraisers do not consider the intangible assets as a whole when selecting specific appraisal parameters, resulting in the appraisal parameters being very one-sided for intangible asset appraisal, which can affect the appraisal accuracy, and in order to remove the influence of subjective factors on intangible asset appraisal, the gray correlation analysis method can be introduced.

Through the existing theories, we explore which valuation method is more applicable to the supply chain structure of intangible asset enterprises as it develops step by step and becomes increasingly complex. With the strong support of the state for the development of small and medium-sized enterprises, all kinds of enterprises have ushered in the spring of development. How to correctly and reasonably evaluate the supply chain class of assets seems to be urgent. In this paper, we will use the revenue method, cost method and market method as the basis combined with the AHP to explore how to use the appropriate method to evaluate the supply chain assets of enterprises, taking into full consideration the overall supply chain assets of enterprises.

### III. RELATED CONCEPTS AND THEORETICAL BASIS

#### 3.1 Related Concepts

The supply chain is a network of relationships around the core enterprise, starting from the supporting parts, making intermediate products and final products, and finally the sales network delivers the products to the consumers. Such a point-to-point formation of a functional network chain structure is the supply chain. The supply chain has the following characteristics. (1) Complexity. Due to the different sizes of nodal companies in the supply chain, the supply chain often consists of several, several types or even multinational companies, so the supply chain structure model is more complex than the general model of unified enterprise structure. (2) Dynamic in nature. The market is unpredictable, so the supply chain will change with the market changes. In addition to the changes in the market, changes in the company's strategy will also cause adjustments in the supply chain. (3) User-oriented. There is demand to create a supply chain, the end of the supply chain is the customer, customer demand is the driving force of the supply chain operation. (4) Cross-cutting in nature. As the name implies, the intersection of supply chains is formed by connecting one point after another, and some supply chains share one or more points to form the intersection of supply chains.

An **asset** is an economic resource that is owned or controlled by an economic entity, can be measured in money, and can bring economic benefits to the economic entity. Assets of an enterprise, which the enterprise has the right to own or control. Assets have three basic characteristics. (1) Reality. Assets should be realistic. What is in the phenomenon or forecast is not an asset, it is the result of production and transactions that have taken place in the past. (2) Controllable. Controllable means to have ownership or control over the assets of the business, meaning that you can control these assets to obtain economic benefits for the business. (3) Economical. Economy refers to the characteristics of an asset that is expected to bring economic benefits to the enterprise and has exchange value and use value. An asset cannot be recognized as an enterprise asset if it has no exchange value or use value and cannot bring future economic benefits to the enterprise.

The definition of **supply chain assets** is derived from this: the functional network chain structure resources that can function continuously and bring economic benefits are the supply chain. The characteristics of supply chain assets are as follows. (1) Holistic. The supply chain is an organic whole with one link to another. It requires information sharing, risk sharing and benefit coexistence among the node enterprises. (2) Adopting an integrated model. The supply chain uses the idea and method of integration. It is an integrated model of the whole element and process from supply to manufacturing, distribution, retailing, and up to the final customer, which integrates different companies and focuses on cooperation between companies. (3) The complexity of the rights subject. The supply chain assets of an enterprise may include suppliers, manufacturers, distributors, sellers, customers, etc. The main contributors may be cooperative funds or funds entrusted by other units. The attribution of supply chain assets is not only based on the size of the invested capital, but also to some extent on the goodwill and technology level of the enterprise, so the subject of supply chain assets is relatively complex. (4) Diversity of objects. Supply chain assets are often

composed of multiple supply chains and are an integration of many supply chains. It is often difficult to combine all the supply chains together for valuation, and it is often necessary to classify them and sort them out before valuation. The supply chain of an enterprise often involves many aspects: raw materials, equipment, semi-finished products, finished products and so on. Therefore, there are many different types of supply chain assets.

In order to obtain a relatively accurate value of supply chain assets, various evaluation factors of the supply chain must be fully considered and different scientific evaluation methods must be used. There are many factors that can affect the evaluation of supply chain value, and no matter which one is ignored, it will cause misrepresentation to its evaluation.

### **3.2 Theoretical Basis**

#### **(1) The theory of supply and demand**

The supply of all goods in the market is closely related to the number of producers. Other things being equal, the supply of a commodity fluctuates in the same direction as the price, i.e., the supply increases as the price of the commodity itself rises and decreases as the price of the commodity itself falls.

#### **(2) Theory of Enterprise Value**

Enterprise value is the exchange value of an enterprise as a specific asset complex in real market conditions, determined by the profitability of the enterprise, and is the combination of the value of the profitability of the enterprise on an existing basis and the value of potential dynamic opportunities.

#### **(3) CAPM**

Investors conform to the rational man assumption and are diversified strictly according to the Markowitz model and will choose their portfolios from somewhere in the efficient frontier, and the capital market is a perfectly efficient market.

## **IV. DESIGN OF INDEX SYSTEM FOR ASSET VALUE EVALUATION OF ENTERPRISE SUPPLY CHAIN**

### **4.1 Evaluating the need for the design of an index system for evaluating the value of an enterprise's supply chain assets**

The supply chain resources of an enterprise are closely related to the supply chain structure of the enterprise. Generally, the larger the enterprise, the more complex its supply chain composition is, and when the enterprise carries out some business activities or some equity changes, there is a need to assess its value. In this case, if there is no set of criteria for the evaluation, it will be very difficult to evaluate and cannot accurately assess its value. (1) It provides a value basis for some business activities, equity changes, etc. (2)

Improve the lack of supply chain asset value when assessing enterprise value. (3) It makes it possible for companies to realize the transfer of rights to supply chain assets and the realization of supply chain value.

#### **4.2 The principles of constructing the index system of enterprise supply chain asset value assessment**

Wei<sup>[26]</sup> mentioned in his paper named "Enterprise Asset Appraisal Indicators and Fuzzy Appraisal" that the following principles should be considered when selecting appraisal indicators: the principle of relevance, the principle of purpose, the principle of principal, the principle of matching, the principle of measurable data, the principle of objectivity, and the principle of comparability. (1) Targeting principle. Assessment objects are diverse, and different objects may have different characteristics. In this case, when selecting indicators, it is necessary to "prescribe the right medicine" according to the characteristics possessed by the assessment object. (2) Purposeful Principle. The purpose of valuing an asset varies, the valuation methods used may be different, and the valuation metrics selected will be different. (3) Main principle. The selection of indicators should be based on key and representative factors. (4) Matching principle. The selected indicator system should not only be able to comprehensively reflect all the characteristics that affect the assessment conclusions without omission, but also avoid duplication of different indicators to reflect the same characteristics, resulting in overlapping of the role of indicators. (5) Principle of measurable data. Indicators should be easy to evaluate quantitatively. When selecting indicators, it is important to consider the certainty of the indicators to facilitate quantitative evaluation. If a more ambiguous indicator must be selected, it should also be relatively easy to evaluate quantitatively. (6) Principle of objectivity. In order to avoid or reduce such interference, it is necessary to identify indicators that are more objective and less susceptible to influence. (7) Comparability principle. Adopting the common indexes in the market nowadays, it is convenient to compare similar cases among enterprises with each other.

#### **4.3 Selection and analysis of indicators**

Because of the complexity of the supply chain asset structure, we need to understand what factors can interfere with our valuation process in order to balance accuracy and efficiency at the same time. To summarize, the main factors that affect the value of supply chain are as follows. (1) Supply Chain Stability. Due to the specificity of supply chain assets, the benefits formed by them are generally long-term benefits and short-term benefits. When a supply chain tends to be stable, it brings more and more stable returns, and the value of the supply chain will be higher. (2) Supply Chain Management Capability. Supply chain management means making the best of supply chain operations through sound technical operations, which simply means making the best of it and doing the most with the least. A strong supply chain management capability enables companies to achieve profitable growth, and this is when the value of the supply chain becomes even higher. (3) Supply Chain Logistics Capability. Logistics is a comprehensive reflection of the response speed, logistics and order processing of the entire supply chain. The speed and safety of delivery is from order receiving to order processing, product sorting, transportation and other aspects. The stronger the logistics capability, the stronger the ability to create revenue and the higher the value of the supply chain. (4) Market supply and demand situation. The final segment of the supply chain is the customer, so the value of the supply chain assets is also closely related to the supply and demand situation in the market. When the supply of the end product exceeds the demand, the value of the whole supply chain assets will drop, and vice versa. (5) National Policy. When the state strongly supports the development of a certain industry, the



government will encourage the enterprise in legal, policy, economic and administrative ways. After receiving such key support, the industry's prospects expand and the value of the supply chain rises. If the state strictly restricts, the value of the supply chain will be reduced. (6) The degree of monopoly of supply chain assets. The value of a supply chain is higher if it is the only one with no identical or similar alternatives. (7) Other factors. The value of asset valuation is not only influenced by the above aspects, but also by other social, human, economic, geographical factors, etc. See Table 4.1.

Table 4.1 Indicator System Design

Tier one Indicators	Secondary indicators	Tertiary indicators
Assess the quality of the supply chain assets themselves	Supply Chain Stability	Survey of business cooperation
	Supply Chain Management Capability	Testing supply chain responsiveness
	Supply Chain Logistics Capability	Examine the timeliness and stability in logistics
Assessing the quality of the external environment of supply chain assets	Market Supply and Demand	Conduct market research
	National Policy	Check the relevant policy announcement
	Degree of monopoly	Examining the market alternative supply chain
	Other factors	Examining the social and economic environment

## V. MODEL CONSTRUCTION FOR ENTERPRISE SUPPLY CHAIN ASSET VALUATION

### 5.1 The basis for model building

Through the descriptions in the previous sections of the article, we know that supply chain assets have the following characteristics: complexity of rights holders, diversity of objects, and holistic nature of supply chain assets. The following factors affect the evaluation of the value of supply chain assets are: supply chain stability, supply chain management capability, supply chain logistics capability, market supply and demand conditions, national policies, monopoly degree of supply chain assets, and other factors.

## 5.2 Modeling and determining the set of indicators

Each influence factor in the assessment object constitutes an indicator set, and each influence factor is denoted by  $x_i$  ( $i$  is a natural number), and the indicator set is denoted by  $X$ . Consider whether each influence factor can be measured, and organize them in a certain order of classification. Let  $X$  be the first level

indicator set,  $X_i = \{X_{i1}, X_{i2}, X_{i3}, \dots, X_{ij}\}$  is the second level index set. The following evaluation system Table 5.1 is constructed according to Table 4.1.

Table 5.1 Basic framework for model building

Evaluation factors	Evaluation Indicators	Indicator content
Quality of the supply chain itself	Supply Chain Stability	Number of cooperation, length of cooperation
	Supply Chain Management Capability	Supply chain service quality, supply chain response speed
	Supply Chain Logistics Capability	Logistics stability, logistics timeliness
Quality of the external supply chain environments	Market Supply and Demand	Supply and demand balance or not
	National policy situation	Whether the state has incentives, the number of policies
	Monopoly degree situation	What is the number of alternative supply chains
	Other factors	Social acceptance, economic environment stability, geographical advantages and disadvantages

$X = \{X_1 \text{ Quality of the supply chain itself, } X_2 \text{ Quality of the external supply chain environments}\}$

$X_1 = \{X_{11} \text{ Supply Chain Stability, } X_{12} \text{ Supply Chain Management Capability, } X_{13} \text{ Supply Chain Logistics Capability}\}$

$X_2 = \{X_{21} \text{ Market Supply and Demand, } X_{22} \text{ National policy situation, } X_{23} \text{ Monopoly degree situation, } X_{24} \text{ Other factors}\}$

## 5.3 Constructing a pairwise comparison matrix

The pairwise comparison matrix has the following properties:

$$x_{ij} = \frac{1}{x_{ji}}$$

The method to determine the scalar of matrix element  $x_{ij}$  is as follows in Table 5.2.

Table 5.2 Scaling Method

Factor i is higher than factor j	Quantified values
Equally important	1
Slightly more important	3
Stronger and more important	5
Strongly Important	7
Extremely important	9
Intermediate value of two adjacent judgments	2,4,6,8

Then there is a pairwise comparison matrix as follows in Table 5.3:

Table 5.3 Build pairwise comparison matrix

	X <sub>11</sub>	X <sub>12</sub>	X <sub>13</sub>	X <sub>21</sub>	X <sub>22</sub>	X <sub>23</sub>	X <sub>24</sub>
X <sub>11</sub>	1	5	5	3	7	3	7
X <sub>12</sub>	1/5	1	1	1/3	3	1/3	3
X <sub>13</sub>	1/5	1	1	1/3	3	1/3	3
X <sub>21</sub>	1/3	3	3	1	5	1	5
X <sub>22</sub>	1/7	1/3	1/3	1/3	1	1/5	1
X <sub>23</sub>	1/3	3	3	1	5	1	5
X <sub>24</sub>	1/7	1/3	1/3	1/5	1	1/5	1

### 5.4 Consistency check

The maximum characteristic root is 7.181309115185172.

CI=0.030218185864195373, CR=0.02221925431190836

The weights are in following Table 5.4.

Table 5.4 Weight value of the factor

Factors	Geometric mean	Weights
Supply Chain Stability	3.7799204226007213	0.3867436787886836
Supply Chain Management Capability	0.7945974047018523	0.0812994690610173
Supply Chain Logistics Capability	0.7945974047018523	0.0812994690610173
Market Supply and Demand	1.8529593621474292	0.1895860865424698
National policy situation	0.3493378431622096	0.03574260500217107
Monopoly degree situation	1.8529593621474292	0.1895860865424698
Other factors	0.3493378431622096	0.03574260500217107

## 5.5 Determination of appraisal value based on the revenue method

When the supply chain is stable and brings a certain percentage of revenue to the company, we consider the revenue period as infinite years and the basic formula for future revenue is:

$$V = \frac{A}{Y - g}$$

Where V—Assessed Value

A—Annual net income

Y—Compensation rate

g—Net income future period 1 is thereafter increasing at the rate g year by year long

In the case of an unstable supply chain, it is considered as a finite annual return period and the sum of the present values of the expected returns in the expected alternate years, the basic formula is

$$V = \sum_{i=1}^n \frac{A_i}{(1 + R)^i}$$

Where V—Assessed Value

$A_i$ —Net income in future year i

R—Capitalization rate

n—Number of years of future earnings available

After estimating the assessed value V, according to the weight values above there are:

$$V_0 = V = (X_{11} + X_{12} + X_{13} + X_{21} + X_{22} + X_{23} + X_{24}) \times V$$

## VI. THE CASE STUDY OF DOWNSTREAM SUPPLY CHAIN ASSET VALUATION OF LAMBERT TECHNOLOGY

### 6.1 The method of determining the evaluated object

The company's main production of passenger car air conditioning system rubber seals, Huayu Sandian, Chongqing Construction, Nanjing Aotejia and other large enterprises are the main downstream customers, these three companies in the domestic passenger car air conditioning compressor field has a high goodwill.

In this paper, we will take the example of all the rights of the downstream supply chain assets of Changzhou Lambo Seal Technology Co.

### 6.2 Background of the appraised company

Changzhou Lambo Sealing Technology Co., Ltd. was founded in 2005. JMP brand has a high reputation in the automotive industry and is a widely known brand. It belongs to a high-tech enterprise mainly engaged in the production and sales of rubber seals and rubber products.

### 6.3 Relevant information reflecting the profitability of the appraised object

From the market information, we get the following four years relevant information of the company.



Figure 6.1 Customer share chart in 2014

Table 6.1 Sales and percentage of each customer in 2014

Customer Name	Sales (million yuan)	Percentage of Sales
Shanghai Sandian Behr Automobile Air Conditioning Co.	1696.86	12.69%
Nanjing Aotea New Energy Technology Co.	1454.99	10.88%
Chongqing Construction Motorcycle Co.	1135.21	8.49%
Shanghai Yi Xin Auto Air Conditioning Parts Co.	881.61	6.59%
Suzhou Zhongcheng New Energy Technology Co.	737.27	5.51%



Figure 6.2 Customer share chart in 2015

Table 6.2 Sales and percentage of each customer in 2015

Customer Name	Sales (million yuan)	Percentage of Sales
Nanjing Aotea New Energy Technology Co.	1884.89	13.24%
Huayu Sandian Automobile Air Conditioning Co.	1495.26	10.50%
Chongqing Construction Motorcycle Co.	1032.06	7.25%
Suzhou Zhongcheng New Energy Technology Co.	928.55	6.52%

Shanghai Yi Xin Auto Air Conditioning Parts Co.	882.92	6.20%
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Figure 6.3 Customer share chart in 2016

Table 6.3 Sales and share of each customer in 2016

Customer Name	Sales (million yuan)	Percentage of Sales
Nanjing Aotea New Energy Technology Co.	2522.43	16.13%
Chongqing Construction Motorcycle Co.	1422.71	9.10%
Huayu Sandian Automobile Air Conditioning Co.	1278.72	8.18%
Suzhou Zhongcheng New Energy Technology Co.	754.88	4.83%
Liuzhou Jiajiu Automobile Brake System Co.	679.22	4.34%



Figure 6.4 Customer share chart in 2017

Table 6.4 Sales and share of each customer in 2017

Customer Name	Sales (million yuan)	Percentage of Sales
Nanjing Aotea New Energy Technology Co.	1574.04	17.41%
Suzhou Xinzhi Electromechanical Industry Co.	868.23	9.60%
Huayu Sandian Automobile Air Conditioning Co.	763.47	8.44%
Chongqing Construction Motorcycle Co.	723.04	8.00%

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Suzhou Zhongcheng New Energy Technology Co.	456.71	5.05%
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## 6.4 Evaluation Analysis

### (1) Material Organization

The assumed the base date of assets evaluation is January 1, 2021. Valuation is performed under business valuation assumptions.

Analyzed by the top 5 customers during 2014-2017: Nanjing Aotea New Energy Technology Co Ltd , Huayu Sandian Auto Air Conditioning Co Ltd (formerly Shanghai Sandian Behr Auto Air Conditioning Co Ltd), Chongqing Construction Motorcycle Co Ltd, Suzhou Zhongcheng New Energy Technology Co Ltd, these four companies have been maintaining a cooperative relationship with Lambert Technology.

Table 6.5 Sales growth rate of the four largest customers as a percentage of operating revenue

Year	Total Sales	Ratio to operating income	Growth rate over the previous year
2018	5024.34	37.57	/
2019	5340.76	37.52	-0.05
2020	5978.74	38.25	0.73
2021	3517.27	38.90	0.65

As seen from the Table 6.5, these four major customers accounted for about 37%-39% of the operating revenue during 2014-2017 and have a stable relationship with Lambert Technology. From this we treat it as an infinite annual return, so using the formula:

$$V = \frac{A}{Y - g}$$

### (2) Case calculation

Lambert Technology has generated operating income of RMB 170 million in 2018, RMB 159 million in 2019 and RMB 169 million in 2020. Based on the top four customers accounting for 38% of total sales. Sales in 2018 will be RMB 64.6 million, sales in 2019 will be RMB 60.42 million and sales in 2020 will be RMB 64.22 million.

The forecast annual return is at RMB 63.08 million with a growth rate of 0.69%, the risk-free rate of interest is 2.84% and the assumed risk rate is 4%. So the asset was obtained at an appraised value of RMB 2,933.95 million.

Based on the model developed above it can be calculated that:

Supply Chain Stability Value=  $0.386743678788683 \times 29.3395 = \text{RMB } 11.3468 \text{ Billion}$

Value of supply chain management

capabilities=  $0.0812994690610173 \times 29.3395 = \text{RMB } 2.3852 \text{ Billion}$

Value of supply chain logistics capabilities=  $0.0812994690610173 \times 29.3395 = \text{RMB } 2.3852 \text{ Billion}$

Market supply and demand situation value=  $0.189586086542469 \times 29.3395 = \text{RMB } 5.5623 \text{ Billion}$

Value of national policy situation=  $0.035742605002171 \times 29.3395 = \text{RMB } 1.0487 \text{ Billion}$

Monopoly degree situation value=  $0.189586086542469 \times 29.3395 = \text{RMB } 5.5623 \text{ Billion}$

Value of other factors=  $0.035742605002171 \times 29.3395 = \text{RMB } 1.0487 \text{ Billion}$

$V_0 = \text{RMB } 58.679 \text{ Billion}$

Therefore, the appraised value of the four major downstream supply chain assets of Lambo Technology was obtained as RMB5,867.9 million as of the base date of assets evaluation.

## VII. CONCLUSIONS

In this paper, the definition of supply chain and supply chain assets are explained and their characteristics are summarized. Some previous literature on intangible asset valuation is summarized and cited. From the basis of asset valuation, it is clarified that the supply chain assets of an enterprise should fall within the scope of intangible asset valuation. Based on the current three basic methods of asset valuation: market approach, cost approach and income approach, the valuation was conducted based on the supply chain of Lambert Technology's four major downstream customers.

Currently, there are very few cases of supply chain valuation in the market, and it is difficult to find comparable examples, so the market approach is very limited in the valuation of such intangible assets. Moreover, for the cost method, since supply chain assets are closely related to some interpersonal relationships, enterprise market position, goodwill, customer preferences, etc., the cost factors are too complicated to be considered comprehensively and difficult to be expressed in figures, which makes it difficult to use data to show the cost of supply chain assets. Therefore, the cost method is unable to make a reasonable assessment of the supply chain assets when valuing them. At this point, the income approach shows its merits, and in the supply chain assets, the income brought by the assets is directly reflected. After the introduction of the supply chain, the profit income of the enterprise grows, and the operating profit income brought by the current supply chain of the enterprise is directly reflected in the financial statement of the enterprise. At the same time, when exploring, it is found that when using the income approach to evaluate supply chain assets, the judgment of some influencing factors is more subjective, which may affect the objectivity of the evaluation, and it remains to be explored how to find an industry standard in this aspect.

Because of the late start of intangible assets in China, the research of enterprise supply chain asset value assessment is even less, and the assessment system related to enterprise supply chain assets is not yet sound, and the attention to supply chain value is not enough when it comes to enterprise value assessment, and



there are very few comparable examples in the market. This article has many shortcomings in addition to being limited by personal incompetence: First, the research process can not select a suitable comparable case, the lack of actual cases relatively lack of persuasive, can only be built on the basis of the previous theory and then studied the theory; Second, the degree of understanding of the assessment method is insufficient, many data are floating on the surface, unable to explore in depth; Third, when the value of supply chain assets is assessed through the income approach, the factors considered have not reached very perfect, and with time progresses and the industry further develops, there will be more and more influencing factors in the future, and these influencing factors have to be reconsidered each time; fourthly, many information of the enterprise is not available, and some of them are relatively old; fifthly, when the income method is adopted, the subjective influence is greater, and there may be greater errors.

With the rapid progress of the domestic asset valuation industry and the entry of a large amount of fresh blood, the asset industry is full of vitality. It is hoped that through further study and based on the research in this paper, there are three prospects: first, to systematize the methods of enterprise supply chain asset valuation; second, to further refine the application of the income approach in supply chain asset valuation; and third, to explore more and better valuation methods in depth, making it more accurate when valuing supply chain assets.

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