Evaluation of sustainable Fuel Supplier for NF Aerospace

Yu Yihang

Haaga-Helia University of Applied Sciences

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Abstract

Author(s)
Yu Yihang

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This paper focuses on the study of sustainable aviation fuel suppliers. The current market is dominated by sustainable aviation fuel (SAF). It is of great practical significance for the aviation industry to achieve the short-term goal of net zero carbon emissions, and it is also the most feasible choice for sustainable long-range flight. In the face of growing market demand, traditional energy giants are striving to produce SAFs with high quality, large scale and low cost. Many emerging energy companies are also committed to promoting the commercialization of SAFs. According to the IASC Aviation Industry Chain, Royal Dutch Shell, one of the world's largest oil traders, says its SAF production capacity will reach 2 million terts by 2025, 10 times more than the world's total production in 2019 and accounting for more than 10% of the company's jet fuel sales. Neste Energy, a Finnish company, has made an even more radical transformation, already supplying SAF to San Francisco International Airport, and with the upcoming opening of its Rotterdam plant in the Netherlands, its annual output of SAF will increase from 100,000 tons today to 1.5 million tons by 2023.

Therefore, we must realize that although there are many types of SAFs that have been certified at present, most of the preparation processes are not mature and there is still a large gap between them and the market application. Considering that the new process technology can be used to prepare higher-quality SAFs and replace the existing process in the future, there may be a large risk of uncertainty in the production of rapid deployment production lines.

Therefore, there are obvious deficiencies in the current research on suppliers in the field of sustainable aviation fuel. This topic mainly establishes a more beneficial supplier evaluation and analysis system for NF Aviation by studying the output and quality of suppliers.

Key words
New energy, aviation fuel, supply chain.

Table of contents

1 Introduction

With the acceleration of the process of economic globalization, the competition among enterprises is becoming increasingly fierce. Supply chain management has become an important means for enterprises to continuously expand their strength and win the victory in the market competition. Supplier selection is an important link to realize supply chain management. In this context, the evaluation of suppliers is getting more and more attention from enterprises. The core enterprises will continuously optimize their own supplier evaluation system according to the changes of market economy. The evaluation system established according to their own situation can make the supply chain of enterprises run more smoothly, thus improving the competitiveness of enterprises.

With the increasing competition among enterprises, the interaction between supply chains is also increasing. In order to maximize the interests of enterprises and even the entire supply chain, enterprises need to pursue the management mode of high efficiency, high efficiency and low cost so as to improve the profit space of enterprises, so more and more enterprises have put emphasis on supplier management. With the selection and evaluation of suppliers becoming more and more important, it is of great significance for enterprises to choose suppliers that are more reasonable and more in line with their own development needs to improve their comprehensive competitiveness, control cost input and guarantee operating benefits. However, there are so many suppliers to choose from in the supply chain that it is important to adopt appropriate selection methods. This paper takes NF Company as an example, combined with the actual situation, uses analytic hierarchy process (AHP) to conduct a comprehensive analysis on the selection and evaluation of NF enterprises to select high-quality suppliers and eliminate unsuitable suppliers, so as to create greater benefits.

Firstly, this paper analyzes the background and significance of the writing, discusses the research trends in recent years, the content and methods of the research, and defines the supplier evaluation under supply chain management. Then a new evaluation system is established for NF Company based on its specific situation. This evaluation system mainly includes the determination of evaluation index and its weight, the selection of evaluation methods and other steps. Finally, through the empirical analysis of the raw fuel suppliers, the selection sequence of the four alternative suppliers is determined. Based on the analysis of the specific situation of NF Company and the characteristics of sustainable fuel industry, the paper also puts forward relevant suggestions and countermeasures to the problems encountered in the process of research.

2 Research background, research purpose and research significance

2.1 Research background

In the middle and late 20th century, human history began to enter a new stage, which is the fastest developing and changing stage in history. In this stage, there are the following special points: The production-driven model was changed, and the significant increase in productivity in industrial economy led to the accumulation of material wealth in this period. Ford once declared that "Ford cars are rolling off the production line without a sales problem", reflecting the height of economic prosperity at the time. However, with the development of excess productivity, the market is gradually filled with a variety of products, the market gradually becomes saturated, competition between enterprises began to shape and gradually intensified. On the other hand, with the continuous accumulation of material wealth, buyers have more rights to speak in the market, and buyers' market is gradually formed. Economic instability is growing steadily. The continuous progress of technology makes the updating speed of products faster and faster. The shortening of the life cycle of products further tests the viability of enterprises. Without an excellent research and development team, it is difficult for enterprises to gain a foothold in market competition. In this way, the enterprise face the risk of wind also further increased. Another serious consequence of the rapid production of foreign products is the proliferation of products in the market. Consumers become more unpredictable in the face of the selective intensification of these products. The market value of the products that firms create is even harder to estimate. Because of the existence of bullwhip effect, may make the prediction of the market become worthless, which requires enterprises to strengthen the cooperation between each other to achieve the effect of mutual benefit and smart win, the use of supply chain is highlighted; The process of economic globalization is accelerating. If an enterprise wants to take the lead in the whole market, it must focus on its own expertise, which is often referred to as the "core competence of the enterprise", and realize the "win-win" of each other through the cooperation between enterprises. With the emergence of outsourcing enterprises' supply and demand relationship becomes more and more complicated, the cooperation between enterprises has become a historical trend; The popularization of information technology and its development have exerted a great influence on the reform and management of enterprises. At the same time, it also provides some technical support for supply chain management, so that the management of supply chain can be realized.

Due to the change of the macro background, the competition between enterprises has become more severe, and the competition pattern is no longer as simple as before and becomes more complex. The competition between enterprises has gradually changed into the competition between supply chains. The change of competition pattern will inevitably lead to the change of

enterprise management mode. Under the new background, the previous management model of "enterprise as the core" is no longer applicable, and then the management model of supply chain as the core is quietly emerging. Cooperation has become an important premise of supply chain management, that is, to establish a mutual coordination and complementary relationship between upstream and downstream enterprises in the supply chain, so as to maximize the benefits of the whole chain, that is, to realize the advantages of the whole body.Managers have begun to pay attention to the importance of supply chain ideas for enterprise management and conduct enterprise management based on this. The relationship between enterprises on the supply chain is different from any relationship in the past, and there is a lack of relevant constraints and no clear provisions between them. Only by finding suppliers who are willing to cooperate, can the capital flow, information flow and material flow of the enterprise be well operated, the needs of customers can be satisfied, and the interests of the enterprise can be truly maximized. According to the above reasons, the reasonable choice of suppliers determines the success or failure of further cooperation between enterprises.

On the basis of referring to the research of different scholars at home and abroad in recent years and analyzing the specific situation of enterprises, we find that NF Company's supply chain management is still relatively backward. The research significance of this paper is mainly reflected in the research on some existing problems of supply chain management of NF Company. It confirmed the necessity and urgency for the company to establish a supplier evaluation system about supply chain and established a supplier evaluation system suitable for specific conditions of NF company on the basis of thorough and active discussions with relevant personnel of the company. It can promote the selection of NF company's suppliers and its long-term development in the future.

2.2 Research purpose

By analyzing the current situation of supply chain, airlines and fuel enterprises, this paper proposes a more scientific aviation fuel supplier selection scheme to solve the key link problems of supply chain management, so as to realize low-carbon and environmental protection production and improve the decision-making accuracy of aviation enterprises. Make the airline supply chain greener and more efficient.

2.3 Research significance

The supply chain management achieved by aviation enterprises is not comprehensive and systematic. They should pay attention to how to control the overall supply chain, follow the changing trend of national policies and regulations, and realize low-carbon and environmental

protection production. As aviation fuel is a non-renewable resource, airlines should choose fuel suppliers to help aviation enterprises improve their development status through research, which has very important practical significance. In addition, the resource data of airlines and fuel enterprises are abundant, which is conducive to the in-depth analysis of this research direction. Therefore, for the study of sustainable fuel supplier selection of aviation companies under the supply chain in the procurement link, we can enrich theoretical knowledge and scientifically evaluate fuel suppliers. Based on the analysis and research of aviation enterprises' selection of fuel suppliers under the supply chain, this paper puts forward practical and scientific selection indexes, improves the evaluation indexes in this aspect, and improves the original theories, which has certain theoretical guiding significance. In addition, through the use of evaluation methods, theory and practice are combined to consolidate the theoretical foundation.

3 Literature review at home and abroad

3.1 Review of foreign literature research

Based on the analysis of supplier evaluation problem, it is found that the problem can be divided into two different directions. One of the aspects involved is the determination of the indicators involved in supplier evaluation, i.e., what are the indicators that are applicable to a specific enterprise. The other aspect is the study of the methods used in supplier evaluation, which is conducted by an earlier scholar on supplier evaluation selection. In his correlation study, he proposed an evaluation system containing 23 evaluation indicators. In the system he constructed, we can find that quality ranks the first, that is, quality is the most important factor among the 23 evaluation indicators. There are seven factors in the second place: delivery, historical performance, etc. In the third place, there are 14 factors, which include communication system and following quotation procedures, and in the fourth place, transaction arrangement, which is the least important factor in the whole index system. Since then, scholars have carried out more in-depth studies on supplier evaluation, including some breakthrough studies. The following mainly introduces some research achievements of foreign scholars on supplier evaluation.

The earliest study abroad was conducted in 1966. Dickson sorted out the survey data of purchasing managers and purchasing agents, drew 23 criteria for selecting suppliers, and ranked their importance. According to the importance of various factors, different grades were made, including very important, fairly important, moderately important, slightly important, etc. Finally, it is concluded that quality is a very important criterion for supplier evaluation. In 1999, Ahya and Kingsman used analytic hierarchy process (AHP) to try to obtain supplier evaluation criteria and their corresponding weights. However, there is little difference between their selection indicators and the selection criteria given by Dickson, from which we can find many common indicators in the selection process of suppliers.

Junyan. W took the indicators of various suppliers as fuzzy variables, established the fuzzy expected value model and the fuzzy opportunity constraint programming model, and used simulation technology and genetic algorithm to solve the model [15].

Chang et a1. The research points out that product delivery time is the most influential evaluation index in supplier evaluation.

Philipp Goebel et al. believe that in addition to considering general indicators, moral culture is an important indicator that enterprises cannot ignore when constructing supplier evaluation indicators [16].

Felix T.S. Chan and Niraj Kumar introduced risk as an important criterion for supplier evaluation on the background of evaluation and selection of global suppliers. The selection of global suppliers faces more uncertainties than that of general domestic suppliers, and special factors such as political uncertainty, geographical environment, local economic conditions and terrorism conditions must be taken into account when selecting global suppliers [17].

Lee considered the construction of supplier evaluation system from the perspectives of benefits, opportunities, costs and risks [17].

3.2 Review of domestic literature research

In the aspect of domestic supplier evaluation method research, supplier selection method research has gone through three stages of development, the first is qualitative evaluation and selection method, the second is quantitative analysis method. The third is a qualitative and quantitative evaluation method. Qualitative method mainly selects suppliers based on previous experience and relations, and its analysis of problems is relatively comprehensive, while quantitative method is more accurate and reliable. Their shortcomings lie in that the accuracy of qualitative method is inferior to that of quantitative method. Although the accuracy of quantitative method is relatively high, it is difficult to search data and ignore qualitative evaluation. However, the combination of qualitative and quantitative methods effectively combines the advantages of qualitative and quantitative evaluation, so that more and more scholars and enterprises pay attention to it. Through literature research, the basic methods commonly used to select and evaluate suppliers are as follows: just judgment method, bidding method, procurement cost comparison method, ABC cost method, analytic hierarchy process and so on. There are many problems in the selection of suppliers for Chinese enterprises: On the one hand, there are more subjective components when the enterprises choose suppliers; On the other hand, the selection criteria of suppliers are not comprehensive. At present, the selection criteria of enterprises are mostly focused on the product quality, price, flexibility, delivery punctuality, lead time and batch size of suppliers, and there is no comprehensive evaluation index system of suppliers, which cannot make a comprehensive, objective and specific evaluation of suppliers.

Qian Bibo, Cheng Yaodong and Pan Xiaohong eliminated the evaluation reference system and three-stage structured process of partner selection in agile virtual enterprises, determined the value method of weight factors based on AHP, and then adopted a method called benchmark comparison method to quantify the decision values of key factors [1].

Zhang Guilei, Liu Zhixue and Maersk believed that the ultimate goal of supplier management is to seek the maximization of interests. Therefore, whether to establish a mutual trust mechanism or

deepen information sharing between enterprises, the ultimate goal is to coordinate the reasonable distribution of economic interests between enterprises, so that both parties can obtain the maximum benefits [2].

According to Chan Wu, inventory management in supplier management is a good supply chain inventory management strategy, which contributes to the reduction of inventory costs and the improvement of corresponding capabilities of enterprises [6].

Zhou Li believes that supplier management is the general term of comprehensive management such as understanding, selection and development of suppliers, rational use and control of suppliers [7].

Chen Miaozhen believes that suppliers are at the upstream of the supply chain, which is the key for enterprises to control external resource risks and reduce operating costs. Therefore, it is very important to select the right suppliers [8].

According to Li Hengxing and Bao Yu, supplier management is to build up a reliable and stable supplier team and provide reliable supplies for the production of enterprises. Supplier management is an important part of supply chain management, not only to reduce the total cost of procurement and management costs, but more importantly to establish a long-term and stable cooperative relationship with suppliers and form a stable supply chain [9].

Huo Hong and Hua Rui believe that the selection and evaluation of suppliers is a multi-standard comprehensive decision-making process, and the most important link in supplier evaluation and selection is the selection of supplier evaluation indicators and the calculation of supplier evaluation index weight [3].

Tang Sijie believes that, in a broad sense, the selection and evaluation of suppliers is a circular development process, which includes not only the evaluation of potential new suppliers before cooperation, but also the regular or irregular evaluation of suppliers who have cooperated or are cooperating, with the purpose of promoting enterprises to provide better quality products [11].

Wang Dandan believes that China's study of supplier management in the supply chain started late. Although research and practice in related fields have improved in recent years, it is undeniable that Chinese enterprises still have some problems in the selection and evaluation of suppliers. For example, there are a series of problems such as imperfect standards for supplier selection and evaluation, incomplete collection of supplier information and lack of professional evaluation institutions [12].

Maersk believes that price, delivery lead time, batch flexibility and quality diversity are important factors to consider in the selection of supplier evaluation indicators, and puts forward four evaluation indicators, namely enterprise performance, production capacity, quality system and enterprise environment [2].

3.3 Literature review summary

Through reading a large number of literatures, this paper analyzes the research status of domestic and foreign literatures, and understands that the problem of supplier selection affects the development of enterprise supply chain. In summary, current researches on supplier selection and evaluation present the following characteristics:

1. The research object is gradually differentiated, from the original general and one-sided research to the specific industry specific supply chain type supplier research. For different types of supply chains, different evaluation criteria for supplier selection are refined, and the research in this area has been paid more and more attention.

2. Research on evaluation criteria is gradually moving towards systematic objectification, shifting from the original subjective research to diversification and comprehensive evaluation criteria. With the development of economy and the change of production and management mode, the evaluation criterion of suppliers has changed from a single cost criterion to a multi-criterion development direction such as product design, quality, inventory level, delivery time, service, flexibility, information system and environmental protection. This trend is basically consistent at home and abroad.

According to the current research status, there are abundant evaluation studies on supplier selection. In the next step, based on the current situation of NF Company and the problems encountered in supplier selection and evaluation, based on the existing literature, I will use analytic hierarchy process to analyze the problem of supplier selection of NF Company and propose solutions.

4 Research ideas and methods

4.1 Research idea and content

By analyzing the development status of aviation industry and fuel industry, and referring to the literature research results of scholars at home and abroad, the topic of this paper is determined to be the study on fuel supplier selection of aviation enterprises under the green supply chain. Based on the overall consideration of green supply chain (with aviation enterprises as the core), this paper analyzes and discusses the key link affecting the implementation of green supply chain in aviation enterprises -- fuel purchase. The specific research ideas are shown in Figure 1.1.

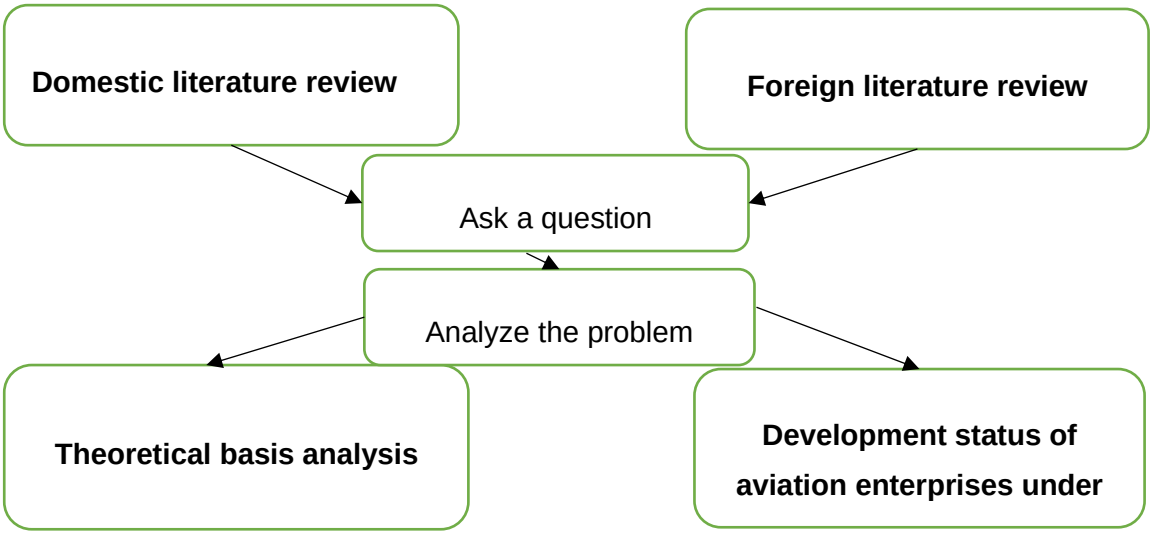

Fig.1.1 Research ideas chart

As shown in Figure 1.1, at the problem solving stage of the subject, this paper uses the methods of investigation and interview of aviation enterprises with fuel suppliers and references to relevant literature to establish evaluation indexes for aviation enterprises to select suitable sustainable fuel suppliers, quantifies the selected indexes, calculates the scores of each supplier with analytic hierarchy process, and selects the most suitable supplier. Finally, this paper takes aviation enterprises as an example to explain how aviation enterprises choose fuel suppliers under the green supply chain, and uses the data in the case to test the evaluation system, proving the scientific nature of this study.

This paper mainly involves six chapters. The first chapter is the introduction, which mainly describes the research background, significance, content, method and innovation of this paper.

The second chapter is related to supply chain theories. In this part, it mainly describes the theoretical support based on the writing process of this paper, describes the connotation of supply chain partners and cooperative relations, and summarizes the content and methods used in supplier evaluation. The third chapter is the analysis of the current situation of NF company. In this part, the general situation of NF company is introduced, including the organizational structure, main products, production status and scientific research status, the situation of NF company's suppliers and the current situation of supply chain operation. Through relevant analysis, the existing problems in supplier evaluation are found out. The fourth chapter is the determination of the evaluation system. In this part, appropriate evaluation methods, evaluation indicators and weights of related indicators are selected according to the specific situation of NF Company. The fifth part is the demonstration and analysis of raw material suppliers; The sixth part is the conclusion and prospect. Based on the analysis of the specific conditions of NF Company, the safeguard measures relied on in the process of supplier evaluation are obtained, and the prospect of this paper is put forward.

4.2 Research methods and innovation

Literature research method: In the early stage, I collected and read literatures in recent 5 years through newspapers, books and websites to understand the indicators and research methods related to supplier evaluation.

Analytic hierarchy Process (AHP) : This paper adopts the hierarchical division imperative method to make an empirical analysis of NF company. Ahp is a method combining qualitative and quantitative methods. This paper mainly uses AHP to determine index weights and evaluates alternative suppliers.

Expert scoring method: In order to verify the correctness of relevant conclusions, the method of expert scoring is adopted in this paper for relevant verification.

NF company is one of the important enterprises in the civil aviation industry in our country. This paper mainly establishes a set of evaluation system suitable for its own situation, and the analytic hierarchy process is used to verify the method, the conclusions of the paper are more persuasive. This system has reference significance for the evaluation of other aviation enterprise suppliers.

5 Supply chain related theory

5.1 Supply chain concept

The research on supply chain began in 1960s, and then scholars gradually carried out more research on it

For the study of deep engraving. That is, the research on supply chain is earlier than before, but the scholars have different understandings and perceptions of supply chain, which leads to the lack of a complete definition of supply chain even after many years of research. If we want to learn the supply chain, we must first understand the implication of supply chain. The following is mainly some authoritative understandings found in the process of supply chain learning and research. The famous American professor S t eve ns (1 9 8 9) once made the following definition of supply chain. He believed that: The main part of a supply chain is a flow that starts at the supply pass and flows along the sales channel through value-enhancing activity until the cost is reduced. According to Professor Evens (209), supply chain is a huge network formed by connecting manufacturers, suppliers, distributors and customers through two major flows of information flow and material flow. Through years of learning and accumulation, our professor Maersk (2 0 0 0) understood supply chain as: The whole economic activity involves a variety of activities carried out by suppliers, manufacturers and consumers. The suppliers supply raw materials to the travelling enterprises, and the manufacturers process the raw materials purchased into the products needed by consumers. Consumers add and buy such products so that suppliers, manufacturers, retailers, and consumers form a network through their distinct activities. In the whole network from the connection is used for information flow, material flow and capital flow. It can be seen from this that supply chain is not only information flow, capital flow, material flow, but also an incremental chain, through which enterprises can bring different economic benefits.

Our national Bureau of Quality and Technical Supervision has put forward the relevant definition of supply chain -- a network formed by enterprises in order to sell products or services to consumers during the whole production and circulation process.

On the basis of the research on the relevance of supply chain, In this paper, supply chain is regarded as a strong network of supply and demand which involves suppliers, manufacturers, wholesalers, retailers and ultimately consumers in the whole economic activity. This network is mainly dependent on the material flow, capital flow and information flow to form the flow.

5.2 Supply chain based partnership

Supply chain partners mainly involve five types of participants: suppliers, manufacturers, wholesalers, retailers and customers.

Strategic partner relationship management is the most important part of supply chain management, we can regard it as the most essential part of supply chain management. With the emergence of supply chain management, people gradually realize the importance of mutual cooperation among enterprises. Japanese scholars studied the cooperative relationship between enterprises on the basis of supply chain earlier. It is generally agreed that in order to form a good supply chain management model, enterprises must change from competition to mutual benefit, mutual help, sharing important materials, information and other resources, and truly sharing benefits and risks. The independent relationship between enterprises makes the cooperation on the basis of supply chain informal, and there is no contract, which requires enterprises in the same chain should have A certain direction of cooperation. And so in this mode.Has its own unique characteristics, these characteristics mainly include the following points:

First, long-term. The partnership relationship that can be formed into a supply chain management model must be long-term. Only with long-term cooperative relationship can enterprises understand each other and form trust, and trust is one of the keys to cooperation.

Second, target consistency. Enterprises in the supply chain should be committed to key business activities to form a common goal and performance criteria;

Third, trust. In the first point, we have discussed the importance of trust. The supply chain management mechanism between enterprises requires to form a trust mechanism with enterprises.

Fourth, win-win. Supply chain management is no longer focused on maximizing the profits of a single enterprise but on the whole chain.All enterprises can maximize profits.

Fifth, interactive. Upstream and downstream enterprises should carry out a good channel to form a pattern of sharing information and solving problems together.

5.3 The content and method of supplier evaluation under supply chain condition

5.3.1 Content of supplier evaluation

In the traditional economic model, the supplier is only for the enterprise to provide the corresponding raw materials and other required goods. However, under the economic model of

supply chain management, the supplier is the starting point of supply chain management and the beginning point of capital flow and material flow of the enterprise. Supplier quality selection is an important step for suppliers to achieve competitive advantage and cooperative relationship, which is the success of supply chain management. According to the requirements of the supplier, the enterprise evaluates the supplier's product advantage, cooperation willingness, competitive advantage and other related factors, and selects the supplier suitable for the development of the enterprise on the basis of the evaluation results. Selecting suitable suppliers is a reliable guarantee for the smooth progress of enterprise procurement activities, and is also an important way for enterprises to reduce costs. In order to complete supply chain management, enterprises need to evaluate and select their suppliers, and to confirm high-quality suppliers is indispensable for enterprises to form efficient supply chain management, which is an important part of the realization of supply chain management. Only by fully recognizing the importance of supplier selection for supply chain management and selecting suppliers with competitive advantages can enterprises improve their competitive advantages.

Therefore, I have listed the content of supplier evaluation that needs to be clear.

(1) Make sure that suppliers can strictly regulate themselves according to the requirements of enterprises. Any enterprise will develop written or agreed standards for its suppliers. If the suppliers can comply with these standards, it shows that the suppliers are honest and willing to cooperate. Only such suppliers can be cooperated with.

(2) Whether the supplier has the ability to deliver products that meet the quality requirements to the enterprise on time. No matter in the traditional management mode or in the existing supply chain management mode, it is necessary for suppliers to provide the required products according to the time and quality and quantity.

(3) Whether the supplier can provide high-quality service. With the fierce competition, enterprises are looking for ways to bring added value to themselves. In the process of looking, they find that providing good service becomes

A good way, even the tertiary industry and service industry have become a new industry, good service for enterprises is one of the means to increase sales

It can improve the reputation of enterprises, form important intangible assets of enterprises, and significantly improve the value of enterprises and their products. Therefore, paying attention to the service level of the other side in the process of supplier selection can improve our satisfaction.

(4) Supplier's cost. Enterprises can achieve maximum value through differentiation and cost leadership

Dahua, cost minimization is an important factor that all enterprises must consider. Lower prices for similar products can attract more consumers, especially if there is no difference in what companies offer.

(5) The scale of suppliers. The larger the scale of the supplier, the stronger its ability to withstand risks, the more able to form a long-term and effective cooperative relationship between enterprises. Especially in the case of intensifying competition between enterprises, enterprises want to

To form a long-term stable cooperative relationship, the size of the scale is also an important evaluation criteria.

(6) Supplier flexibility. The so-called flexibility means that the enterprise can quickly, dynamically and flexibly respond to the market

The ability to change. It is mainly reflected in the effective integration of enterprise technology, organization and personnel. Flexibility is one of the bases of supply chain management and an important factor of supplier evaluation.

(7) The informationization degree of suppliers. An effective technical support for the realization of supply chain management is good information level, and the information level of suppliers is also a factor that must be considered in supply chain management.

5.3.2 Methods of supplier evaluation

A large number of different kinds of methods have emerged with the continuous research on supplier evaluation methods, yes

These methods can be roughly divided into three categories: the first type is qualitative analysis method, in the definite method we find more common two methods are bid method and intuitive judgment method. This kind of method mainly depends on the experience of the evaluator, which is highly subjective, which leads to the fragmentation and inaccuracy of the evaluation results. This method is mainly applicable to suppliers in all aspects of the difference, can be very intuitive to find the difference between each other, because of this to say that the application of this method is very narrow. The application in practice is not very extensive, mainly small enterprises use. The second type is fixed quantity analysis method, among which DEA analysis method and cost analysis method are more common. The main advantage of DEA analysis method is that it can deeply analyze the advantages and disadvantages of suppliers. Full control of supplier status. In this way,

although the existing suppliers have many disadvantages, they are chosen because of some significant advantages. However, such suppliers may not be suitable for the enterprise in the end. The other method is cost analysis, because the index is limited to the cost and neglects some other important indicators in the evaluation, so that the evaluation result is too superficial. Class H is a combination of deterministic and quantitative methods, among which hierarchical analysis method is commonly used. In this method, deterministic and quantitative factors are considered at the same time. Fuzzy hierarchical analysis is one of the more common methods, which is more applicable because of the comprehensiveness of the test index.

There are more and more kinds of methods used in supplier evaluation and selection questions. Looking through the research in recent years, this paper mainly introduces several common methods.

(1) Cost method

Cost method mainly includes cost ratio method and AB and C cost method. Cost ratio method is mainly used to calculate the total cost of the items related to cost. Its basic idea is to determine the supplier by calculating the ratio of different items to the total cost. AB and C cost method is to calculate the ratio of different elements to the total cost to distinguish different elements according to the size of the specific weight, and conduct classified management on them. Among them, class A elements are the elements that need to be managed by enterprises, and class B is the more important element. Class C elements are those that require only general management. When selecting suppliers, the cost method needs to collect the detailed cost materials of suppliers, and the workload ratio is large, and the data is not easy to obtain. The faceted nature of costing has been discussed above. In today's competitive landscape increasingly complex macro view back to consider the quality of the acquisition of materials, delivery accuracy, willingness to cooperate and other factors, that is, after comprehensive consideration of various factors to determine the appropriate supplier for the specific situation.

(2) Bidding method

Bidding method is also one of our more common selection methods, this method is more suitable for the procurement of raw materials. First of all, the enterprise should list its own conditions on the official website or by invitation. The bidding suppliers should compete with each other. By comparing the conditions of different suppliers, the enterprise selects the suppliers suitable for its own situation, and determines the bid after selecting the appropriate suppliers. Eventually the company will choose the best supplier and sign a sale agreement with it.

(3) Artificial neural network method

Artificial warp network model was established by two scholars in the 1940s, and it was not until the 1980s that this method developed its flying speed. The main inspiration for its construction is to come from the network of the moving objects, including their various feelings and different actions, and then to rationalize the different information. The best processing of the information available is supported by a complex system, and is achieved by dealing with the relationships between different elements in the system. The first step of the method is to carry out a detailed analysis of the input and output data, and to sum up the correlation between the output data and the rules. New data can be obtained by re-entering the new data according to the conclusion of the file file. The method of artificial neural network is mainly through the summary analysis of the previous data, and then through the simulation process to obtain new output data, and finally reach the goal of supplier evaluation. The model established according to the method is very scientific and relies on the computer for data processing, but this method and the way of human thinking is still very much out of the way and may be very different from the enterprise's own situation.

(4) Data envelopment analysis

The data envelopment analysis method was put forward by two American operation researchers in the 1970s. This method is mainly used to solve the non-parametric production problem with more input and output. Data envelopment analysis has one

A characteristic that is not always apparent is the strong systematism. In the evaluation and selection of suppliers, it is necessary to change the criteria based on the selection into a variable that is easy to calculate. Then, a related model is constructed, and the data related to the variable is input. Finally, we can obtain the final evaluation value of each supplier. This final value is a number of relative efficiency between suppliers, and can determine the most suitable for the enterprise's own suppliers. By applying the mathematical model, we can solve the price selection question of suppliers with multi-data characteristics through this method. Through this method, enterprises can be freed from the heavy calculation process and concentrate on the evaluation of output indicators. Among all the evaluation methods, this method is relatively simple and quick.

(5) Fuzzy hierarchical analysis

Fuzzy hierarchical analysis is a new method which combines hierarchical analysis with fuzzy comprehensive evaluation

Method. Because it is a combination of two methods, this method has the characteristics of hierarchical analysis and fuzzy comprehensive evaluation. The analytic hierarchy Process itself is a typical analysis method integrating deterministic and deterministic analysis. In the process of application, this method can be used to mathematize the thinking process of complex hybrid systems, and

also to numerically treat the differences between different elements. By the property of being above. This method is more suitable for the evaluation of complex complex systems with strong fuzziness.

With the continuous research and in-depth study of the supplier evaluation methods, a large number of evaluation methods have been studied. However, each method has its own advantages and disadvantages. It is very important to choose the supplier selection method suitable for different situations, which is related to the accuracy of the evaluation of suppliers, and also related to the survival of the enterprise and the competitive position of the enterprise in the whole market.

6 Analysis of the current situation of NF Airlines

6.1 An overview of NF Aviation

Founded in 1995, China Southern Airlines is one of the first private airlines operating in the Chinese mainland and headquartered in Guangzhou, Guangdong province. China Southern Airlines is a major carrier in China, providing domestic and international flights with a global route network and a large fleet. China Southern is a member of the SkyTeam Alliance, which works with airlines around the world to provide better service.

China Southern's fleet size has been expanding year by year, and now it has more than 800 aircraft including Boeing 737, 747, 777, 787, Airbus A320, A330, etc., making it the second largest airline in China. China Southern has a network of routes to major cities around the world and, in addition to domestic routes, offers international services to Asia, Europe, Australia, Africa and North America. China Southern's on-time performance has been maintained at a high level.

China Southern Airlines has always been committed to sustainable development, promoting the aviation industry towards environmental protection and sustainable development. In terms of sustainable development, China Southern Airlines has taken a number of measures, such as using sustainable aviation fuel, optimizing flight routes, adopting energy-saving and environmental protection technologies, waste treatment and recycling. China Southern is also one of the first airlines in China to receive the "green airline" certification.

China Southern Airlines has been widely recognized for its quality of service and customer satisfaction. China Southern Airlines' service standards, equipment and facilities are constantly upgraded to provide more comfortable and convenient services. China Southern has also launched a number of innovative products and services, such as the "Pearl membership" program, wireless network and online check-in, to meet the needs of different customers.

In general, China Southern Airlines is one of the major airlines in China, with a large fleet size and a global route network. It is committed to promoting the sustainable development of the aviation industry and providing high-quality service, which has won wide customer recognition and support.

In addition to the above overview and development status, China Southern Airlines also has some noteworthy characteristics and achievements:

1. Efficient management team: The management team of China Southern Airlines has rich experience in the aviation industry and management, focuses on innovation and change, and is

committed to improving the efficiency and competitiveness of the company. China Southern's efficient management team is an important guarantee for the company's successful development.

2. Excellent service brand: China Southern Airlines has been committed to providing high-quality services to meet customers' needs and expectations. China Southern Airlines has launched a number of innovative products and services, such as the "Pearl membership" program, wireless network, online check-in, etc., to provide more comfortable and convenient services. The service brand of China Southern Airlines has occupied an important position in China's aviation industry.

3. High sense of social responsibility: China Southern Airlines has been committed to fulfilling its corporate social responsibility and actively promoting sustainable development and environmental protection. China Southern Airlines focuses on energy conservation, emission reduction and environmental protection in procurement, production and operation, and strives to reduce the company's impact on the environment. China Southern Airlines also actively participates in public welfare and social innovation projects, making positive contributions to society.

4. Advanced technology and equipment: China Southern Airlines has advanced technology and equipment. China Southern's fleet is constantly updated with the latest models of aircraft and engine technology to improve safety and efficiency. China Southern Airlines also promotes the use of electronic technologies, such as self-service check-in and wireless networks, to improve service efficiency and convenience.

In general, China Southern Airlines is an airline with rich experience and quality service brand. It focuses on sustainable development and social responsibility, and is committed to providing more environmentally friendly, comfortable and convenient aviation services. China Southern Airlines occupies an important position in both the Chinese aviation industry and the international aviation industry, becoming a model of China's private airlines.

6.2 NF Aviation's supplier situation analysis

China Southern Airlines (" China Southern ") took delivery of its 14th A350 aircraft at the Airbus Tianjin Delivery Center on Oct 21, 2022, marking the first delivery flight on a wide-body aircraft using sustainable aviation fuel "made in China" (" SAF ").

In 2019, China Southern received an A320neo aircraft from Airbus headquarters in Toulouse, France, for its first delivery flight using SAF fuel, becoming the first Chinese airline to achieve SAF fuel delivery flight using Airbus aircraft[18].

This time, China Southern Airlines joined hands with Airbus again. The SAF fuel delivered for the flight was produced by Sinopec Zhenhai Refining and Chemical Plant using waste food and beverage oil as raw materials and oil hydrogenation (HEFA) technology with independent intellectual property rights. It is the first batch of domestic SAF fuel after the large-scale production of China's first set of sustainable aviation fuel industrial units.

SAF fuel is an alternative fuel produced in a sustainable way using waste animal and plant fats, oils, municipal household waste and agricultural and forestry wastes as raw materials. Compared with traditional fossil fuels, SAF fuel can reduce carbon emission by up to 85% in the whole process from raw material collection to end-user use, which is of great significance for promoting the low-carbon development of aviation industry.

In recent years, China Southern Airlines has been trying to explore new plans for green development, accelerate the building of the responsible brand of "green flight", advocate the concept of "green, harmonious and innovative", and gradually form a new green development mode from the air to the ground, from the field to the off-site, from operation to management, with aircraft energy saving and carbon reduction, reducing ground energy consumption, passengers' green behavior. During the 14th Five-Year Plan period, China Southern will improve the standard system of green operation and management, optimize the measures of aircraft weight reduction and fuel saving, strengthen the reserve of environmental protection and energy saving technologies, promote the utilization of recyclable resources, cooperate with aircraft engine manufacturers and bio-jet fuel manufacturers, jointly promote the application of clean energy, and continue to reduce ton-kilometer fuel consumption and carbon emissions.

By the end of September 2022, China Southern was operating a total of 368 Airbus aircraft, including 13 A350 aircraft. With the latest aerodynamic design, the Airbus A350 aircraft can reduce fuel consumption and CO2 emissions by up to 25%, providing unrivalled operational efficiency and playing a vital role in the sustainable development of the aviation industry[19].

6.3 NF Airlines supplier operation status and existing problems evaluation

NF Aviation's main fuel suppliers are currently China Aviation Oil Corporation and Sinopec Zhenhai Refinery.

In a world where the coronavirus pandemic has profoundly changed the aviation industry, it also offers the best opportunity for airlines to tackle climate change and achieve zero-carbon flying. Sustainable aviation fuel (SAF) will be the key to zero-carbon flight strategy [20].

In the long run, the aviation industry is likely to experience structural changes in terms of demand and industry consolidation. These changes could create a great opportunity for the aviation industry to build a low-carbon future, and for airlines to break out of the decarbonisation trap.

The global airline industry has done a remarkable job of improving fuel efficiency: fuel consumption per passenger kilometre has halved since 1990, according to the International Air Transport Association. The current demand crisis has given airlines that have long wanted to make changes, emphasizing fuel efficiency while retiring older, more fuel-efficient aircraft (read: 5 Questions Facing Airline Executives). Younger fleets and better fuel efficiency are important for decarbonisation, but in fast-growing markets, increases can easily outweigh reductions in stock. Carbon offsetting is a more promising area, serving as a bridge to the industry-wide action needed to gradually reduce its own emissions. The only alternative to transforming aviation and aligning the industry's growth ambitions with the Paris climate targets is sustainable aviation fuel. Compared with fossil fuels, it can reduce carbon emissions by 70 percent or even close to 100 percent.

While sustainable aviation fuel is currently overpriced and in short supply, airline management should see it as a promising candidate for decarbonisation. To accelerate this approach, airlines can increase their use through targeted investments and procurement while reducing costs (SAFs currently account for less than 1% of total global aviation fuel consumption).

The global aviation industry has taken many steps to deal with rising emissions. In 2009, the industry set ambitious targets, including carbon-neutral growth from 2020 and cutting net emissions by half of 2005 levels by 2050.

The Chinese government has set the ambitious goal of reaching the carbon peak by 2030 and becoming carbon neutral by 2060. Major enterprises in the aviation industry are central state-owned enterprises. Realizing zero-carbon flight is not only the need of their own reform, but also the opportunity of The Times to undertake the national mission and create social value.

To achieve the UN's Intergovernmental Panel on Climate Change recommendation that all industries, companies and countries should limit global warming to 1.5°C over pre-industrial levels, The transportation sector, including airlines, is facing more pressure. A set of McKinsey scenarios for achieving the 1.5°C target shows that aviation emissions are projected to need to be reduced by 18-35 per cent by 2030.

So to reconcile emissions reduction targets with economic benefits, airlines now have to switch to more fuel-efficient fuels.

The traditional fuels of the past have been gradually replaced by the sustainable aviation fuels of today. So NF Aviation is also pursuing new fuel supplies. According to the information at my disposal, China Southern Airlines' use of Sustainable Aviation Fuel (SAF) was zero at the end of 2021. However, China Southern Airlines has begun to explore and practice the use of sustainable aviation fuel, and has developed related sustainable development strategies and action plans. China Southern plans to increase its use of sustainable aviation fuel to about 2 percent by 2025 and 5 percent by 2035. At the same time, China Southern Airlines is actively carrying out research and cooperation related to sustainable aviation fuel. These efforts will help reduce China Southern's carbon emissions and promote the sustainable development of the aviation industry.

7 Determination of evaluation system

7.1 Analytic hierarchy process

Through the previous analysis of the total junction, it is found that the main use of H types of methods in the process of supplier evaluation, namely, the fixed method, the fixed quantity method and the combination of the two methods. In the following article, we will evaluate the alternative suppliers of Company A through a combination of deterministic and deterministic methods, and the analytic hierarchy process (AHP) is adopted. Because there are two methods in the set, the hierarchical analysis method has the advantages of these two methods. It can not only reach the objectivity of evaluation, but also fully consider various factors to achieve comprehensiveness when constructing the evaluation matrix.

Hierarchical analysis method was first proposed and used in the early 1900s. This method combined the special points of qualitative analysis and qualitative analysis, which could systematize the whole decision-making process and quantize the subjective factors involved in decision making. Assign weights to different evaluation indicators to ensure the consistency of thinking in the decision-making process. Therefore, the theory is applicable to the complicated questions involved and the large influence of human factors [21].

The main purpose of the hierarchical analysis method is to deal with the thought process numerically and systemically, which makes the correlative research easier. Analytic hierarchy process (AHP) has low requirements on data, but it requires decision-makers to have a clear grasp of the factors involved in the research problem and their relationships. The analytic hierarchy process (AHP) can process the different factors involved in the hierarchy and form different levels by ranking them from high to low according to the membership relationship. The corresponding weight can be determined by ppair comparison between the elements at the same level.

7.2 Evaluation index and weight determination

The first step of the hierarchical analysis is to determine the hierarchical structure diagram, so that the problem to be solved can be hierarchical, and it looks more organized. Every element can be found in the hierarchical composition. Elements are dominant, and the elements with the same genus form a layer. The elements in the middle layer not only dominate the elements in the next level, but also are dominated by the upper level at the same time. In other words, there is a relationship between the levels of domination and being dominated. According to the position of the element in the hierarchy, we can divide the level into three types: the top level, which is the top one

Layer, is the target layer that needs to make smart decision questions, this layer has a special point is only one element; The middle layer is also called criterion layer, which actually includes criterion layer and sub-criterion layer. The bottom layer, the bottom layer is used to solve the problem depends on the various measures.

(2) Construct judgment matrix Judgment matrix refers to the importance of elements under the control of the same upper element relative to other elements in the same level. This comparison of importance is often expressed on a scale. Scale is a kind of quantitative expression reflecting people's consciousness by quantifying people's qualitative judgment. Up to now, people have established more than ten kinds of scaling methods, such as 0-2 H scaling method, five scaling method, exponential scaling method and 1-9 scaling method. Different scales have advantages and disadvantages, but the specific need to select which scale mainly needs to be combined with specific questions. The 1-9 scale will be used in this paper.

Table 7.2 Comparison scale table

Scale	Scale 1-9
Equal importance	1
Slightly more important	3
Obviously of great importance	5
Great importance	7
Extremely important	9
The above two judge the corresponding value of the intermediate state	2、4、6、8

The first is the calculation of weights. The determination of moment matrix is carried out by comparing the importance of indicators with each other

The result of averaging. There are many methods to assign weight to each element in the judgment matrix, including sum-product method, eigenvalue method, column and inverse method, etc. The eigenvalue method is extremely simple to operate, the main thing is to find every one

The largest feature value in row or each column, W is used as the basis for element normalization processing. However, due to the simplification of data processing, the data processing may not meet the standard of consistency test after data processing, making the data processing invalid. In addition, let's introduce the sum-product method. The sum-product method is not comprehensive when considering the judgment moment matrix, but only considers the middle of it

A row or column, because the accuracy of this calculation is not very far apart. The second is consistency checking. Analytic hierarchy process is essentially a quantitative processing of expert Jiang's thinking process.

However, due to the complexity of the object itself and the ambiguity of the artificial decision, the decision matrix will deviate

Consistency, so that the decision result deviation. In order to solve the above questions, we need to introduce the consistency ratio into the analytic hierarchy process, so as to ensure the rationality of judgment on objective things. In the consistency ratio, it is generally believed that when C. R. < 0. When 1, it is acceptable to judge the consistency of the moment matrix.

$$C.R=C.I./\ R.I.$$

In this formula, C. I. And R.I. Are used to represent consistency and random consistency indicators respectively.

$$C.I.=(\ \lambda max-n)/(n-1)$$

$$R.I.=1.98(n-2)/n$$

Judging moment matrix is one of the most important components in all steps of hierarchical analysis and is the basic basis for determining the importance of factors. The membership degree of the elements between the upper and lower levels is determined with the construction of the judgment matrix and evaluation model

Come out. The elements at a certain level of the model are compared with the elements at the next level to form the judgment matrix. The mode of decision matrix is as follows:

Table 7.3 Mode of judgment matrix

C0	C1	C2	C3	…	Cn
C1	C11	C12	C13	…	C1n
C2	C21	C22	C23	…	C2n
C3	C31	C32	C33	…	C3n
…	…	…	…	…	…
Cn	Cn1	Cn2	Cn3		Cnn

Through calculating weights with the data analysis group on the Internet, the calculated weights of the first index and the second index are obtained:

Table 7.4 Calculation of first-order index weight

	Product competitive advantage	Supplier internal advantage	Supplier cooperation ability	weight
Product competitive advantage	1	3	5	0.6
Supplier internal advantage	1/3	1	2	0.26
Supplier cooperation ability	1/5	1/2	1	0.14

Table 7.5 Calculation of secondary index weight(1)

	Product acceptance rate	Relative price level	Just-in-time delivery capacity	flexibility	Relative weight
Product acceptance rate	1	1	1	3	0.3
Relative price level	1	1	1	3	0.3
Just-in-time delivery capacity	1	1	1	3	0.3
flexibility	1/3	1/3	1/3	1	0.1

Table 7.6 Calculation of secondary index weight(2)

	Financial position	Human resources situation	Service level	Relative weight
Financial position	1	1	2	0.4
Human resources situation	1	1	2	0.4
Service level	1/2	1/2	1/2	0.2

Table 7.7 Calculation of secondary index weight(3)

	Corporate culture	Development strategy	Enterprise information sharing degree	Relative weight
Corporate culture	1	1	1	0.33
Development strategy	1	1	1	0.33
Enterprise information sharing degree	1	1	1	0.33

8 Argumentation and analysis

8.1 Supplier introduction

Due to the nature of production of NF Company, the company needs a large amount of aviation fuel in operation, which accounts for more than 20% of the total cost. Therefore, I take the four major aviation fuel suppliers of NF Company as examples to evaluate them in this paper. The following is a brief description:

(1) SH Company is a large refining and chemical enterprise affiliated to SINOPEC Corporation. At present, the main products of this refinery include gasoline, diesel, jet fuel, liquefied petroleum gas, petrochemical products, etc.

The following are some operating conditions of Sinopec Zhenhai Refinery:

1. Production capacity: The refinery has several production lines and an annual processing capacity of 21 million tons, making it one of the largest refining and chemical enterprises in China.

2. Main products: The main products of the refinery include gasoline, diesel, jet fuel, liquefied petroleum gas, petrochemical products, etc. Among them, gasoline and diesel are the main products of the plant, accounting for the majority of its total production.

3. Technical level: Sinopec Zhenhai Refinery has adopted a number of advanced production technologies, including high efficiency and energy saving catalytic cracking technology, low temperature desulfurization technology, heavy oil gasification technology, etc., which has improved production efficiency and product quality.

4. Environmental protection measures: The refinery pays attention to environmental protection and adopts a number of environmental protection measures, including waste gas treatment, waste water treatment, solid waste treatment, etc., to reduce the pollution to the environment.

5. Economic benefits: Sinopec Zhenhai Refinery is an important part of SINOPEC. According to public data, the refinery achieved operating revenue of about 101.9 billion yuan and net profit of about 3.9 billion yuan in 2019.

In general, Sinopec Zhenhai Refinery is one of the important enterprises in China's oil refining and chemical industry. It has strong production capacity, technical level and environmental protection measures, and performs well in terms of economic benefits.

(2) HL is a state-owned enterprise of China Petroleum and Chemical Corporation, founded in 2000 and headquartered in Beijing. Cao is one of the major suppliers in China's aviation fuel market and one of the world's largest private aviation fuel companies. In general, China Aviation Oil is one of the main suppliers of China's aviation oil market, with strong production capacity, technical level and environmental protection measures, and also has a certain influence in the international market. At the same time, the company has made some achievements on the road of constantly exploring innovation and improving efficiency.

(3) HY Corporation is one of the largest energy companies in China, founded in 1982 and headquartered in Beijing. Cnooc is mainly engaged in oil and gas exploration and development, refining and chemical industry, natural gas sales and offshore engineering. In general, CNOOC is one of the important enterprises in China's energy industry, with strong production capacity, technical level and environmental protection measures, and also has a certain influence in the international market. At the same time, the company has made some achievements on the road of constantly exploring innovation and improving efficiency.

BF Company is one of the important state-owned industrial enterprises in China. It was founded in 1999 and headquartered in Beijing. Norinco is mainly engaged in the design, research and development, production and sales of aerospace, mechanical equipment, electric power equipment, rail transit and other fields. In general, northern industry is one of China's important state-owned industrial enterprises, with strong production capacity, technical level and environmental protection measures, and also has a certain influence in the international market. At the same time, the company has made some achievements on the road of constantly exploring innovation and improving efficiency.

8.2 Supplier index weight

During my internship, I collected relevant data from relevant departments and personnel, sorted out and analyzed the data to get the index weights of these four companies, as shown in the table below:

Table 8.2 Index weights of four companies

Index layer	SH company	HL company	HY company	BF company
Product acceptance rate	0.99	0.95	0.97	0.94
Relative price level	0.96	0.98	0.91	0.92
Just-in-time delivery capacity	0.96	0.95	0.98	0.99
flexibility	0.95	0.96	0.92	0.97
Financial position	0.12	0.1	0.11	0.08
Human resources situation	0.98	0.94	0.89	0.95
Service level	0.95	0.92	0.96	0.91
Corporate culture	0.98	0.96	0.99	0.94
Development strategy	0.97	0.89	0.92	0.96
Enterprise information sharing degree	0.93	0.94	0.96	0.91

8.3 Conclusion verification

The ten indicators selected are all positive indicators, that is, for the enterprise, the larger the corresponding value of the indicator is, the more beneficial it is to the enterprise. Because these ten indicators are consistent, there is no need to process related data. For the above data, the judgment moment matrix is constructed as follows:

$$U1=\begin{bmatrix} U111 & U112 & U113 & U114 \\ U121 & U122 & U123 & U124 \\ U131 & U132 & U133 & U134 \\ U141 & U142 & U143 & U144 \end{bmatrix}=\begin{bmatrix} 0.99 & 0.95 & 0.97 & 0.94 \\ 0.96 & 0.98 & 0.91 & 0.92 \\ 0.96 & 0.95 & 0.98 & 0.99 \\ 0.95 & 0.96 & 0.92 & 0.97 \end{bmatrix}$$

$$U2=\begin{bmatrix} U211 & U212 & U213 & U214 \\ U221 & U222 & U223 & U224 \\ U231 & U232 & U233 & U234 \end{bmatrix}=\begin{bmatrix} 0.21 & 0.1 & 0.11 & 0.08 \\ 0.98 & 0.94 & 0.89 & 0.95 \\ 0.95 & 0.92 & 0.96 & 0.94 \end{bmatrix}$$

$$U3=\begin{bmatrix} U311 & U312 & U313 & U314 \\ U321 & U322 & U323 & U324 \\ U331 & U332 & U333 & U334 \end{bmatrix}=\begin{bmatrix} 0.98 & 0.96 & 0.99 & 0.94 \\ 0.97 & 0.89 & 0.92 & 0.96 \\ 0.93 & 0.94 & 0.96 & 0.91 \end{bmatrix}$$

Construct the relevant weight set:

M1=[0.18 0.18 0.18 0.06]

M2=[0.104 0.104 0.052]

M3=[0.05 0.05 0.05]

Construct the evaluation set, since E=M*U

E1=M1*U1=[0.58 0.576 0.57 0.571]

E2=M2*U2=[0.1638 0.156 0.154 0.154]

E3=M3*U3=[0.144 0.1395 0.1435 0.1405]

Construct judgment matrix:

$$U=\begin{bmatrix} 0.58 & 0.576 & 0.57 & 0.571 \\ 0.1638 & 0.156 & 0.154 & 0.154 \\ 0.144 & 0.1395 & 0.1435 & 0.1405 \end{bmatrix}$$

E=M*U=[0.411 0.406 0.405 0.4023]

From the above calculation process, we can see that from the perspective of product competitive advantage, SH company has the highest evaluation value of 0.58, followed by HL Company 0.576. From the perspective of internal advantages of suppliers, SH company has the highest evaluation value of 0.1638, followed by HL Company 0.156, HY company and BF company have the same evaluation value. From the analysis of supplier cooperation ability, SH company has the highest evaluation value of 0.144, HY company is followed by 0.1435, and HL company has the worst evaluation value. SH Company is NF Company's first choice for sustainable fuel supplier based on the three selected first-level indicators.

9 Conclusion and prospect

9.1 Main conclusion

This paper mainly selects NF Company as the research object to study the selection of supplier evaluation indicators and methods under the supply chain. The traditional supplier selection method based on quality and price is no longer suitable for the supplier evaluation system under the new situation. Therefore, it is very important to establish a supplier evaluation system applicable to the specific situation of NF company for the correct selection of suppliers and the long-term development of the company. Based on the analysis of NF company, this paper constructs a set of indicators and evaluation methods which may be suitable for NF company supplier evaluation at present. I hope to offer some help to NF Company in selecting suppliers and some opinions on its supply chain development ideas, so as to maximize the benefits of the whole supply chain. Through the study of NF Company, it is found that some safeguards should be set up in supplier evaluation based on supply chain management.

To sum up, NF's fuel supplier should be one with good reputation, stability, quality assurance, reasonable price, high level of service and sustainability.

Supplier's Quality Assurance: The fuels used by NF must meet the relevant quality standards and suppliers must have a complete set of quality assurance and control procedures to ensure that the fuels they provide meet these standards.

Supplier's price: Price is a factor that every business considers, and NF is no exception. The supplier's price should be reasonable and in line with the market price.

Supplier service level: Supplier should be able to deliver fuel timely and accurately, and provide quick response and problem solving ability when NF needs help.

Supplier sustainability: NF may consider the sustainability of its fuel suppliers, including their performance in terms of environmental impact, social responsibility, etc.

To sum up, NF's supplier problems may involve quality, reliability, cost and compliance. In order to solve these problems, China Southern Airlines needs to establish an effective supplier management mechanism, including evaluation, screening, contract management and supervision, and establish a good cooperative relationship with suppliers to ensure the stability and sustainability of the supply chain.

9.2 prospect

At present, this paper only studies NF company's own supplier evaluation system and related supplier evaluation parties

Method question. The evaluation questions of suppliers are formulated on the basis of the research of multiple departments with the purchasing department as the core, and require the participation of multiple departments in the specific implementation process. With the formation of the global integrated economy, the production mode has also undergone significant changes. Only a highly efficient and agile supply chain management mode can improve the operation efficiency of the company and enhance the competitiveness of the enterprise in the market. Therefore, it is also necessary to determine the production mode and the organization structure of the company which are suitable for the supplier management under the supply chain mode. These questions are worth paying attention to in future research.

Sources

[1] Shen Tao. Research on Evaluation Index System and Method of Equipment Supplier of Y Company [D]. Shandong university, 2022. DOI: 10.27272 /, dc nki. Gshdu. 2022.002288.

[2] Qiu Guangcheng. Study on Coal Supplier Selection and Evaluation of Yunnan DG Iron and Steel Company [D]. Yunnan University of Finance and Economics,2017.

[3] Wang Xiangyu. Development prospect of sustainable aviation fuel [J]. Aerospace Power,2022(02):24-28.

[4] Zhan Tingwen, Deng Zhibin. Evaluation and countermeasures of sustainable aviation fuel development [J]. Science & Technology Innovation and Application,2019(02):151-152. (in Chinese)

[5] Guo Wei, Wang Na, Sun Gaina. Application of AHP and TOPSIS in Supplier Evaluation and Selection [J]. Journal of Xi 'an Polytechnic University, 2013,27 (1) : 93.96.

[6] Wu Chanjuan. Study on the Model of supplier Management Inventory in Chinese Enterprises [J]. Value Engineering, 2013,32 (3) : 105-106.

[7] Zhou Li. Selection and Management of Material Suppliers in Manufacturing Enterprises [J]. Think Tank Time, 2018(52): 18-19.

[8] Chen Miaozhen. Research on Supplier Selection Evaluation Based on AHP Method [J]. Economic and Trade Practice, 2016(19): 123-124.

[9] Li Hengxing, Bao Yu. Purchasing Management [M]. Beijing: Beijing Institute of Technology Press, 2014:149-151. (in Chinese)

[10] CUI Xikang, XING Ziheng, HU Xiaojia. Sustainable aviation fuel under the dual-carbon target [J]. Big Aircraft,2021(08):77-79.

[11] Liu Saiyu. Research on Supplier Evaluation System of A Company Based on Supply Chain Management [D]. Shanxi University,2015.

[12] Yu Yunyun. SN company supplier evaluation index system of optimization research [D]. Jilin university, 2022. The DOI: 10.27162 /, dc nki. Gjlin. 2022.003882.

[13] Shi Hao. XY enterprise evaluation index system of supplier selection research [D]. Beijing university of posts and telecommunications, 2021. The DOI: 10.26969 /, dc nki. Gbydu. 2021.002385.

[14] Jin Han. Evaluation and Selection of Green Suppliers Based on Fuzzy entropy-TOPSIS method [D]. Guangdong university of technology, 2019. DOI: 10.27029 /, dc nki. Ggdgu. 2019.001294.

[15] Lena L Kronemeyer,Herbert Kotzab,Martin G Moehrle. Analyzing technological competencies in the patent-based supplier portfolio: introducing an approach for supplier evaluation using semantic anchor points and similarity measurements[J]. International Journal of Operations & Production Management,202,42(11).

[16] Pelissari Renata,Duarte Leonardo Tomazeli. SMAA-Choquet-FlowSort: A novel user-preference-driven Choquet classifier applied to supplier evaluation[J]. Expert Systems With Applications, 2022207 (in Chinese).

[17] Yuan Shuailei,Liu Aijun,Li Zengxian,Yang Yun,Liu Jing,Su Yue. Supplier Evaluation Considering Green Production Based on Probabilistic Linguistic Information[J]. Energies,2022,15(19).

[18] Chinese flight uses sustainable aviation fuel for first time[J]. M2 Presswire,2022.

[19]China Southern Airlines has taken delivery of the first domestically produced sustainable aviation fuel A350.URL： http://news.carnoc.com/list/593/593585.html.Accessed: On May 16th.

[20] Zero Carbon Flying: The Green Path for Airlines.URL:https://www.mckinsey.com.cn/%e9%9b%b6%e7%a2%b3%e9%a3%9e%e8%a1%8c%ef%bc%9a%e8%88%aa%e7%a9%ba%e5%85%ac%e5%8f%b8%e7%9a%84%e7%bb%bf%e8%89%b2%e5%8f%91%e5%b1%95%e4%b9%8b%e8%b7%af/. Accessed: On May 17th.

[21] Chen Boqi and Wang Youping on the Cognitive Analysis of Analytic Hierarchy Process. Journal of Management Engineering.1997.