Vendor Selection and Order Allocation in the Locomotive Manufacturing Industry using Cloud Technology

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Abstract — Focusing on the actual purchasing demands of locomotive industry in cloud manufacturing, taking quality, price, delivery lead time and transportation cost as evaluation index, taking aggregate value minimum of evaluation indices as the objective, this paper presents a method of vendor selection and order allocation in locomotive industry in cloud manufacturing. And the genetic algorithm is proposed for the solution. The feasibility and validity of the method is proved through a numerical application. This paper provides insight into the choosing of appropriate vendors of users from locomotive industry in cloud manufacturing.

Keywords - Cloud Manufacturing; Locomotive Industry; Vendor Selection; Order Allocation

I. INTRODUCTION

As an important foundation, Motorcycle industry support the development of the national economy has the product structure, species diversity, complex complex manufacturing process with many special equipment, the production of high quality requirements, the corresponding production and material management is more complex. Material requirement of neat set of sex is one of the important conditions to ensure continuous production process, the manufacturing mode as the typical many varieties, small batch, or even single piece or according to the characteristics of the order custom-made. May arise due to the production cycle is long, the customer requirements and delivery condition, such as the change of the locomotive products production process there are many conflicts and interference, seriously affect the enterprise production process of the balanced and orderly, make full use of resources and delivery time, the general production organization mode is difficult to adapt to the requirements of the product's production and management of the locomotive industry. Emerging information technologies such as cloud computing, Internet of things and the integration of manufacturing are profoundly change the production mode of the enterprise, promote the manufacturing industry to "the size of the customization production" and "service production".

Bo-hu Li academicians in 2010 and made "cloud" [1], the related concept and theory of hope with the help of advanced information technology, expanding the concept of "software as a service" to "manufacturing as a service", to product development, production, sales in the whole life cycle of the related resources integration, support our country manufacturing industry with high added value, low cost manufacturing service standard, specification, can be Shared. Cloud CNR group has already started in 2013 manufacturing related application research, set up a group enterprise cloud manufacturing platform. Compared with the traditional manufacturing mode, because cloud manufacturing operations platform, improve the manufacturing information sharing degree of supply chain, supply chain in enterprise is no longer a production oriented activities alone, but the whole life cycle of product solution oriented enterprise collaboration, supplier management under these new features make cloud manufacturing to achieve the optimal allocation of limited resources and global business cooperation plays a more important role. At present, the related research mainly concentrated in the cloud manufacturing concept [2-6], resource virtualization and service composition [7, 8], operating mode [9, 10], etc., around the supplier management research is relatively small. Cloud manufacturing under the locomotive manufacturing industry, the author of this paper, therefore, the actual needs of purchasing and supply management, locomotive industry under the cloud manufacturing supplier selection and order allocation methods and theories.

II. CLOUD MANUFACTURING UNDER THE CHARACTERISTICS OF THE MOTORCYCLE INDUSTRY SUPPLIER SELECTION AND ORDER ALLOCATION

A. Literature Review

The generation of cloud manufacturing mode make the supply chain produces a certain change. Cloud manufacturing supply chain under different from traditional supply chain, first of all reflected in the supply chain structure is different, Linder, Bo-hu Li [11, 12], Wu [13] and so on were studied under the cloud manufacturing supply chain structure is different, Linder, Bo-hu Li [11, 12], Wu [13] and so on were studied under the cloud manufacturing supply chain members, but are mainly including service providers and end users and cloud manufacturing platform. Cloud manufacturing under the supply chain of cloud manufacturing service platform as the core, star structure consisting of multiple service providers and users, the chain structure different from traditional supply chain. Second, li
fang [14], the expedition [15], Jin Ying [16] etc. Through the analysis of cloud manufacturing under the difference between supply chain and traditional supply chain, points out that under the cloud manufacturing supply chain more flexible, more dynamic, more professional and the characteristics of the green. Through the above analysis can find that under the cloud manufacturing supply chain and traditional supply chain, embodied in the structure of different and more flexible, dynamic, etc. Therefore, we need further study to find the specific characteristics of cloud manufacturing motorcycle industry under the supply chain.

B. Analysis of Characteristics of Cloud Manufacturing Motorcycle Industry Under The Supply Chain

Due to information asymmetry in the traditional supply chain procurement activities and only focus on the purchase directly involved in the supplier, can't understand the supplier's production capacity and equipment load situation, also don't know suppliers upstream procurement activities, only with the experience and transaction history to select suppliers, optional the gender is strong, and difficult to guarantee the product quality and delivery time material provided by the supplier's set of requirements. Under the cloud manufacturing environment, made by cloud and starting point, the concept of cloud manufacturing is intended to provide users with the lifecycle of the product manufacturing process service, when choosing locomotive products supplier, the supplier's production capacity can not only understand the link and the utilization of equipment, can also through the cloud manufacturing platform real-time understanding of other equipment and resources utilization, the link of supply chain by reasonable supplier selection and order allocation, and can guarantee the stability of the whole supply chain and production process of continuous, realize reasonable allocation of limited resources under a global perspective, so as to improve the efficiency of the whole supply chain and customer satisfaction.

Cloud manufacturing mode, a motorcycle enterprises will be outsourcing tasks to join the cloud manufacturing, locomotive industry supply chain showed the following characteristics: on the one hand, under the action of cloud manufacturing platform, according to each locomotive manufacturing enterprise's equipment use and reasonable production schedule to arrange the demand and production task, to help users choose can provide the corresponding product and meet the quality and delivery time, the appropriate suppliers. On the other hand, under the cloud manufacturing characteristics of the system is changed. Cloud manufacturing platform to the motorcycle industry in the supply chain of each enterprise and the end user open, some have professional knowledge of the user of the product can be creative and ideas as a service provided to cloud manufacturing platform, participate in the development of a product or service, such as design process, improve product quality and satisfaction of delivery.

Railway locomotive vehicle research and development, design, manufacture and repair is one of the important business scope north car group, such as locomotive manufacturing enterprise with geographical diversification, production specialization and characteristics of resource redundancy. For the member enterprises to the advantages of complementary resources and capabilities in the form of service, ability to mobilize resources and meet the demand of end user diversification personalized scattered, north car group major key products such as rail transportation equipment manufacturing as the research background, research and development and set up a group enterprise cloud manufacturing platform. Cloud manufacturing platform highly sharing and transparent information, to ensure material requirements under the premise of neat set of sex, effective help users understand the various locomotive manufacturing enterprise real-time equipment usage and production progress, not only can help the realization of the rational allocation of resources and locomotive manufacturing enterprises, the low cost, high quality and high level service in the direction of development, and can meet the needs of user customization, to achieve the optimal allocation of limited resources under a global perspective, the height of realizing the product design, manufacture and management of locomotive synergies with deep integration. Can be seen from the above analysis, cloud manufacturing motorcycle industry supplier selection and order allocation under different from the traditional supplier selection and order allocation, the key influence factors in the process of supplier selection need according to the actual situation for analysis.

III. CLOUD MANUFACTURING MOTORCYCLE INDUSTRY SUPPLIER SELECTION AND ORDER ALLOCATION UNDER THE KEY INFLUENCING FACTORS

In the locomotive under the cloud manufacturing industry in the process of supplier selection and evaluation, needs to fully consider the effect factors of the locomotive industry supplier selection, in this way can make the evaluation index of more objective, scientific and applicability. Cloud manufacturing's ultimate aim is to provide users with meet the requirements of products, and suppliers to provide the quality of the product quality is very important to the sustainable development of the user, so it must be taken into account when choosing suppliers supply product quality. Quality is to determine whether the supplier can be selected is very important factor. Cloud manufacture motorcycle industry users through the cloud platform to submit manufacturing task, since the response time is short, high requirements, delivery lead time for subsequent continuous production is critical. Cloud manufacturing service platform in accordance with user requirements to provide manufacturing services, influenced by the market, the price of manufacturing services all the time. For users, lower price means increasing returns. Visible, the price is also the important factors that affect the user to select suppliers. Due to the geographical distribution of cloud manufacturing resources and services, each supplier by order after the completion of the production to distribution, the distance between each supplier and user, and shipping costs, and occupies an important position in the total cost of the user, in order to reduce the order of users use cloud
manufacturing service platform total cost, improve the efficiency of cloud manufacturing service platform, transport costs is also affect cloud manufacturing service platform of the more important factor of the user to select suppliers. Through the above analysis, the key of the supplier selection under a cloud manufacturing industry influence factors including the quality, delivery lead time, price and transportation costs.

IV. SUPPLIER SELECTION AND ORDER ALLOCATION MODEL UNDER THE CLOUD MANUFACTURING MOTORCYCLE INDUSTRY

A. Problem Description

Cloud manufacturing, due to production needs, at a certain moment will have multiple locomotive manufacture enterprise users in the cloud manufacturing platform is put forward the request, so need to consider the influence of related factors, select more than one from many alternative suppliers to satisfy corporate users demand of suppliers, optimize the supply of materials for the users effect, improve the efficiency of supplier selection and user satisfaction.

Based on the analysis of the key factors of supplier selection, under the combination of cloud manufacturing tasks and actual characteristics of supplier selection and order allocation problem, this article selects the price (P), delivery lead time (T), quality (Q), and transportation cost (C) as the optimization goal. Among them, the price refers to the unit price of the materials, not including the shortage cost; Delivery lead time refers to accept orders to goods delivery to the length of the duration, for the user, the shorter the better, supplier to shorten the delivery lead time can reduce the inventory level of the user, and can enhance the response speed of the user to the customer demand, so as to improve the satisfaction of users; Quality refers to the degree of supplier supplies to meet user needs, here with the percent of pass; Transport costs refer to the user by the total cost of procurement of materials from suppliers to destination.

To sum up, the problem can be described as: a certain time, users in the cloud manufacturing service platform is put forward m order request of material can meet the order request suppliers have n. Different vendors each materials of put forward m order request of material can meet the order request suppliers have n. Different vendors each materials of order allocation problem, this article selects the price (P), delivery lead time (T), quality (Q), and transportation cost (C) as the optimization goal. Among them, the price refers to the unit price of the materials, not including the shortage cost; Delivery lead time refers to accept orders to goods delivery to the length of the duration, for the user, the shorter the better, supplier to shorten the delivery lead time can reduce the inventory level of the user, and can enhance the response speed of the user to the customer demand, so as to improve the satisfaction of users; Quality refers to the degree of supplier supplies to meet user needs, here with the percent of pass; Transport costs refer to the user by the total cost of procurement of materials from suppliers to destination.

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B. Assumptions

For the cloud manufacturing motorcycle industry under the specific characteristics of supplier selection and order allocation, make the following assumptions:

1) similar supplier production and processing the same type of products, in each manufacturing suppliers can purchase a variety of materials, supplies between independent each other.
2) each supplier for batch production, the batch delivery, each batch of orders for the delivery of the goods.
3) each order purchase a material.
4) transport costs shall be borne by the user.
5) consider purchasing quantity discounts, when purchasing quantity to meet the corresponding requirements, all purchase products the same discount.

C. Symbolic Meaning

- \( i \): supplier's serial number, \( i = 1, 2, ..., n \); \( n \) : the number of alternative suppliers;
- \( m \): at the same time reach the cloud manufacturing service platform of orders; \( j \): serial number, different products;
- \( j = 1, 2, ..., m \);
- \( x_{ij} \): the number of purchasing products to suppliers;
- \( P_{ij} \): suppliers, no discount products unit price; \( t_{ij} \): supplier product delivery delays the number of days; \( d_j \): discount phase sequence number, \( t = 1, 2, ..., T \); \( r_{ij} \): purchase products from supplier's delivery lead time when meet the corresponding requirements, for the first phase of the discount rate; \( d_j \): the number of product demand; \( q_{ij} \): supplier qualification rate of products; \( Q_{ij} \): the qualification rate of products can accept the lowest;
- \( y_{ij} \): get discount \( I \) from supplier \( i \).

D. Model Establishment

Under combined with cloud manufacturing enterprise supplier selection and order allocation characteristics, in the process of modeling, to the user's purchasing cost minimum, the shortest delivery lead time, minimum transportation cost and product percent of pass supreme as the objective function, at the same time guarantee the balance between supply and demand, help users choose the suppliers for the following models.

\[
\begin{align*}
\min P, & \quad \min T, \quad \max Q, \quad \min C \\
\text{s.t.} \quad & \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} p_{ij} r_{ij} y_{ij} + t_{ij} y_{ij}, \quad T = \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} t_{ij}, \\
& Q = \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} q_{ij}, \quad C = \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} c_{ij}
\end{align*}
\]

Among them, \( p_{ij} \), \( r_{ij} \), \( t_{ij} \), \( c_{ij} \) are the suppliers for price of the product, percent of pass, delivery lead time and transportation cost, \( p_{ij} \), \( t_{ij} \), \( c_{ij} \) are cost indicators, \( q_{ij} \) are profitability indicators.

\[
\sum_{i=1}^{n} \lambda_{ij} x_{ij} = d_j \quad (1)
\]
Among them, the constraint conditions of (1) each product supply is equal to the demand of this kind of product; Type (2) says the number of each supplier to provide the product does not exceed its maximum production capacity; Type (3) says that the quality of the product constraints; Type (4) to provide the number of each product suppliers shall not exceed the total amount; Type (5) phase from suppliers to obtain product up to use a discount rate; Type (6), said the decision variables values for nonnegative constraints.

Because the dimension is different, every index to eliminate its influence on the evaluation results, Zhang Lijun (2010), by comparing the proof in the linear comprehensive evaluation, subtraction consistent method, Z-Score method and poor method is more effective than other standardized methods [17]. In the literature, this paper puts forward the standardized method, the qualified rate, price, delivery lead time and transportation cost data to do the following process:

\[ X_{ij} \geq 0, \ i=1,2,\ldots, n, \ j=1,2,\ldots, m \]

(6)

A variety of constraints model.

And [Formula]

\[ \begin{align*}
X_{ij} &= \frac{X_{ij} - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \\

P &= \sum_{i=1}^{T} \sum_{j=1}^{n} \sum_{x=1}^{m} \frac{X_{ij} - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \cdot p \cdot r_{ij} \cdot Y_{ij} \\
T &= \sum_{j=1}^{n} \sum_{i=1}^{m} \frac{Y_{ij} \cdot X_{ij} - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \\
Q &= \sum_{j=1}^{n} \sum_{i=1}^{m} \frac{X_{\text{max}} - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \\
C &= \sum_{j=1}^{n} \sum_{i=1}^{m} \frac{X_{\text{max}} - X_{\text{min}}}{X_{\text{max}} - X_{\text{min}}} \\

X_{\text{max}}, X_{\text{min}} \text{ are the maximum and minimum products that supplier } i \text{ provide product } j .
\end{align*} \]

On the type of the maximum number of suppliers to provide products and minimum quantity. Because of cloud manufacturing mode, the motorcycle industry single piece and small batch and customization production mode can be invoked at any time of cloud service platform resources, closely linked to each production link, stable supply chain, material neat set of sex of the production process of continuous is critical. In this regard, industry experts accumulated experience in production and sourcing for supplier selection has important guiding significance, to the historical experience and demand characteristic, the combination of comprehensively considering the influence factors in the process of supplier selection. When choosing suppliers, in addition, different users for its quality, lead time of delivery, product price and transportation cost of different emphasis, among these factors, such as the quality and timeliness of delivery, influence each other. For combining the user's specific needs, choose the suitable suppliers, need the expert experience in supplier selection and order allocation model, the selection results closer to the actual needs of users. Consider the relationship between the influencing factors of ANP and combining qualitative and quantitative, to scientifically evaluate the influencing factors. Wang ning, the ANP method used in the automobile industry logistics service supplier selection. This article USES the ANP method, through the combination of qualitative and quantitative analysis, to determine the weight of each influence factor W1, W2, W3, W4, each target to balance, improve customer satisfaction. And converts the objective function.

\[ \min Z = w_1 \min T + w_2 \max Q + w_3 \min C + w_4 \min P. \]

V. Model solution

Probability of genetic algorithm as a global optimization algorithm, adaptive and generality, implicit parallelism and scalability of three characteristics. For objective function and constraint conditions of no clear requirements on the form can handle; You can also use flexibility on the issue of special strong heuristic algorithm, to ensure the effectiveness of the algorithm. Li shanshan (2014) using genetic algorithm to solve the order of the logistics service supply chain distribution optimization problem, and prove in time and with the solution results are superior to the LINGO software. Therefore, suitable for supplier selection and order allocation under the cloud manufacturing many varieties, many constraints model.

First, the user quality requirements of the objective function into:

\[ \min \ Q = - \sum_{j=1}^{m} \sum_{i=1}^{n} x_{ij} \cdot q_{ij} \]

Based on the above analysis, the use of genetic algorithm to solve the model of concrete steps as follows:

Step 1: input the suppliers and users to set the parameters of the data, the establishment of the optimization model, determine the population size N, mating probability for P1, the mutation probability for P2, convergence threshold for epsilon, stop the evolution algebra as a, t = 0.

Step 2: N of uniform distribution random chromosome, constitute the initial population.

Step 3: calculate the first generation of the fitness of each chromosome X_i i=1,2,...,n in a population and the average fitness \( \bar{f}(X) \). And decide whether continuous a generation have satisfied, if satisfied, then go to step 7.
Otherwise, according to calculate the fitness value, according to set standards, from the selection of N group M a chromosome, get new colony.

Step 4: on the basis of mating probability P1, the new generation of mating group, select the chromosomes, the offspring further into new groups, populations rest not mating chromosome copy directly, into a new community.

Step 5: according to the mutation probability P2, the new generation group, select the chromosome, the offspring further into new groups, populations rest not mating chromosome copy directly, into a new community.

Step 6: replace the old population with new generated population, t = t + 1, go to step 3.

Step 7: iterative process, will be the biggest fitness value of chromosome decoded output as the optimal solution.

This paper uses the Matlab optimization toolbox ga to solve solver, due to the default for the minimum in the ga solver, so the first step is to model the objective function of all into minimum value, the objective function as fitness function.

VI. EXAMPLE SIMULATION

A locomotive group has four branch joined the cloud manufacturing service platform, to control the purchase price at the same time, guarantee the quality of products. Group has four suppliers from quality, transportation costs, delivery lead time and purchasing cost, etc. a comprehensive assessment for all suppliers of qualified rate, quantity flexibility, the relative importance of factors such as transportation costs, and quantifies the qualitative values. Four suppliers offer quantity discounts, when the order number belongs to a discount range, purchase of the product are the same discount prices; Each supplier can supply at least 2 kinds of products can supply up to four. Demand for four specific products and purchase quantity as shown in table 5.1. Each supplier supply capacity for each product as shown in table 5.2 and table 5.3.

<table>
<thead>
<tr>
<th>Product</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>supplies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>demand</td>
<td>10000</td>
<td>12000</td>
<td>11000</td>
<td>8000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material1</th>
<th>Material 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>supplier 1</td>
<td>2</td>
</tr>
<tr>
<td>$q_j$ (%)</td>
<td>96</td>
</tr>
<tr>
<td>$t_j$ (day)</td>
<td>10</td>
</tr>
<tr>
<td>$c_j$</td>
<td>2</td>
</tr>
<tr>
<td>$p_j$</td>
<td>5</td>
</tr>
</tbody>
</table>

Discount rules:

<table>
<thead>
<tr>
<th>$R^1_1$</th>
<th>$R^1_2$</th>
<th>$R^1_3$</th>
<th>$R^1_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.8,2000 \leq x_j \leq 3000$</td>
<td>$1, 1 \leq x_j \leq 2000$</td>
<td>$0.85,2500 \leq x_j \leq 4000$</td>
<td>$0.8,4000 \leq x_j \leq 6000$</td>
</tr>
<tr>
<td>$0.9,3000 \leq x_j \leq 4000$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$0.85,2500 \leq x_j \leq 4000$</td>
<td>$1, 1 \leq x_j \leq 4000$</td>
</tr>
<tr>
<td>$0.9,3000 \leq x_j \leq 4000$</td>
<td>$1, 1 \leq x_j \leq 2000$</td>
<td>$1, 1 \leq x_j \leq 2000$</td>
<td>$1, 1 \leq x_j \leq 3000$</td>
</tr>
<tr>
<td>$0.89,2000 \leq x_j \leq 5000$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$1, 1 \leq x_j \leq 3000$</td>
</tr>
<tr>
<td>$0.85,4000 \leq x_j \leq 6000$</td>
<td>$0.89,2000 \leq x_j \leq 5000$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$1, 1 \leq x_j \leq 3000$</td>
</tr>
<tr>
<td>$1, 1 \leq x_j \leq 2000$</td>
<td>$0.89,2000 \leq x_j \leq 5000$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$1, 1 \leq x_j \leq 3000$</td>
</tr>
<tr>
<td>$0.85,4000 \leq x_j \leq 6000$</td>
<td>$0.89,2000 \leq x_j \leq 5000$</td>
<td>$1, 1 \leq x_j \leq 2500$</td>
<td>$1, 1 \leq x_j \leq 3000$</td>
</tr>
</tbody>
</table>
According to the result of ANP method, the product price, quality, delivery lead time of transportation cost and the importance of the weight vector for (0.1, 0.3, 0.5, 0.1). Substitution model, it is concluded that the objective function and constraint conditions are as follows.

\[
\begin{align*}
MnZ &= 0.5 \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} - x_{\min} i \quad t + 0.3 \sum_{i=1}^{n} \sum_{j=1}^{m} x_{\max} - x_{ij} i j + 0.1 \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} - x_{\min} i j + 0.1 \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} - x_{\min} i j \\
\text{s.t} \quad & \sum_{i=1}^{n} \lambda_{ij} x_{ij} = d_{j} \sum_{j=1}^{m} \lambda_{ij} x_{ij} \leq PR_{ij} \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} Q_{ij} j d j \sum_{i=1}^{n} \lambda_{ij} \leq n \sum_{j=1}^{m} y_{ij} \leq 1 \\
& x_{ij} \geq 0,i=1,2,\ldots,n, j=1,2,\ldots,m
\end{align*}
\]

Using the genetic algorithm for running parameters Settings: population size of 50,50,50,50; the four words size of 50 species group of total scale of 200; Save the best individuals for each evolution 2; Was 1.8 crossover probability, mutation probability is 0.04, terminate evolution conditions for 500 or 50 consecutive generation fitness value failed to improve. It is concluded that the objective function for 11257, the optimal purchasing strategies as shown in table 5.4.

| Table 4 A LOCOMOTIVE GROUP SUPPLIER SELECTION AND ORDER ALLOCATION |
|-----------------|---|---|---|---|
| Product supplier | 1 | 2 | 3 | 4 |
| 1 | 2975 | 4190 | 5392 | 2017 |

When change supplier evaluation index weights, the results of supplier selection and order allocation will be different. Cloud manufacturing service platform, therefore, can according to the actual needs of users, personalized choice weights of evaluation indexes, users select the suppliers and the comprehensive cost of the order allocation is minimal.

VII. Conclusion

This article from the characteristics of locomotive manufacturing industry supply chain model, analyzed the characteristics of the motorcycle industry supply chain under the cloud manufacturing and supplier selection and order allocation under cloud manufacturing and the difference between the traditional supplier selection and order allocation, on the basis of clear under the cloud manufacturing industry key influence factors of supplier selection and order allocation, considering the quality, lead time of delivery, transportation cost and purchasing cost of the four locomotive industry focus in the process of supplier selection, establishes the supply and demand balance, suppliers, production capacity and quality constraints as constraint conditions, such as quality, price, shipping costs and delivery lead time optimal for target under the cloud manufacturing of locomotive industry supplier selection and order allocation model, combined with experience of supplier selection locomotive industry and user needs, combined with the ANP method determine the factor weights, is transformed into single objective optimization model. And build the suitable characteristics of genetic algorithm to solve the model. A motorcycle group, for example, application of supplier selection and order allocation model. Studies show that the proposed locomotive industry supplier selection and order allocation model can according to user selection, formulate reasonable supplier selection and order allocation strategy, for the cloud manufacturing service platform user order decision-making to provide the reference.

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