Research on the Decision Method of Maintenance Materials Direct Supply

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Abstract. With the further development of civil military integration, more and more maintenance materials will be supplied by the factory directly. Aiming at the mode condition of maintenance materials factory direct supply, maintenance materials needs equipment support in the process of facing a number of direct supply manufacturers how to decision problems, using AHP, considering many factors optimization of direct supply manufacturers involved, and gives the weights of the evaluation indexes of the direct supply manufacturers to evaluate optimal. Finally, with 4 straights for the manufacturer as an example, considering the various evaluation indexes to carry out evaluation and drawing the correct evaluation of direct supply manufacturers, the best manufacturers direct supply is selected. An example shows that, AHP can provide scientific and theoretical basis to materials factory direct supply security.

1. Introduction
At present, in the maintenance equipment manufacturers direct supply mode, the introduction of multiple direct manufacturers bidding competition can achieve cost efficient and transparent purposes. The commonly used evaluation methods include the lowest quotation method, the lowest evaluation method, the approximate bottom price method, the experience evaluation method and the comprehensive score method [1]. The above methods will inevitably appear unreasonable and unfair because of the Jue factors, market supply and demand factors, time, geographical location and traffic conditions, and the units which choose maintenance equipment manufacturers' direct supply mode have some characteristics, such as emergency, decentralized and after-sale service requirements, which require the units with direct supply of manufacturers to consider more factors to complete the business process such as decision - making, cooperation intention, and the purpose of promoting the deep development of integration of defense and civilian technologies, the improvement of equipment availability rate, and the efficient and transparent use of cost [2]. This paper mainly discusses the application of the maintenance equipment manufacturers direct supply guarantee mode in the maintenance equipment direct suppliers to tender response, using the analytic hierarchy process, to optimize the direct supply manufacturers need to consider many factors, to evaluate the decision - making optimal bidding for manufacturers.
In the direct supply mode of maintenance equipment manufacturer, the user needs to feedback the maintenance equipment through the supply chain information network system to the front end of the supply chain [3]. The maintenance equipment is directly supplied by the manufacturer under the traction of the force user, and the maintenance equipment supply is guaranteed to the user. The direct supply mode of maintenance equipment manufacturer is not only a military activity, it needs scientific
management to improve military benefits, but also a complex economic activity, and has a connection with various economic factors, with the dual nature of military and economic, and is subject to the double restriction of military law and economic law [4]. Below, we briefly introduce the five indicators of precision execution rate, rapid response ability, production line flexibility, manufacturer's economic benefits and supply price stability in the optimization of maintenance equipment direct manufacturers.

2. Analytic hierarchy process
Analytic hierarchy process (AHP) decomposes the complex problem into each component, and then group these factors into an ordered hierarchical structure according to the dominant relationship. The relative importance of the factors in the hierarchy is determined by the comparative method. Finally, the overall judgment determines the order of the relative importance of the factors, namely the advantages and disadvantages of each scheme, which is the basis of the evaluation and selection scheme [5]. According to the 1-9 scale method shown in Table 1, the relative importance degree of each two evaluation indexes is determined by comparison, and then the judgment matrix is constructed [6].

| Serial number | Scale | Relative comparison |
|---------------|-------|---------------------|
| 1             | 1     | it is of equal importance |
| 2             | 3     | one factor is slightly more important than the other |
| 3             | 5     | one factor is more important than another |
| 4             | 7     | one factor is much more important than another |
| 5             | 9     | one factor is much more important than another |
| 6             | 2, 4, 6, 8 | 2, 4, 6, 8, median of the two adjacent judgments |
| 7             | Reciprocal | the inverse of the other factor is inversely proportional to the original factor |

(1) Determine the solution method. The calculation method has the root method, regularization, and so on. In this paper, the root method is used to compare the maximum characteristic root of the matrix and its corresponding feature vector w, and the feature vector w normalization is the weight value of the relevant elements of a layer on the upper layer. The formula is as follows:

(2) Consistency check. In calculating the judgment matrix, in order to measure whether the judgment matrix has the quan yi property, we introduce the average random consistency index ri of the judgment matrix, and the random mean value of the consistency index of the same order matrix, whose value is shown in Table 2.
Table 2. The value of the random consistency index RI

| Order | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
|-------|------|------|------|------|------|------|------|------|------|
| RI    | 0    | 0    | 0.57 | 0.89 | 1.11 | 1.23 | 1.31 | 1.39 | 1.44 |

The random consistency ratio Cr is the ratio of the consistency index ci to the average random consistency index ri of the same order, namely [7].

Determining the contact form between the matrix elements is shown in Table 3.

Table 3. Determining the contact form between the matrix elements

| A      | B₁    | B₂    | ...  | Bₙ    | W     |
|--------|-------|-------|------|-------|-------|
|        | b₁₁   | b₁₂   | ...  | b₁ₙ   | b₁    |
|        | b₂₁   | b₂₂   | ...  | b₂ₙ   | b₂    |
| ...    | ...   | ...   | ...  | ...   | ...   |
| Bₙ     | bₙ₁   | bₙ₂   | ...  | bₙₙ   | bₙ    |

3. Applications
The application of AHP in the direct supply mode of maintenance equipment manufacturers can effectively solve the various indicators of the advantages and disadvantages, and even the contradictions of various indicators, such as good quality but higher quotation. Therefore, in order to achieve the expected target, the equipment needs to make comprehensive evaluation of multiple direct manufacturers, and give a certain weight to each evaluation index. The following four direct manufacturers, five evaluation indicators as an example to illustrate how to apply AHP in the equipment manufacturer's direct guarantee mode.

According to the 1-9 scale method of the judgment matrix shown in table 1, the optimal direct supply manufacturers factors are compared on one item by item, and the a-b judgment matrix is shown in Table 4.

Table 4. The a-b judgment matrix

| A     | B₁   | B₂   | B₃   | B₄   | B₅   |
|-------|------|------|------|------|------|
| B₁    | 1    | 3    | 5    | 6    | 1/2  |
| B₂    | 1/3  | 1    | 3    | 4    | 1/7  |
| B₃    | 1/5  | 3    | 1    | 2    | 1/5  |
| B₄    | 1/6  | 1/4  | 1/2  | 1    | 1/8  |
| B₅    | 2    | 7    | 5    | 8    | 1    |

The values of judging matrix is shown in Table 5.
Table 5. The values of judging matrix

|   | B₁ | B₂ | B₃ | B₄ | B₅ | W |
|---|----|----|----|----|----|---|
| A₁ | 0.1 | 0.15 | 0.26 | 0.09 | 0.3 | 6 |
| C₁ | 0.1 | 0.17 | 0.22 | 0.52 | 0.1 | 0.1 |
| C₂ | 0.4 | 0.21 | 0.21 | 0.10 | 0.1 | 0.2 |
| C₃ | 0.2 | 0.48 | 0.16 | 0.30 | 0.3 | 0.2 |
| C₄ | 0.1 | 0.11 | 0.39 | 0.06 | 0.3 | 0.3 |

From Table 5, it could be found that the sort of C1, C2, C3, C4 is 4, 2, 3, 1.

4. Conclusions
In the maintenance equipment manufacturer direct supply mode, how to correctly screen out the best direct suppliers to take the direct guarantee mode of the unit to provide equipment support, to improve the comprehensive protection ability is very important. The research of evaluation system is also very important to the direct guarantee mode of the equipment manufacturers. However, it must be noted that the evaluation system of this paper has limitations, and some special interference factors have not been taken into account.

5. References
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