

# Research on Benefit Evaluation Index System of Equipment Maintenance Materials Military-Civilian Integration Support

Shunan Shen \*, Xiaodong Liu

Equipment Management and UAV Engineering, Air Force Engineering University, Xian, 710000, China

\* Corresponding author: Shunan Shen

**Abstract:** The construction of evaluation index system is a key link in the implementation of the evaluation of benefits of military-civilian integration support. On the analysis of the four stations of equipment maintenance materials civil-military integration, on the basis of military and economic benefits, this paper proposes to build four air station equipment maintenance materials civil-military integration principle and procedure of the security evaluation index system of benefit, further build the civil-military integration safeguard benefit evaluation index system, and analyze the index system of the indicators at all levels.

**Keywords:** maintenance materials; military-civilian integration; support benefit; evaluation index system

## 1. Introduction

It is necessary to study the military-civilian integration support and benefit evaluation of equipment maintenance materials to improve the support efficiency of equipment maintenance materials and the use of funds. In view of the current situation of equipment maintenance materials support, it is difficult to achieve the purpose of economy, accuracy and timeliness of equipment maintenance materials support in the four aviation stations by relying solely on military independent support. By studying the theory and method of military-civilian integration support for equipment maintenance materials and constructing an effective military-civilian integration support operation system for equipment maintenance materials, the reasonable division of labor between military forces and local forces can be carried out to make up for the shortage of military equipment support institutions such as the small number of personnel and backward means. Reduce supply links and supply time, enhance time-limited transportation and distribution capacity, improve maintenance materials support efficiency and use efficiency of funds [1].

## 2. Benefit Analysis of Military-Civilian Integration Support

### 2.1. Military Benefit Analysis

At present, there are many kinds of equipment, various types of equipment and large demand for maintenance materials. Many maintenance equipment commonly used by

the military and the civilian are independently guaranteed by the military, which brings a lot of inconvenience to the maintenance, repair and maintenance of equipment and maintenance materials. The implementation of the military-civilian integration strategy will further improve the convenience of equipment maintenance, maintenance and repair. The particularity of the military-civilian fusion support activities of equipment maintenance materials requires that improving military benefits should be the primary purpose of the military-civilian fusion support activities of equipment maintenance materials. Research, therefore, the activities of the equipment maintenance materials civil-military integration support military benefit, should focus on the goal of equipment maintenance materials civil-military integration support requirements, fully considering the equipment availability and equipment supply timeliness of equipment maintenance materials civil-military integration of military benefits, the main factors for various factors are realized and comb.

### 2.2. Economic Benefit Analysis

In the military and civilian integration support activities of equipment maintenance materials, economic benefits and military benefits are dialectically unified. Military benefit is the goal, and economic benefit should serve military benefit, but the acquisition of military benefit is also on the premise of certain investment, which requires that the military-civilian integration support activities of equipment maintenance materials must be conducive to improving economic benefit. The improvement of military efficiency depends on economic efficiency, especially in the case of shortage of military economic resources and relatively tight funds, it is not desirable to pay no attention to economic efficiency and one-sided pursuit of military efficiency [2]. Therefore, research of equipment maintenance materials civil-military integration of economic benefit, should focus on the goal of equipment maintenance materials civil-military integration support requirements, fully considering the materials inventory costs, transportation costs, such as materials influence the economic benefit of equipment maintenance materials civil-military integration support, the main factors for various factors are realized and comb.

## 3. Construction of Benefit Evaluation Index System

### 3.1. Construction Principle of Benefit Evaluation Index System

To construct the evaluation index system of military-civilian integration support benefit of equipment maintenance materials, the following principles should be followed.

#### (1) Objectivity principle

Evaluation criteria should be taken as the basic basis in the evaluation process, and objective and fair evaluation objects should be based on the essential characteristics of evaluation objects, without personal subjective assumptions. Experts must be authoritative and representative when indicators are selected, and if necessary, experts' opinions and suggestions from multiple fields should be widely consulted.

#### (2) Completeness principle

The so-called system capability is actually the result of the interaction between multiple components. Each index contains multiple aspects of the system capability, rather than considering a single index itself, and the final index should be able to cover the whole process of system capability generation.

#### (3) Normative principles

When selecting indicators within the research scope, the standard indicators related to the research object should be selected as far as possible, so that they can be popularized and used in a wider range, so as to facilitate data collection and collation in the process of processing and specific understanding of indicators.

#### (4) Operability principle

The so-called operable principle is the selection of indicators: quantitative indicators should be selected as far as possible, reduce the selection of qualitative indicators. The indexes that are easy to obtain data should be selected to the maximum extent and the indexes that are difficult to obtain data should be reduced [3].

### 3.2. Steps for the Establishment of Benefit Evaluation Index System

The specific steps of establishing the evaluation index system are as follows:

(1) Selection of experts. After practical investigation, the initial decision has been made to select 30 expert group members from military academies, aviation stations and military depots.

(2) Clear prediction problems. Only individual experts are usually consulted in the first round of forecasting. The prediction topic of this paper is "Determining the evaluation index system of military-civilian integration support benefit of equipment maintenance materials". Questionnaire questionnaire is designed and distributed to 5 experts. The inspection and improvement process of single index mainly depends on expert consultation or Delphi method verification. The overall test of indicators mainly calculates the concentration degree, dispersion degree and coordination degree of indicator layer by constructing mathematical model, and revises or removes indicators with less scores. After the first round of consultation, some of the factors were combined to adjust.

(3) Index test. 30 questionnaires were issued, 30 questions were recalled in total and 30 valid questionnaires were issued. After the questionnaires were collected, the statistical method was to calculate frequency A, which was the ratio of the number of questionnaires for each item to the total number. Due to the limitation of knowledge, there may be certain "discomfort" in the evaluation index system of military-civilian integration support benefit of equipment maintenance materials initially established, so the index should be tested. Through the test, we should not only ensure the scientific rationality of individual indicators, but also ensure that the overall association of indicators is feasible. From the perspective of system analysis and synthesis, using analysis method as the main synthesis method as the auxiliary construction criteria, in-depth analysis of the indicators of each layer, if necessary, to consult experts to summarize. The research results of scholars in related fields and local industry norms can be used as reference for the comprehensive method. After the statistical calculation results, the understanding of experts began to unify.

(4) System construction. According to the statistics of the last round, experts were further consulted and opinions were solicited. Important index values were taken as the final index to form the evaluation index system of military-civilian integration support benefit of equipment maintenance materials.

### 3.3. Primary Selection of Benefit Evaluation Indicators

Quantifiable indicators should be selected as far as possible in the initial selection of evaluation indicators, that is, indicators can be quantitatively described by specific numerical values. Through investigation and expert consultation, and combined with the characteristics of military-civilian integration support benefit evaluation of equipment maintenance materials, the initial selection of indicators in this paper is determined as follows:

The evaluation indexes affecting the military benefit of equipment maintenance and materials integration support are preliminarily determined as follows: materials timeliness, materials satisfaction rate, materials support good rate, equipment usability, equipment supportability, equipment perfect rate, a total of 6 evaluation indexes.

Affect the economic benefit of equipment maintenance materials civil-military integration support to determine the preliminary assessment indexes for: equipment financing cost, equipment backlog of inventory cost, materials loss cost, shortage of materials loss cost, materials transportation cost, materials quality problem caused by the loss, the loss caused by factory production capacity is insufficient, a total of seven evaluation indicators.

### 3.4. Benefit Evaluation Index Inspection

The following is an overall test of 6 evaluation indexes that affect the military benefits of military-civilian integration support of equipment maintenance materials and 7 evaluation indexes that affect the economic benefits of military-civilian integration support of equipment maintenance materials [4].

In the overall inspection process of the evaluation index of military-civilian integration support benefit of equipment maintenance materials, the concentration degree, dispersion degree and coordination degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials should be calculated respectively. The concentration degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials reflects the concentration degree of experts' opinions on the index. The discrete degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials reflects the discrete degree of experts' opinions on the index. In general, when the concentration degree of the benefit evaluation index of military-civilian integration support of equipment maintenance materials is larger, the dispersion degree of the benefit evaluation index is smaller. When the calculated results are inconsistent, the coordination degree value of the evaluation index of military-civilian integration support benefit of equipment maintenance materials can be used to distinguish [5].

There is a benefit evaluation index, and a total of experts participate in the evaluation of the index, then:

1) The concentration degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials is

$$\varphi_i = \frac{1}{n} \sum_{j=1}^s E_j N_{ij} \quad (i = 1, 2, \dots, m; j = 1, 2, \dots, 5)$$

Where, is the concentration degree of evaluation index of military-civilian integration support benefit of equipment maintenance materials; Is the corresponding level value of the level; The number of people determining the importance degree of benefit evaluation indexes corresponding to the grade of benefit evaluation indexes for military-civilian integration support of equipment maintenance materials; Is the judgment grade of the military-civilian integration support benefit of equipment maintenance materials (the general grade number is 5, namely, the corresponding is not

important, general, important, very important and extremely important).

2) The dispersion of the evaluation index of military-civilian integration support benefit of equipment maintenance materials is

$$\mu_i = \sqrt{\frac{1}{n-1} \sum_{j=1}^s N_{ij} (E_j - \varphi_i)^2}$$

$(i = 1, 2, \dots, m; j = 1, 2, \dots, 5)$

Where, is the dispersion of the benefit evaluation index of military-civilian integration support of equipment maintenance materials. The more concentrated the experts' judgment opinions are, the lower the value of the dispersion of the benefit evaluation index will be. The more dispersed the experts' opinions, the greater the dispersion of the evaluation index of military-civilian integration support benefit of equipment maintenance materials.

3) The coordination degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials is

$$C_i = \mu_i / \varphi_i \quad (i = 1, 2, \dots, m)$$

The greater the concentration degree and the smaller the dispersion degree of the military-civilian integration support benefit evaluation index of equipment maintenance materials, the greater the importance of the corresponding benefit evaluation index. The coordination degree of the evaluation index of military-civilian integration support benefit of equipment maintenance materials is mainly used to implement auxiliary decision-making, and the smaller the coordination degree is, the higher the importance of the benefit evaluation index is.

In the process of issuing the consultation questionnaire, experts were required to score the importance of the evaluation index of military-civilian integration support benefit of equipment maintenance materials, and 30 recovered consultation questionnaires were summarized and sorted out, as shown in Table 1.

**Table 1.** Evaluation table of primary indicators of military-civilian integration support benefit evaluation of equipment maintenance materials

Index	Indicator importance level number of people				
	not important (1)	general (2)	important (3)	very important (4)	Extremely important (5)
materials timeliness	0	2	9	11	8
materials satisfaction rate	0	3	8	12	7
materials support good rate	0	4	9	11	6
equipment usability	0	3	7	6	14
equipment supportability	6	15	7	2	0
equipment perfect rate	8	13	8	1	0
materials raise cost	0	3	12	12	3
materials stock cost	1	5	14	5	5
materials overstock cost	2	4	17	5	2
materials shortage cost	2	6	15	6	1
materials transport cost	0	5	18	4	3
loss caused by materials quality problems	17	13	0	0	0
loss caused by insufficient production capacity of the manufacturer	15	15	0	0	0

Stipulate that each index should meet the concentration degree, dispersion degree and coordination degree. Stipulate that each index should meet the concentration

degree  $\varphi_i \geq 3.0$ , dispersion degree  $\mu_i \leq 1.1$  and coordination degree  $C_i \leq 0.4$ . According to the

comprehensive analysis in Table 1, the indexes that do not meet the conditions include "equipment supportability", "equipment perfect rate", "loss caused by materials quality problems" and "loss caused by insufficient production capacity of the manufacturer", which should be eliminated.

3.5. Establishment of Benefit Evaluation Index System

After scoring primary indicators of military-civilian integration support benefit evaluation of equipment maintenance materials and removing secondary indicators,

the evaluation index system of military-civilian integration support benefit evaluation of equipment maintenance materials is established, as shown in Figure 1. In the target layer, U represents the military-civilian integration support benefit of equipment maintenance materials, and the index layer is divided into two first-level indicators, military benefit and economic benefit, and nine second-level indicators.

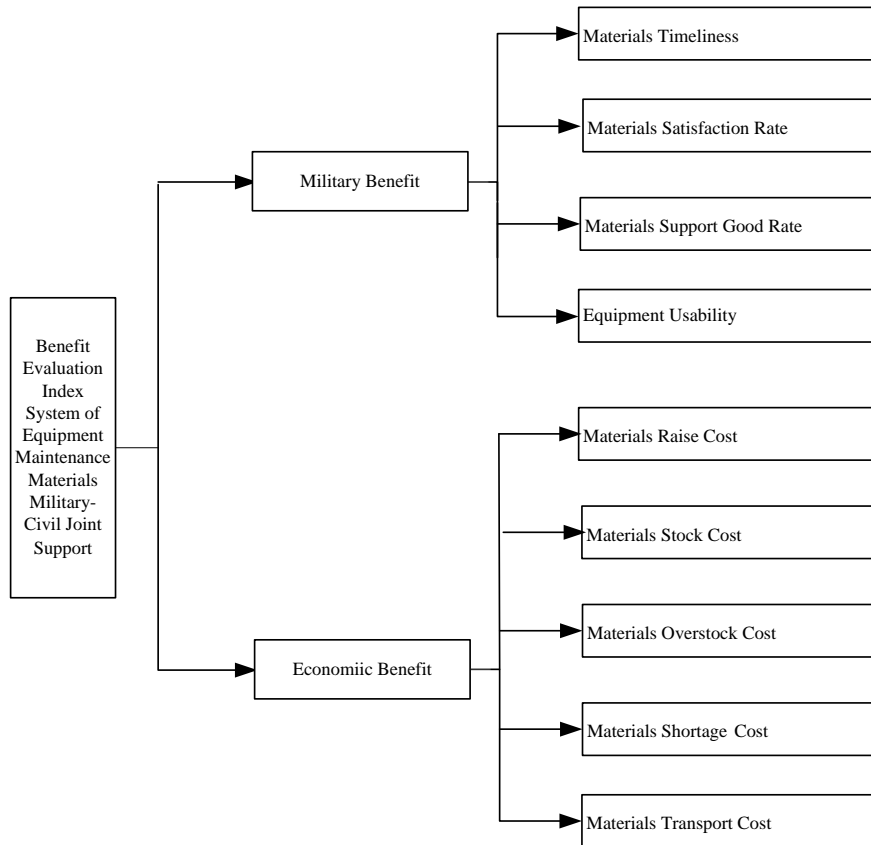


Figure 1. Evaluation index system of military-civilian integration support benefit of materials

4. Conclusions

Based on the analysis of the four stations of equipment maintenance materials civil-military integration, on the basis of military and economic benefits, this chapter puts forward to build the four stations of equipment maintenance materials civil-military integration principle and procedure of the evaluation index system of benefit, to distinguish between primary, secondary and further build the civil-military integration security benefit evaluation index system, The characteristics of materials timeliness, materials satisfaction rate, materials support good rate, equipment availability, materials raise cost, materials stock cost, materials overstock loss cost, materials shortage loss cost, materials transport cost and other indicators in the index system are analyzed.

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