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Study on Establishment and Improvement Strategy of Aviation Equipment

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Abstract

As a special commodity with high-tech characteristics required by national development, aviation equipment has the characteristics of confidentiality, long cycle and high risk during the production and research and development. Therefore, the supply chain of its manufacturing and research and development is the focus of national construction and development. On the basis of understanding the current development status of aviation equipment application, this paper analyzes its evaluation system and feedback basic mode through tree vector multiplication and X-0-1 determinant feedback basic mode calculation method, and puts forward corresponding improvement strategies in combination with specific contents, so as to ensure each interest subject to obtain more benefits at the same time. A new management method is proposed for the development of aviation equipment in the future.

Keywords: Differential equation; Airlines; Equipment; Supply chain; Evaluation; Improvement; Tree vector; X-ray 0-1 determinant; Aviation supply chain

AMS 2010 codes: 76U05.

1 Introduction

Understand the current situation of aviation equipment manufacturing in China, the market to develop innovative enthusiasm is not strong, relevant technical innovation of learning motivation is insufficient, and exist in the management and evaluation is not rigorous, such problems as incomplete, and did not deal with investment and benefit, scientific research and development, etc, the relationship between this will restrict the sustainable

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development of this field. Under the background of economic globalization, if China wants to occupy a major position on the world stage, it must strengthen the exploration of aviation equipment and its supply chain, and pay attention to put forward appropriate improvement countermeasures based on the research results.

2 Aviation equipment manufacturing supply chain performance evaluation system and its feedback analysis

2.1 Multiplication of tree vectors

Definition 1. Assume to enter the tree $T_i(t)$ ($i=1, \dots, n$) regard $R(t)$ as the root, and $L_{j1}(t), \dots, L_{jk}(t), \dots, L_{jm}(t)$ is regarded as the end, then the included branch vectors are all components, and will be sorted one by one according to the size of the subscript jk contained in the mid-flow potential variable $L_{jk}(t)$, and thus formed, defined as $(R_i(t), A_{ijk}(t), L_{j1}(t), \dots, (R_i(t), A_{ijk}(t), L_{jk}(t), \dots, T_i(t)$ tree vector of, $(R_i(t), A_{ijm}(t), L_{jm}(t))$, can be denoted as $(R_i(t), L_{j1} - \dots - jk - \dots - j_m(t))$.

Proof. This content will transform flow graph into vector, and can use the calculation method of advanced mathematics to deal with the vector relationship, such as determinant, matrix, etc., which can simplify the calculation process and build a more standardized processing process. Assume that using $(R_i(t), L_{j1} - \dots - jk - \dots - j_m(t))$ to indicate that all roots are $R(t)$, ending is $L_{j1}(t), \dots, L_{jk}(t), \dots$. The branch vector of LJM of T , then that means multiplication of the tree vector.

Definition 2.

$$\begin{aligned} & (R_i(t), L_{j1} - \dots - jk - 1 - jk - jk + 1 - \dots - j_m(t)) \times (R_t(t), L_{p1} - \dots - pq - 1 - pq - pq + 1 - \dots - p_n(t)) \\ & \begin{cases} = ((R_i(t), A_{ijk}(t), L_t(t), R_t(t), A_{tpq}(t), L_{pq}(t))), \\ (R_i(t), L_{j1} - jk - 1 - \dots - jk + 1 - \dots - j_m(t)), \\ (R_t(t), L_{p1} - \dots - pq - 1 - \dots - pq + 1 - \dots - p_n(t)) \\ \text{when } L_{jk}(t) \text{ is the } R_t(t) \text{ stream bit and } A_{ijk}(t) \text{ and } A_{tpq}(t) \text{ have no same variable;} \\ = 0, \text{ other} \end{cases} \end{aligned}$$

Proof. In combination with the above formula analysis, it can be seen that when the tree vector is multiplied by the tree vector, in order to make the final result not to be 0, the middle shunt of the two must be guaranteed to be the same. In other words, the tree vector long hair and nested operation are equivalent procedures.

$$\begin{aligned} \text{Definition 3. } & \begin{cases} (R_i(t), L_{j1} - \dots - jk - 1 - jk - jk + 1 - \dots - j_m(t)) \times \\ (R_t(t), L_{p1} - \dots - pf - 1 - pf - pf + 1 - \dots - pq - 1 - pq - pq + 1 - \dots - p_n(t)) \times \\ (R_r(t), L_{s1} - \dots - sd - 1 - sd - sd + 1 - \dots - s_m(t)) \end{cases} \\ & \begin{cases} = ((R_i(t), A_{ijk}(t), L_t(t), R_t(t), A_{tpq}(t), L_r(t), R_r(t), A_{rsd}(t), L_{sd}(t))), \\ (R_i(t), L_{j1} - \dots - jk - 1 - jk + 1 - \dots - j_m(t)), \\ (R_t(t), L_{p1} - \dots - pq - 1 - pq + 1 - \dots - p_n(t)), \\ (R_r(t), L_{s1} - \dots - sd - 1 - sd + 1 - \dots - s_m(t)), \\ \text{when } L_{jk}(t) \text{ and } L_{pq}(t) \text{ are streams of } R_t(t) \text{ and } R_r(t) \text{ respectively and} \\ \text{there is no same variable in } A_{ijk}(t) \text{ and } A_{tpq}(t), A_{ps}(t) \text{ and } A_{rsd}(t) \\ = (R_i(t), A_{ijk}(t), L_t(t), R_i(t), A_{tpq}(t), L_{pq}(t)), \\ (R_i(t), A_{tpf}(t), L_r(t), R_r(t), A_{rsd}(t), L_{sd}(t)), \\ (R_i(t), L_{j1} - \dots - jk - 1 - jk + 1 - \dots - j_m(t)), \\ (R_t(t), L_{p1} - \dots - pf - 1 - pf + 1 - \dots - pq - 1 - pq + 1 - p_n(t)), \\ (R_r(t), L_{s1} - \dots - sd - 1 - sd + 1 - s_u(t)), \\ \text{when } L_{jk}(t) \text{ and } L_{pf}(t) \text{ are streams of } R_t(t) \text{ and } R_r(t) \text{ respectively,} \\ \text{and there is no same variable in } A_{ijk}(t) \text{ and } A_{tpq}(t), A_{tpf}(t) \text{ and } A_{rsd}(t); \\ = 0, \text{ other.} \end{cases} \end{aligned}$$

Proof. Under the condition that the product of three tree vectors is not equal to 0, and the product of two tree vectors is also not 0, it is necessary to calculate how many flow rate variables of the first two tree vectors are contained in the third tree vector flow bit, and make clear the flow bit where one of the flow rate variables is located. In combination with the above definition formula analysis, it can be seen that in each tree vector of k ($k \geq 3$), the result obtained by multiplication among $k-1$ tree vectors will either add chain vectors or the final result will be 0. Therefore, when constructing an evaluation model of aviation equipment supply chain based on differential equations, two conditions must be considered in order to apply tree vector multiplication. On the one hand, it must be guaranteed to meet the exchange rate; on the other hand, the addition operator and distribution rate should be guaranteed in the operation process [1].

In the construction of the flow rate basic tree model system, it is assumed that the feedback basic mode $G_{ij} \dots K(t)$ includes the flow rate variables $R_i(t), R_j(t), \dots, R_k(t)$, then the vector of the feedback fundamental mode can be obtained as, where $ij \dots K$ represents the flow rate number in the fundamental mode, R subscript represents the flow rate in the feedback loop, and L subscript represents the flow rate that has not entered the feedback loop in the fundamental mode. At the same time, since all the flow rate variables must enter the feedback loop through the analysis of the above definition, the new theorem can be obtained. In r ($r = 1, 2, \dots, n$) tree vectors are multiplied by each other, this condition must be observed in order to construct the basis vector: First, tree vectors are randomly extracted

$((R_i(t), A_{ij1}(t), L_{j1}(t)), \dots, (R_i(t), A_{ijk}(t), L_{jk}(t)), \dots, (R_i(t), A_{ijm}(t), L_{jm}(t)))$, The branching vectors contained in the other r minus 1 tree vectors $(R_{jk}(t), A_{jki}(t), L_i(t))$ Or multiplied by a tree vector that treats $R_{jk}(t)$ and $L_i(t)$ as head and tail chain vectors respectively; Second, flow bits $L_{jk}(t)$ and $L_i(t)$ can be expressed as flow bits corresponding to flow rates $R_{jk}(t)$ and $R_i(t)$. At this point, $i = 1, 2, \dots, n$, and jk belongs to $(j_1, j_2, \dots, j_m)$.

2.2 X-0-1 Determinant Feedback Fundamental Mode Calculation Method

In order to further study the complex relationship between the system schema and feedback dynamics, the most important thing is to choose a simple and effective calculation method and build the corresponding feedback schema. In this paper, the X-0-1 determinant tool was selected in the research, which could not only accurately calculate all the feedback fundamental modes, but also quickly simplify the calculation steps by combining the definition and theorem proposed by tree vector multiplication above [2].

Definition 4.

$$\begin{vmatrix} X_{1,1}, 1, 1, \dots, 1, 1 \\ 0, X_{2,1}, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, X_{n,1} \\ 1, 1, 1, 1, 1, 1 \end{vmatrix}$$

The above is defined as the determinant of x-0-1, where x_i ($i = 1, 2, \dots, n$) belongs to vector form, and the corresponding calculation rule is as follows:

$$\begin{vmatrix} a_{11}, a_{12}, \dots, a_{1n} \\ a_{21}, a_{22}, \dots, a_{2n} \\ \dots, \dots, \dots, \dots \\ a_{n1}, a_{n2}, \dots, a_{nn} \end{vmatrix} = \sum_{j_1, j_2, \dots, j_n} a_{1j_1} a_{2j_2} \dots a_{nj_n}$$

And $\sum_{j_1, j_2, \dots, j_n}$ is for $J_1, J_2, \dots$ Sum of permutations of j_n . According to the above definition and column analysis, it can be known that all of them are plus sign properties, so the following theorem can be obtained.

Theorem 1. If the above determinants are as follows: $1, 2, \dots$ In order of n , the values of the two subexpressions will be the same every time. In the case of $n=1$, the above determinant is expanded according to column 1, which can be obtained:

$$\begin{vmatrix} X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix} + \begin{vmatrix} 1, 1, \dots, 1, 1 \\ X2, 1, 1, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \end{vmatrix}$$

Proof. Since all the terms after the expansion of this determinant are plus signs, swapping them does not affect the final result. By converting the last line of the to the previous line, the final line is obtained. Proof. Since all the terms after the expansion of this determinant are plus signs, swapping them does not affect the final result.

By converting the last line of the $\begin{vmatrix} X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix}$ to the previous line, the final line is obtained $\begin{vmatrix} X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix}$.

Proposition 2. If this statement is true for $n=k$ and $k \geq 1$, then we get:

$$\begin{vmatrix} Xk+1, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1 \end{vmatrix} = \begin{vmatrix} 1, 1, \dots, 1, 1 \\ Xk+1, 1, 1, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \end{vmatrix}$$

In the case where n is equal to k plus 1 $\begin{vmatrix} Xk+1, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1 \end{vmatrix}$, will expand in the first column order; then the sub-

matrix of Xk plus 1 can be expressed as $\begin{vmatrix} Xk+1, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1 \end{vmatrix}$ And the submatrix formula of 1 is $\begin{vmatrix} 1, 1, \dots, 1, 1 \\ Xk+2, 1, 1, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \end{vmatrix}$,

which proves that the equation $\begin{vmatrix} Xk+2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1 \end{vmatrix} = \begin{vmatrix} 1, 1, \dots, 1, 1 \\ Xk+2, 1, 1, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, \dots, Xn, 1 \end{vmatrix}$ is true.

Theorem 3. If the determinant is:

$$\begin{vmatrix} X1, 1, 1, \dots, 1, 1 \\ 0, X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix}$$

$$= 1 + X1 + \dots + Xn + X1X2 + \dots + X1Xn + \dots + Xn - 1Xn + X1X2X3 + \dots + Xn - 2Xn - 1Xn + \dots + X1X2X3 \dots Xn$$

The following equation can then be proved to be true:

$$\begin{vmatrix} X1, 1, 1, \dots, 1, 1 \\ 0, X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, Xn, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix} = (Xn + 1) \begin{vmatrix} X1, 1, 1, \dots, 1, 1 \\ 0, X2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, X_{n-1}, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix} = \dots$$

$$\begin{aligned}
&= (X_n + 1)(X_{n-1} + 1) \dots (X_3 + 1) \begin{vmatrix} X_1, 1, 1 \\ 0, X_2, 1 \\ 1, 1, 1 \end{vmatrix} \\
&= 1 + X_1 + \dots + X_n + X_1X_2 + \dots + X_1X_n + \dots + X_1X_2X_3 + \dots + \\
&\quad X_{n-2}X_{n-1}X_n + \dots + X_1X_2X_3 \dots X_n
\end{aligned}$$

Lemma 4. It can be seen that x_k ($k=1, 2, \dots, n$), then the determinant is exactly all of the combinations of n tree vectors. According to the definition of tree vector and theoretic analysis above, since its product is 0, it does not constitute the feedback basis module, so the result obtained by calculating this determinant is all the feedback basis modules of the subsystem. Combined with the above analysis of the theorem, it can be concluded that if the $X-0-1$ determinant is used to obtain the feedback fundamental mode of the system, it can not only obtain more calculation information, but also simplify the actual calculation steps [3].

Corollary 5. R ($R=1, 2, \dots$). The fundamental conditions for multiplying tree vectors to obtain the feedback fundamental mode are shown in the above definition, and the simple calculation steps and results using the determinant $X-0-1$ are shown as follows:

$$\begin{aligned}
&\begin{vmatrix} (R_1(t), L_2 - 6 - 7(t)), 1, 1, 1, 1, 1, 1, 1, 1 \\ 0, (R_2(t), L_1 - 3 - 8(t)), 1, 1, 1, 1, 1, 1, 1 \\ 0, 0, (R_3(t), L_4 - 7 - 3(t)), 1, 1, 1, 1, 1, 1 \\ 0, 0, 0, (R_4(t), L_3 - 5 - 3(t)), 1, 1, 1, 1, 1, 1 \\ 0, 0, 0, 0, (R_5(t), L_7 - 3(t)), 1, 1, 1, 1, 1 \\ 0, 0, 0, 0, 0, (R_6(t), L_7 - 3(t)), 1, 1, 1, 1 \\ 0, 0, 0, 0, 0, 0, (R_7(t), L_2 - 4(t)), 1, 1 \\ 0, 0, 0, 0, 0, 0, 0, (R_8(t), L_2 - 4(t)), 1 \\ 1, 1, 1, 1, 1, 1, 1, 1, 1 \end{vmatrix} \\
&= (R_2(t), L_1 - 3 - 8(t) + 1) \times (R_1(t), L_2 - 6 - 7(t) + 1) \\
&\times \begin{vmatrix} 1, 1, 1, 1, 1, 1, 1, 1 \\ (R(t), L_4 - 7 - 3(t)), 1, 1, 1, 1, 1, 1, 1 \\ 0, (R(t), L_3 - 5 - 3(t)), 1, 1, 1, 1, 1, 1 \\ 0, 0, (R(t), L_7 - 3(t)), 1, 1, 1, 1, 1, 1 \\ 0, 0, 0, (R(t), L_7 - 8(t)), 1, 1, 1, 1, 1 \\ 0, 0, 0, 0, (R(t), L_2 - 4(t)), 1, 1, 1 \\ 0, 0, 0, 0, 0, (R(t), L_2 - 4(t)), 1 \end{vmatrix}
\end{aligned}$$

Conjecture 6. At this point, there is no flow potential variable $L_1(t)$ in the expanded determinant, but the product of $(R_1(t), L_2 - 6 - 7(t))$ and the determinant is 0. Such calculation method is very convenient both in operation and in actual observation [4].

Example 7. Combined with the above definition analysis, we can finally get the method of calculating all the feedback fundamental modes, which can be divided into the following points: First, we should build the basic flow rate into the tree model; Second, we have to construct the X minus 0 minus 1 determinant. Since the flow rate obtained basically corresponds to a tree vector in all the trees in the tree model, tree vectors $(R_i(t), L_{j1}-J_2 \dots)$ can be used in calculation. $J_m(t)$ ($i=1, 2, \dots, n$) instead of X_k ($k=1, 2, \dots, n$); Thirdly, the determinant is calculated and the feedback schema of all subsystems is obtained.

Note 8. When calculating the newly added feedback fundamental mode, the element 1 in the column of x_n in the determinant of $x-0-1$ needs to be changed into the determinant of 0. The specific expression is as follows. This change is also called the 0 permutation of the determinant of $x-0-1$.

$$\begin{vmatrix} X_1, 1, 1, \dots, 1, 1 \\ 0, X_2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, X_n, 0 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix}$$

Open Problem 9. It has been clear that the flow rate is basically entered into the tree as $T_1(t), T_2(t), \dots, T_n(t)$, and the tree vector of each tree is $(R_i(t), L_{j1} - j_2 - \dots - j_m(t))$ ($i = 1, 2, \dots, n$), then the corresponding tree vector is used to replace the element X_k ($k=1, 2, \dots, n$), and finally all the newly added feedback schema can be obtained, that is $\underline{G}_n(t) = \underline{G}_{n-1}(t) \cup \underline{T}_n(t)$.

If the determinant of $x-0-1$ is $\begin{vmatrix} X_1, 1, 1, \dots, 1, 1 \\ 0, X_2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, X_n, 1 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix} = A_n$, then the 0 transpose of the determinant of $x-0-1$ is

$$\begin{vmatrix} X_1, 1, 1, \dots, 1, 1 \\ 0, X_2, 1, \dots, 1, 1 \\ \dots, \dots, \dots, \dots, \dots, \dots \\ 0, 0, 0, \dots, X_n, 0 \\ 1, 1, 1, 1, 1, 1 \end{vmatrix} = B_n$$

In this case, tree vectors are used to replace X_k ($k=1, 2, \dots, N$) and compare the two to get $B_n = A_n - A_{n-1}$. Since there is a big difference between the two, to convert the element 1 in the N th row and the N th column of the former to 0, we need to expand them separately in the N th column. In this case, the $1 \times a_{n-1}$ in A_n is going to be $0 \times a_{n-1}$, and everything else is going to be the same. Thus, the newly added feedback schema relative to and can be obtained [5].

3 Performance growth online basic model and improvement strategies

3.1 Fundamental mode analysis

Based on the study of the aviation equipment supply chain evaluation model based on differential equation, the use of the base model calculation and analysis technology, this paper studies the internal system of the feedback of dynamic change and complexity, this helps in the interaction assessment index at the same time, according to the base model analysis to deeply explore the management policy, In this way, it can solve the research problem that cannot get accurate evaluation results in the past [6].

According to the basic tree model of flow rate of current performance evaluation index system of aviation supplies supply chain, the calculation method of $X-0-1$ determinant is selected, and the minimum basic model of the system can be obtained when the tree vector determinant is constructed. Further discussion on this content can build the system performance growth ceiling schema and other feedback schema, and then conduct in-depth discussion. The specific contents are as follows:

Expression. First, construct the $x-0-1$ determinant as follows:

(1)

$R1.L2.3.4.5.13, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, R2.L2.5.6, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, R3.L1.7.8, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, R4.L3.6.8, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, R5.L1.6, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, R6.L2.7.8, 1, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, R7.L3.9.11, 1, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, R8.L1.9.13, 1, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, R9.L2.4.11.13, 1, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, 0, 0, R10.L11.12.13, 1, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, R11.L12.14, 1, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, R12.L2.10, 1, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, R13.L2.8.12, 1, 1$
 $0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, R14.L10, 1$
 $1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$

$$\begin{aligned}
&= (R1(t), L2-3-4-5-13(t))(R3(t), L1-7-8(t))+ \\
&(R2(t), L3-5-6(t))(R6(t), L2-7-8(t))+ \\
&(R4(t), L3-6-8(t))(R8(t), L4-9-13(t))+ \\
&(R3(t), L1-7-8(t))(R7(t), L3-9-11(t))+ \\
&(R8(t), L4-9-13(t))(R13(t), L2-8-12(t))+ | \\
&(R10(t), L11-12-13(t))(R12(t), L2-10(t))+ \\
&(R2(t), L3-5-6(t))(R5(t), L1-6(t))(R1(t), L2-3-4-8-13(t))+ \\
&(R9(t), L2-4-11-13(t))(R4(t), L3-6-8(t))(R8(t), L4-9-13(t))+ \\
&(R1(t), L2-3-4-8-13(t))(R2(t), L3-5-6(t))(R3(t), L1-7-8(t))+ \\
&(R10(t), L11-12-13(t))(R11(t), L12-14(t))(R12(t), L2-10(t))+ \\
&(R14(t), L10(t))(R10(t), L11-12-13(t))(R11(t), L12-14(t))+ \\
&(R9(t), L2-4-11-13(t))(R7(t), L3-9-11(t))(R3(t), L1-7-8(t))(R2(t), L3- \\
&-5-6(t)) \\
&(R9(t), L2-4-11-13(t))(R8(t), L4-9-13(t))(R3(t), L17-8(t))(R2(t), L3- \\
&-5-6(t))
\end{aligned} \tag{2}$$

By studying and analyzing this content in combination with Figure 1, it can be found that the constructed schema expresses the correlation between investment and profit. Although investment can effectively increase the production quantity, and get more benefit, but for enterprise investment will limit cost profit, thus eventually get improvement countermeasures as follows: on the one hand, the investment to yield a positive guiding role, therefore to moderate scale of investment in the development of the practice, also is the control of the scope of market capacity; On the other hand, the market can be developed in an orderly way, and the driving effect of the military industrial chain can be fully demonstrated, so as to promote the innovation and development of the industry on the basis of expanding the industrial chain.

Fig. 1 Second order minimal fundamental mode.

3.2 Improvement Strategy

According to the minimum schema obtained in the above study, based on the correct classification, the growth upper limit schema describing the variables of different behavioral agents in the aviation equipment manufacturing supply chain is constructed, and the positive role and restrictive influence of continuous improvement of performance are shown. Generally speaking, it can be divided into three types: First, the performance of the OEMs is shown in Figure 2 below; Second, the performance of component suppliers is shown in Figure 3 below. Third, the performance of the defense military industry sector is shown in Figure 4 below.

Fig. 2 OEMs performance schema.

In this paper, the production supply chain of K8 training aircraft of a certain aviation industry group is taken as a case study, and Vensim simulation software is used for simulation analysis. On the basis of understanding the development status of this enterprise group, a simulation study is conducted on the development and

Fig. 3 Component supplier performance schema.

Fig. 4 Performance Schema of Defense Military Industry Departments.

change of the main flow potential variables contained in it on the basis of establishing the equation. Combined with the above cases and the simulation results obtained, and based on the comparison of the data obtained in reality, it can be seen that the evaluation model of aviation equipment supply chain constructed based on differential equations in this paper does not deviate too much from the actual situation. Therefore, it can be seen that this evaluation model has a positive effect. Therefore, the improvement strategies for future development are proposed as follows: First, because the production efficiency of military products is extremely high, the technological innovation and development inertia of the above three products is relatively high, which will inevitably affect the value creation and benefit improvement of the whole supply chain in the practical development. Among them, the benefit of the OEMs will be affected by the orders put forward by the defense industry department, and the products of the parts suppliers are diverse, so the order has little influence on them, but it will also produce the phenomenon of profit reduction. Second, in the practical development of the three, they must increase the intensity of technology research and development and market development, especially for

parts suppliers, to guide the product production technology to market-oriented innovation, increase the attention to the civil market, so as to improve the benefits obtained from their own development. Because the technology is confidential, the main engine factory should regard the technological innovation as the main goal, pay attention to the research and development and provide more efficient and scientific aviation equipment, so as to increase the number of orders from the military industry department and expand the market scale; Third, with the improvement of aviation equipment production quality and the reduction of research and development and production cycle, it is necessary to strengthen the cooperation between customers, manufacturers and suppliers from the perspective of supply chain, which helps to lay a foundation for the future development of the industry while sharing information [7].

4 Conclusion

Definition of Air Materiel Supply Chain: Air Materiel Supply Chain refers to a whole Chain structure in which aviation materials are used and consumed through ordering, Supply, transportation, storage, supplementary Supply and other links, and finally reach the object of support (mainly aviation forces). Among them, the aviation materials supply chain is driven by the demand driving force generated by the training and combat of the support object, through the multi-level transmission of the supply (maintenance) manufacturer of aviation materials, the rear warehouse, the field station and so on, and finally the value-added process is completed by the use of the support object. To sum up, the performance evaluation of aviation equipment supply chain is a complex and systematic task, so in the practice and development, it will be affected by a number of factors and produce unnecessary contradictions. This requires players to strengthen their efforts to control at the same time, the introduction of more advanced technology software, only in this way can the master on the basis of the evaluation index, using the basic model of system dynamics to build the research analysis, and then the feedback of the complexity of the dynamic analytical, eventually get more targeted management solution.

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