USE OF INFORMATION ABOUT THE IMPORTANCE OF THE CRITERIA IN THE SOLUTION OF PERSONNEL MANAGEMENT PROBLEMS

Masuma Mammadova[1], Zarifa Jabrailova[2], Sabina Nobari[3]

Institute of Information Technologies of ANAS, Baku, Azerbaijan
[1]*mmg51@mail.ru*, [2]*djabrailova_z@mail.ru*, [3]*s.nobari@mail.ru*,

Introduction. In every enterprise to make correct, objective decisions concerned with personnel management constitutes foundation of purposeful manpower policy and quality improvement of personnel activity, and also helps to reach the goals corresponding to perspective strategy of the enterprise.

Thus, lately computer engineering was widely applied to the solution of the managing problems. Today most of commercial, social and governmental organizations which make important decisions are not conducted without a single element of computer analysis. But utilization of computer engineering in managing problems and creation of decision-making expert support systems come across with numerous difficulties. These difficulties become apparent in realization of capabilities concerning generation and selection of management decision making within computer technologies, taking into consideration quality factors as well as quantity factors, together with knowledge, intuition, and experience of decision making people, specialist-expert [1].

To overcome these difficulties first of all requires modeling of management problems and elaboration of methods which would give opportunity to use the computing system. As a result of the researches fulfilled in order to work out decision-making support system for the solution of personnel management problems different characteristic features of personnel management problems of the following content were defined:

- Multicriterion nature;
- Criteria are of both qualitative and quantitative character;
- Some of criteria are supported by multiple number of indices, i.e. hierarchic type criteria;
- Importance of recruiting of experts as information source for criteria identification.
- Significance of formalization of our natural language linguistic expressions concerning fuzziness for evaluation of qualitative criteria;
- Taking into consideration relative importance of the criteria concerning the diversity of relative importance, significance of the criteria.

Mentioned characteristic features of personnel management is providing fuzziness of input information, "uploading" the problem into fuzzy environment and for modeling and evaluation of personnel management problems this in its turn requires the selection of adequate formalisms which is taking into consideration fuzziness of linguistic nature concerning with expert knowledge formalization.

From this point of view the necessity for the use of mathematical apparatus for solution of personnel management problem within organization emerged and relational fuzzy model for personnel management problem was proposed. These problems were brought to assessment problem and solution algorithm of multicriteria task was given by scalar optimization method [2, 3].

Importance Factor of the Criteria. As it was mentioned one of the considerable features characterizing personnel management problems based on the fact that together with the criterion characterizing the estimated object which is of both of qualitative and quantitative character, their mutual relative importance is diverse.

This point is one of the problems emerging in the solution of personnel management problems and obtaining of such information gives opportunity to eliminate multicriterionness and to bring this problem to one-criterion problem. In this case global criterion is defined as

$$K_Q = \sum_{j=1}^{m} w_j K_j$$

And here K_j ─ is criterion characterizing estimated object *(j=1, 2,…, m)*, w_j ─ is called weight of criterion *Kj* or importance factor [5]. For importance factor of the criterion the following condition is foreseen:

$$0 \le w_j \le 1; \quad \sum_{j=1}^{m} w_j = 1 \tag{1}$$

The idea of unification is based on the expressions of the person who expresses the opinion about importance of criteria (expert, person who makes a decision) or on determination of appropriate evaluation grade determined to reflect value of considered criterion(in other case refer to 1-100 point scale) and further normalization within condition (1) of this value.

Use of information about importance of the criteria. Information of the variability of mutual relative importance, significance of the criteria refers to the recruiting of experts for the solution of problem put forward and to the strategy of obtaining of expert knowledge.

On the basis of the obtained information for today preparation of methods for determining of criteria importance factors is one of the points the attention is attracted to in the sphere of multicriterion problems solution [4, 5].

Information about mutual importance, significance of the criteria can be referred by the experts can be:

- ─ expressed by the linguistic expressions representing mutual relative advantage (or weak points) and their pair comparison;
- ─ referred to the establishing of appropriate grade to reflect assessment value of the considered criterion against the background of criteria defining any global factor.

In first case to display mutual relative advantage of the criteria the linguistic expressions of the type given below are used:

1) criterion K_1 has a weak advantage over criterion K_2
2) criterion K_2 has rather more advantage over criterion K_1 and etc.

Such linguistic expressions for degree of mutual relative advantage of compared criteria are estimated by 9-point Saati's table [6].

If number of criteria equals to *n* then by defining of *n-1* ratio of pair criteria comparison it is possible to make a matrix of mutual relative relations. Then the following features of the matrix are taken into consideration:

1) diagonal character, in other words: $K_{ii} = 1, \ i = \overline{1,m}$
2) asymmetric property, i.e. elements being symmetric by principal diagonal are in the following interdependence: $K_{ij} = K_{ji}^{-1}$
3) Transitiveness: $K_{ig} \cdot K_{gj} = K_{ij}$

These features of the matrix give opportunity to identify all its elements if *n-1* ratio diagonal elements are known. For instance, if all elements of row *g* are known then K_{ic} is defined as follows:

$$K_{ij} = K_{gj} \cdot K_{gi}^{-1}, \quad i, j, g = \overline{1,m}$$

After all elements of the matrix are identified importance factor of every criterion is calculated by the formula given below

$$w_i = \left(K_{1i} + K_{2i} + ... + K_{mi}\right)^{-1} \tag{2}$$

and then satisfaction of condition (1) is being checked.

In the second case information about the importance, significance against the background of common criteria reflects value of any criterion.

In such case it is more advantageous to use method of importance factor on the basis of 10-point system of expert estimation of the criteria.

In the process of determination of the importance factor on the basis of 10-point system of expert estimation of the criteria, first of all expert group implements evaluation of the each criterion by 10-point system. The description of this method is given below.

Let's assume that $K = \{K_j,\ j = \overline{1,m}\}$ is a criterion characterizing estimated object in the personnel management problem and expert group set up for evaluation of these criteria by 10-point system consists of L number of experts.

After each expert estimated $K = \{K_j,\ j = \overline{1,m}\}$ criterion by 10-point system, then total point of each criteria according to all experts, i.e. $\sum_{l=1}^{L} K_{j_l}$ – is being calculated. Then total sum of total points of all the criteria is being found: in other words $\sum_{j=1}^{m}\sum_{l=1}^{L} K_{j_l}$ – is calculated.

Here, K_{j_l} is value point of K_j criterion determined by expert l ($l = \overline{1,L}$).

For identification of relative importance factor of each criterion the following formula is used:

$$w_{K_j} = \sum_{l=1}^{L} K_{j_l} \cdot \left(\sum_{j=1}^{m}\sum_{l=1}^{L} K_{j_l} \right)^{-1}$$

It should be noted that sum of relative importance factors must equal to 1.

Determination of importance factor of the criteria in evaluation of labor activity of the scientific and technical personnel. In the process of the solution of remuneration problem of scientific and technical personnel for the Institute of Information Technologies of NANA the following criteria determining their labor activity index *(K)* were defined:

- criterion of organizing activity *(K_1)*;
- discipline *(K_2)*;
- criterion of practical activity *(K_3)*;
- Criterion of scientific and theoretical activity *(K_4)*;
- Criterion of scientific and practical activity *(K_5)*;
- Criterion of professional qualification improve *(K_6)*;

It should be mentioned each criterion is also characterized by multiple number of indices that is the index of scientific and technical personnel labor activity has hierarchic nature. If all listed above we would call as criteria of scientific and technical personnel labor activity, and indices characterizing them should be called exponent of *(K_4)* criterion then criterion of scientific and practical activity are characterized by criterion exponent such as to give a report at the seminars of one's own institute *(k_{41})*, to publish scientific articles *(k_{42})*, to be a scientific adviser of post graduates and nominees for the degree *(k_{43})*, to work with nominees for master's degree *(k_{44})*, to write a book, a brochure or a monograph *(k_{45})*, to speak at the conferences, symposiums and other scientific meetings with report *(k_{46})* and etc.

According to the information obtained from expert group members consisting of institute staff on the basis of two above-mentioned approaches about importance of criteria and criterion exponent of scientific and technical personnel labor activity, relative importance factors of the criteria (exponent of the criteria) have been calculated.

In order to estimate labor activity of scientific and technical personnel mutual relative advantages of the criteria were expressed by expert group members in the linguistic expressions representing their pair comparison given below:

1. K_4 and K_5 criteria has evident advantage over K_6 criterion.
2. Criteria K_4 and K_5 has weak advantage over criteria K_1, K_2, and K_3.
3. Criteria K_2 and K_3 has weak advantage over criterion K_1.

Relational matrix of the criteria is built up on the basis of linguistic expressions representing pair comparison of the criteria, using 9-point Saati's scale.

	K_1	K_2	K_3	K_4	K_5	K_6
K_1	1	0,33	0,33	0,5	0,5	4,5
K_2	3	1	1	0,5	0,5	4,5
K_3	3	1	1	0,5	0,5	4,5
K_4	2	2	2	1	1	9
K_5	2	2	2	1	1	9
K_6	0,22	0,22	0,22	0,11	0,11	1

After finding all elements of the matrix importance factors of the criteria were found on the basis of formula (2).

w_1= 0,09, w_2=0,16, w_3= 0,16, w_4= 0,28, w_5=0,28, w_6= 0,03.

2. Importance factors of the criteria determining index of scientific and technical personnel activity were defined on the basis of estimation in 10-point system as follows:

w_1= 0,108, w_2=0,102, w_3= 0,199, w_4= 0,260, w_5=0,232, w_6= 0,099.

As we have mentioned above these criteria are also supplied by multiple number of criterion exponent and it becomes necessary to define their relative importance too. In the result of the research the importance factors of criteria exponent which are characterizing scientific and technical activity criterion *(K_4)* were defined as follows:

w_{41}= 0,161, w_{42}=0,119, w_{43}= 0,147, w_{44}= 0,130, w_{45}=0,086, w_{46}= 0,144,
w_{47}= 0,128, w_{48}= 0,085.

Conclusion. We should notice that great number of criteria and criterion exponent characterizing labor activity of scientific and technical personnel causes such problems as contradictions of information reflecting pair comparison made by expert group members, divergence of opinions of expert group members. Therefore, method of criteria evaluation in 10-point system was applied in order to obtain information (expert knowledge) about criteria importance in the solution of this problem.

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