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INFORMATION TECHNOLOGY AND MODEL OF RATIONAL DISTRIBUTION OF SPECIALISTS FOR VACANT POSITIONS

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In the work developed a structural model of information technology personnel management in the enterprise, which allows, in contrast to the existing personnel management to solve the problem with a comprehensive and uniform system of criteria on the basis of the principles of the process approach

В работе разработана структурная модель информационной технологии управления персоналом на предприятии, которая позволяет в отличие от существующих решать задачу управления персоналом комплексно с единых системных и критериальных принципов на основе процессного подхода.

В роботі розроблена структурна модель інформаційної технології управління персоналом на підприємстві, яка дозволяє на відміну від існуючих вирішувати задачу управління персоналом комплексно з єдиних системних і критериальних принципів на основі процесного підходу.

Keywords: deployment of personnel, assignment problem, interval mathematics

Introduction.

The radical changes taking place in Ukrainian society as a whole and in the economy in particular, impose brand new requirements for effective management. It is necessary to bring into compliance with the new realities the strategy, tactics, organizational structure and activity content of personnel units which are objectively interested not so much in providing labor forces as in establishment of effective organizational management mechanism of their efficient use [1].

Personnel management system is an integrated organizational form (the only personnel service), which is guided by the administrative procedure (staffing plan).

Personnel service must concentrate monopolistically in its hands the fulfilment of personnel function package. Its strategy should consist in being of certain labor forces in a company in required quantity, required quality, at the right time, in the right place at minimal cost, due to their movement (recruitment, training, placement, retraining, professional qualifications growth, payment and incentives). Formulated strategy is proposed to call human resources strategy of providing labor forces «just in time».

Personnel management is the strategic task of any company which consists in personnel screening for vacancies and its optimal allocation of vacant positions by the level of qualifications, professional training and development, evaluation of activity of each employee in terms of achieving the goals of organization.

Aim of the research: Improving productivity through science-based distribution of specialists for vacant positions.

Objectives:

- methods to analyze the distribution of specialists for vacant positions;

- to analyze the methods of decision making under uncertainty;
- distribution model to develop of specialists for vacant positions;
- carry out a scientific rationale for the choice of software environment for distribution of specialists for vacant positions;
- develop software implementation distribution of specialists for vacant positions.
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Results and Discussion

Modern enterprises have long faced with the need to enhance the quality of personnel management of company. For this purpose it is necessary to improve all the processes of human resource management, and implement them on a scientific basis, taking into account the experience of domestic and foreign practice, with the help of information technology that provides models, methods and decision-making procedure (fig. 1) [2].

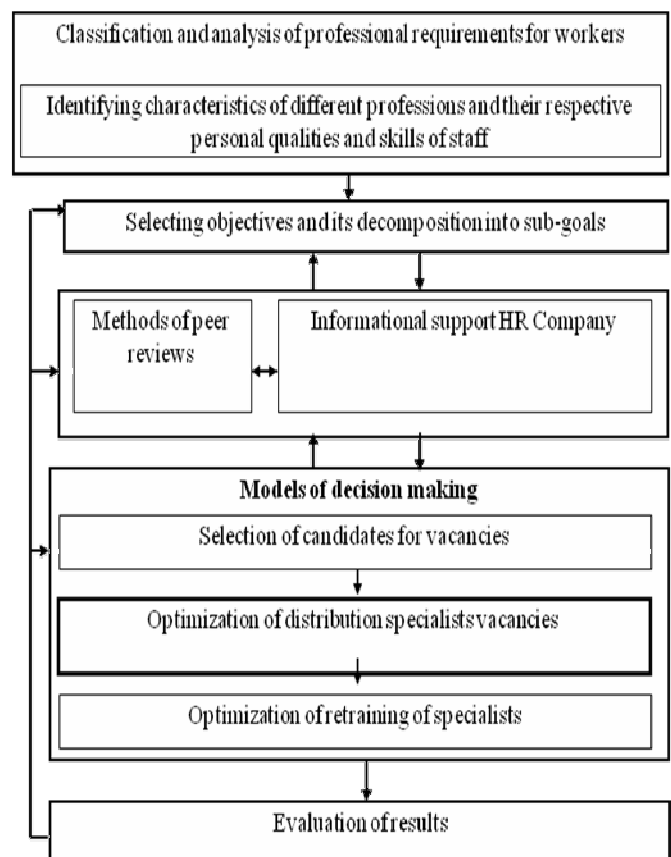


Fig. 1. Information technology of personnel management at enterprise

Технология приборостроения

Taking into account selected design principles, information technology of personnel management in the enterprise includes the decision making models:

- selection of candidates for vacancies;
- optimization of distributing specialists for vacant positions;
- optimization of retraining.

At the last stage the assessment of results is carried out.

Modern level of progress of society and technological processes, taking place in it, imposes certain requirements on employees, related to the necessary skills, abilities and knowledge. There is a certain (ideal) stereotype of the requirements to the employee at each enterprise, in any organization or company. It includes a set of essential characteristics of a person that works for a particular company, on a particular position and has certain specialty.

The scheme of the process of recruitment and selection of personnel to the company is represented in fig. 2 [3].

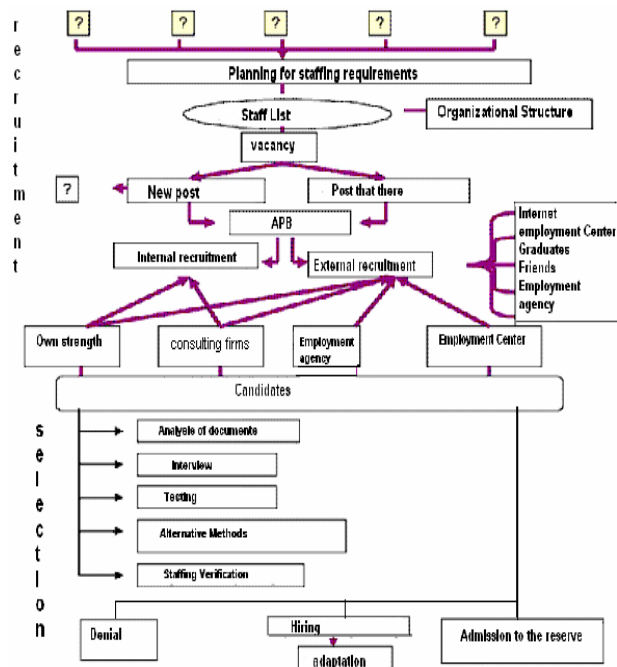


Fig. 2. The scheme of recruitment and selection of personnel for enterprise

Primarily, classification and analysis of professional requirements for candidates for certain position is made. It is necessary to identify the characteristics of different professions and the respective personal qualities and skills for them.

The most difficult task is to determine as far as personal qualities of the applicant meet the position. The main selection methods, which are the most frequently used by organizations: interview, document analysis, testing. Reference information support of a comprehensive assessment of applicant's personal qualities is an automated databank that includes databases of various profiles and management system that regulate the mechanism to access them according to the demands and requirements of the management of the organization. Depending on the position or specifics of the company the selection criteria of applicants change.

Structure of interview is shown in fig. 3 [3].

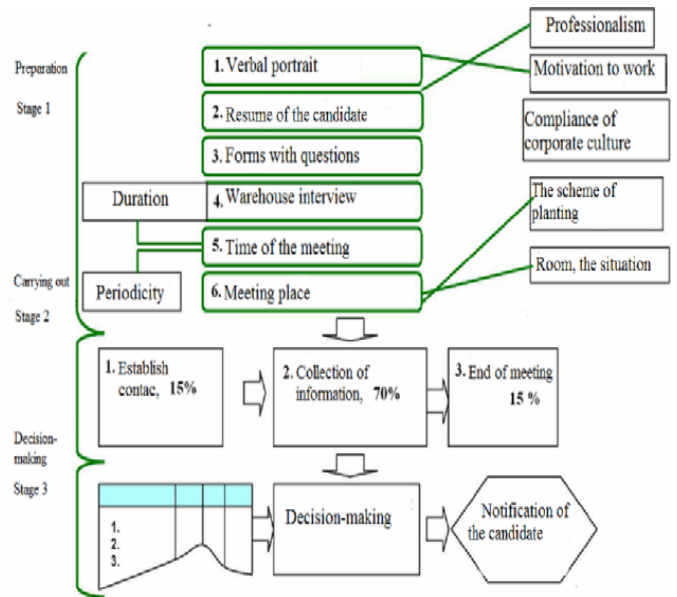


Fig. 3. Structure of interview

After the candidates are shortlisted, they must be distributed for vacant positions. We shall consider the problem statement of optimal distribution for vacant positions.

It is known:

- n types of work;
 - m candidates for their implementation.
- It is believed that each candidate can do any job.

Herewith a_{ij} – costs, associated with the appointment i -th of candidates for j -th the type of work, where $[a_{ij}^1, a_{ij}^2]$.

Need to find a solution $x_{ij}^0, i = \overline{1, m}, j = \overline{1, n}$ in which the function (1) reaches its maximum value and implemented the system of equations (1-4):

$$F = \sum_{i=1}^m \sum_{j=1}^n a_{ij} x_{ij} \quad (1)$$

$$\sum_{i=1}^m x_{ij} = 1, j = \overline{1, n} \quad (2)$$

$$\sum_{j=1}^n x_{ij} = 1, i = \overline{1, m} \quad (3)$$

$$x_{ij} \in \{0, 1\}, j = \overline{1, n}, i = \overline{1, m} \quad (4)$$

To implement the distribution of specialists for vacant positions the special software (SW) must be used. Usually, the choice in such cases is made by subjective judgment of developers or it is imposed from outside. So there is no scientific justification [3-5].

Let us consider the represented multicriterion model of software environment choice and the value of partial criteria functions utility [6].

It is given set of software for distribution of specialists for vacant positions, $R = \{R_{k'}\}$, $k = \overline{1, k'}$; where k' - amount of environments of software development.

Every software implementation of this task has the following characteristics:

- Cost (UAH) P_k k-th software for implementation tasks;
- User-friendly interface C_k k-th software for implementation tasks;
- The popularity of F_k k-th software for implementation tasks.

Let us introduce a variable $y_k \in \{0,1\}$, that takes the value 1, if selected k-a development environment; 0 - otherwise.

It is necessary to select a software for implementation problems with the defined criteria and limitations:

- Minimum value :

$$P = \min \sum_{k=1}^{k'} P_k y_k$$

- the most user-friendly interface software:

$$C = \max \sum_{k=1}^{k'} C_k y_k$$

- maximum popularity environment :

$$F = \max \sum_{k=1}^{k'} F_k y_k$$

Area of feasible solutions is defined constraints :

- the cost should not exceed the specified:

$$\sum_{k=1}^{k'} P_k y_k \leq P_{\text{зад}}$$

- should be chosen only one software Development Environment:

$$\sum_{k=1}^{k'} y_k = 1$$

The value of utility functions partial criteria

According to the results Borland C++ was chosen.

Table 1

	Results of computation			The general criterion
	Utility function of partial criteria			
	Price, thous uan.	Popularity	Convenience interface	
Delphi	0,09	0,5	0	0,15
MS Visual C++	1	0	0,5	0,2
Borland C++	0	1	1	0,5

For realization of the developed model the software tool «Problem» has been worked on [7-10].

At the first stage initial data are entered in accordance with the terms of the problem. For example we shall consider nondeterministic problem of appointments to three positions and three candidates with the interval cost matrix:

$$\tilde{A} = [A_1, A_2]$$

$$A_1 = \begin{pmatrix} 1 & 2 & 2 \\ 1 & 2 & 2 \\ 2 & 2 & 2 \end{pmatrix},$$

$$A_2 = \begin{pmatrix} 2 & 3 & 3 \\ 4 & 4 & 3 \\ 3 & 4 & 4 \end{pmatrix}.$$

In the case when problem is solved for higher dimensionality it must be added columns or (and), for what appropriate buttons are used.

Step 1: Find the set of decisions S_L of lower boundary problem. Cost matrix A_1 of this problem (Fig. 4):

$$A_1 = \begin{pmatrix} 1 & 2 & 2 \\ 1 & 2 & 2 \\ 2 & 2 & 2 \end{pmatrix}$$

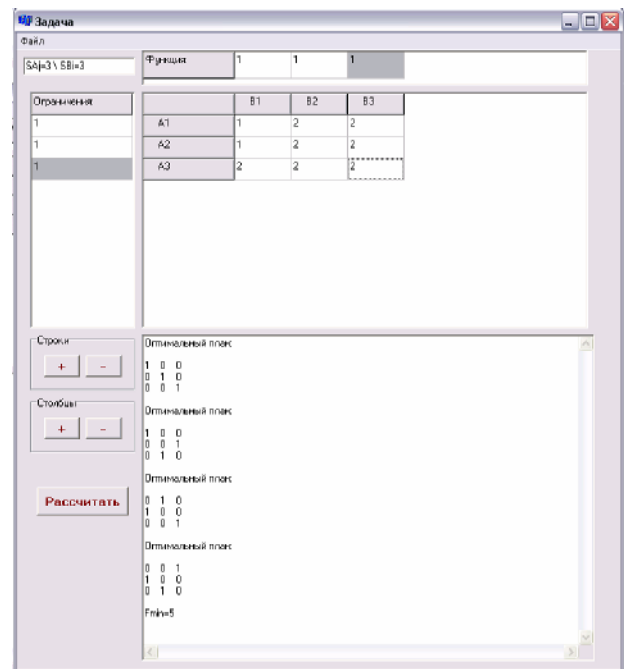


Fig. 4. Set of decisions of lower boundary problem

They meet four minimum sums – of matrix A_1 , namely:

$$\begin{aligned} a_{11} + a_{22} + a_{33} &= 5; \\ a_{11} + a_{23} + a_{32} &= 5; \\ a_{12} + a_{21} + a_{33} &= 5; \\ a_{13} + a_{21} + a_{32} &= 5, \end{aligned}$$

which give four solutions of the problem in the form of four assignment matrices (Fig. 5).

As a result, we obtain the set of decisions S_L of lower boundary problem $S_L = \{X_1, \dots, X_4\}$, where:

$$X_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$

$$X_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix};$$

$$X_3 = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix};$$

$$X_4 = \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix};$$

Step 2: Find the set of decisions S_U of upper boundary problem. Cost matrix A_2 of this problem (Fig. 5):

$$A_2 = \begin{pmatrix} 2 & 3 & 3 \\ 4 & 4 & 3 \\ 3 & 4 & 4 \end{pmatrix}$$

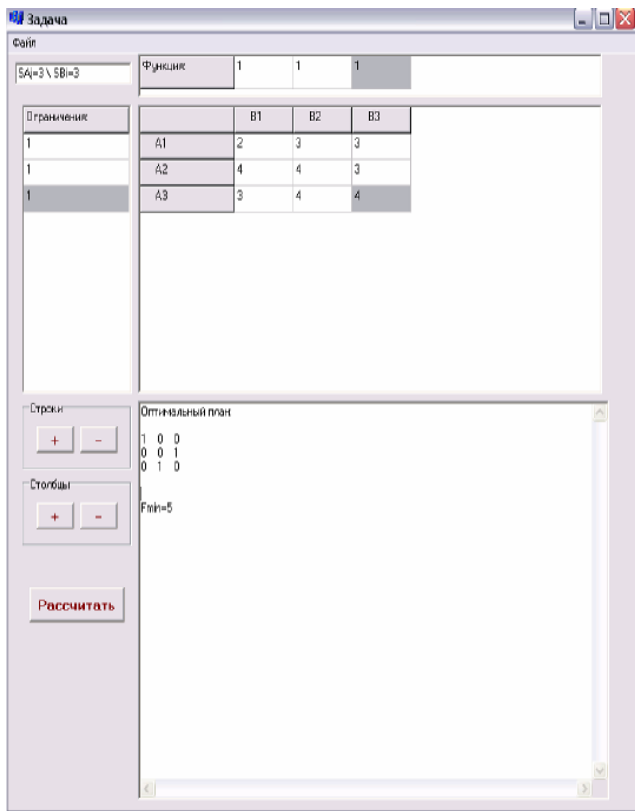


Fig. 5 – Set of decisions of upper boundary problem

As a result, we obtain the set of decisions S_U of upper boundary problem $S_U = \{X_1, \dots, X_4\}$, where:

$$X_5 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix};$$

The intersection of the sets S_L and S_U consists of one assignment matrix:

$$X_2 = X_5 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix};$$

which is the solution of the whole problem. According to this solution the first position is given to the first applicant, the second – to the third applicant, and the third position – to the second applicant.

Conclusions.

In the work there has been analyzed the problem of recruitment for modern enterprises.

Analysis of methods of decision-making used in personnel policy has been carried out.

The structural model of information technology personnel management at the enterprise, which allows, unlike the existing one, to solve HR problems in complex and on basis of unified systems and criterion concept, has been developed.

A mathematical model of distribution specialists for vacancies by skills level has been developed.

The scientific rationale for choosing a software environment to implement the model for distribution of specialists for vacancies by skills level has been given.

Interval model of optimal allocation of specialists for vacancies is implemented as a program-methodical complex, which allows to automate the decision making process.

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