

Mathematical Model of Management of the Corporate Culture of the Organizational System

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Abstract

The main contradictions related to personnel management in organizational systems are presented. The list of problems that arise in personnel management systems is described. The definition of the organization and organizational system is given. The scheme of the life cycle of personnel management is considered, each component of which is significantly influenced by the corporate culture of the organizational system. Various options for defining the corporate culture of an organizational system and the role that corporate culture plays in each organization are given. The functions of corporate culture and its components are also considered. A review of the toolkit of influence on corporate culture which allows to implement, develop and improve corporate culture in a better way is being carried out. An approach to the formalization of corporate culture and a mathematical model of personnel management are proposed. Similarity measures are introduced to determine the similarity between managers' judgments. The results of a computational experiment, which confirm the effectiveness of the proposed approach to the formalization of corporate culture and the personnel management system of the organization as a whole are presented.

Keywords¹

Organizational system, life cycle of personnel management, corporate culture, team, similarity measures, ranking of alternatives, metric of rank mismatch

1. Introduction

In the conditions of the global crisis, the problem of motivating employees is acutely manifested at all levels of management - both in organizations and at the state level. Because the motivation of the organization's personnel is the main factor in increasing labor productivity. The most important element of employee motivation is the quality of corporate culture, which was formed, developed and improved by the organization [1, 2].

Achieving a high level of corporate culture is one of the most important strategic goals of the organization. Some researchers use the terms "organizational culture" or "internal culture" of the organization instead of "corporate culture" [3, 4]. Features of the corporate culture that have developed in the organization permeate the entire cycle of personnel management of the organization: from hiring personnel, their adaptation, personnel development, to the style of management of the organization, evaluation of managers, personnel development, methods of conflict resolution, etc. [5, 6].

Therefore, the definition of the organization's value system, which has a primary impact on the corporate culture, is an important element of the organization's personnel management as a whole and the formation and improvement of the corporate culture in particular.

Corporate culture directly depends on the goals of the organizational system. The key role in the implementation of the entire complex of corporate culture is played by the management of the organization and middle managers.

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2. The purpose of the study and the problems of personnel management of the organization

The purpose of this work is to formalize the personnel management system in organizational systems. In particular, it is necessary to structure the corporate culture of the organization and build a mathematical model of corporate culture.

The need to research and formalize the problems of personnel management and, in particular, the corporate culture of the organization, is a complex and urgent problem [2, 7]. This situation is due to the fact that there are a number of peculiarities in personnel management tasks, which, in turn, create additional problems [4, 8]. Let's list the contradictions associated with the construction and operation of the personnel management system.

1. Personnel management is studied by representatives of various sciences: lawyers, economists, financiers, personnel management specialists, public relations specialists, etc.; there is no single methodology for information and analytical support of personnel management, which would allow combining different views into a single concept.

2. The peculiarity of this resource is the great role of subjective information in personnel management and the lack of adequate formalization of almost all components of personnel management.

3. The key problem of personnel management is the objectification of data received from experts, because when solving many practical problems of personnel management, the importance of correctly obtaining and processing expert information at all stages of management decision-making is underestimated.

4. Experts in most situations of personnel management are not able to adequately fix their preferences. Adequate direct assessments of various aspects of the practical decision-making situation are rather an exception.

5. In personnel management, problems that require the analysis of heterogeneous data, the application of a wide class of models, and the solution of weakly structured problems, that are formalized in different classes, arise.

6. Personnel management problems are traditionally solved using limited mathematical tools:

- only some elements of mathematical statistics, point evaluation and additive convolution are used;

- there are problems with adequate processing of information due to missed or lost data for various reasons;

- some problems of personnel management have a high computational complexity, and obtaining the results of the calculation of such problems is critical in solving the problem;

- the results of solving problems that arise in the personnel management system are incorrectly interpreted, which leads to an inadequate response of the management and to losses in the organization or a lack of profit;

- indirect methods in the study of personnel management models, as a rule, are not used;

- the condition of maximum preservation of information received from participants in the decision-making process is not met when using inappropriate measurement scales and unreasonable application of convolutions;

- the decision-making process regarding personnel management is not justified and transparent at all its stages.

7. Some components of personnel management, in particular corporate culture, are objects that cannot be measured by direct methods.

8. The importance of this area of management of the organization and the limited opportunities for adequate mathematical support of this area create a problem that should be investigated and solved.

Considering the specified features of personnel management and contradictions, the problem of creating methodology, models, methods and tools for processing expert information in decision-making for the objectification of information received from experts in personnel management systems arises.

Solving the problem of unification with a single methodology of personnel management research in different fields and with the help of mathematical methods can provide researchers with a tool for objectifying subjective information.

The problem of objectification of the subjective components of decision-making tasks in the personnel management system has several diverse aspects:

- weighting factors are a determining element of selecting a compromise solution from a set of effective ones [9], but insufficient attention is paid to the adequate definition of the vector of weighting factors [10, 11];

- collective ranking is a traditional method of objectification, requires significant labor costs [12, 13], but at the stage of convolution of partial criteria, as a rule, an unreasonable solution is obtained [14, 15];

- metrication (digitization) of ordinal scales [16, 17] is a method of clarifying preference relations between alternatives, cannot be applied voluntarily, but requires the use of reasoned procedures [18,19];

- weakly structured problems are characterized by rarely repeated solutions, therefore, at the stage of building the model, all components of the personnel management system should be as objective as possible [20, 21].

The use of a methodology built on the basis of information technologies will ensure the correct receipt of expert assessments, adequate analysis and reasonable interpretation of objectified subjective information.

3. Life cycle of personnel management (HR-cycle) of the organizational system

One of the most important factors in building an effective personnel management system is corporate culture. It is the basis, the basic substance for building a harmonious and competitive organization. To determine the place and role of corporate culture in the organization's personnel management system, we will consider some definitions and features of organizational systems.

Definition 1. An organization is a group of employees who are provided with appropriate means of activity, united by a common goal. The organizational system is characterized by the distribution of responsibilities, powers and relationships between system elements - individual employees and units to which they belong.

Definition 2. An organizational system is a set of interconnected elements, processes and structures that are used to achieve the goals of the organizational system and ensure its effective functioning. It includes formal and informal rules, procedures, communication channels, and resources used to coordinate people's activities.

Most organizational systems are weakly structured complex systems [22, 23]. The main characteristics and features of these systems are [24, 25]:

- lack of a formalized goal of functioning;
- impossibility of building an analytical model;
- lack of optimality;
- lack of standards;
- the uniqueness of the task and the impossibility of repeating the decision-making process;
- dynamism of data and knowledge;
- the presence of the influence of the human factor;
- large dimension of the solution space;
- NON-factors when describing alternatives.

The organizational system needs constant changes and adaptation to the environment. Organizational management, especially change and development management, requires a perfect personnel management system. There are various options for building and describing the personnel management cycle. We present the most complete option, the scheme of which is presented in Figure 1.

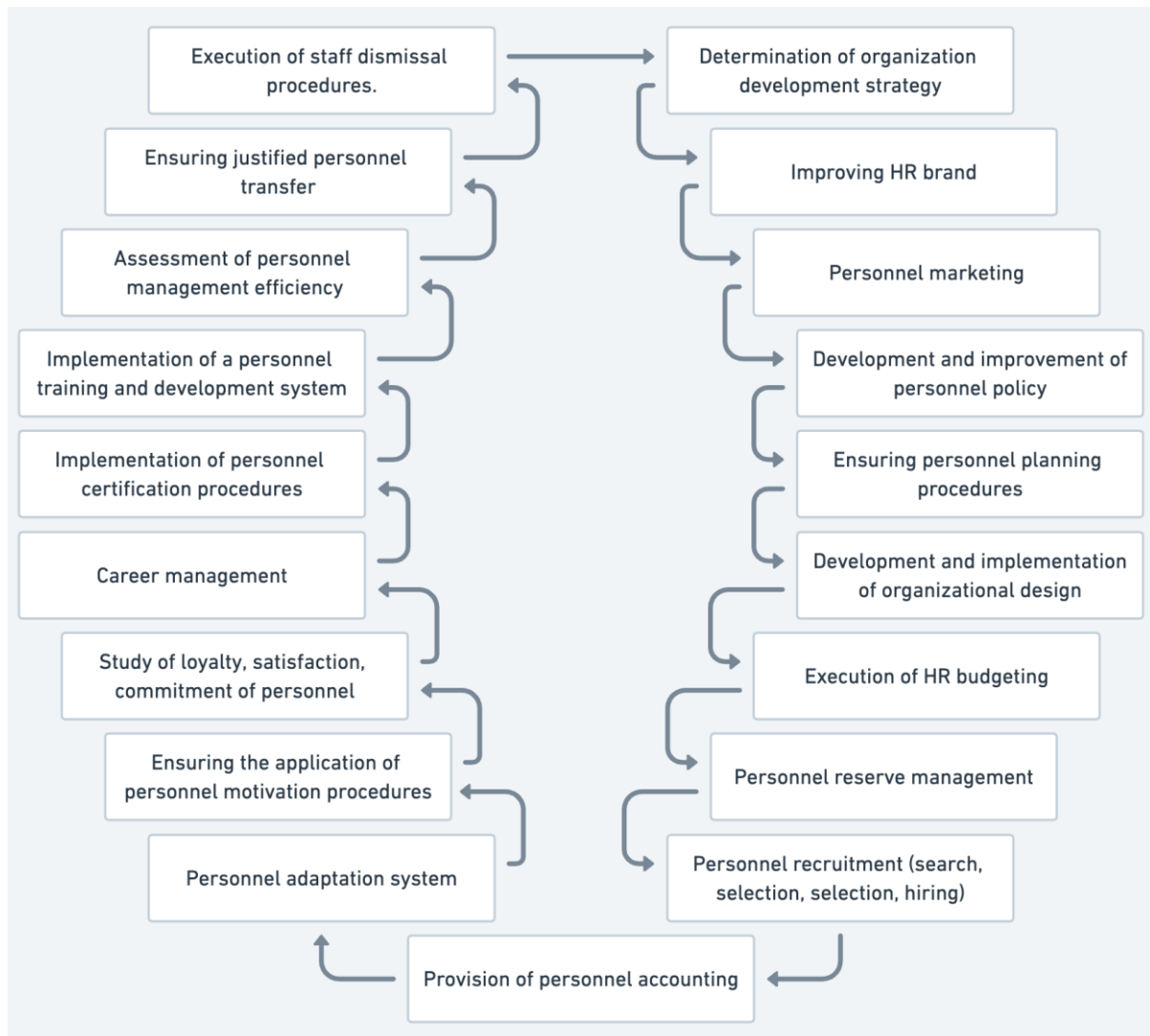


Figure 1: Scheme of the HR cycle of the organizational system

Let's introduce notations for the elements of the personnel management cycle:

- a_1 – determination of the organization development strategy;
- a_2 – improving HR brand;
- a_3 – personnel marketing;
- a_4 – development and improvement of personnel policy;
- a_5 – ensuring personnel planning procedures;
- a_6 – development and implementation of organizational design;
- a_7 – execution of HR budgeting;
- a_8 – personnel reserve management;
- a_9 – personnel recruitment (search, selection, hiring);
- a_{10} – provision of personnel accounting provided for by regulatory documents;
- a_{11} – implementation of the adaptation system and implementation of personnel adaptation procedures;
- a_{12} – ensuring the application of personnel motivation procedures;

- a_{13} – study on satisfaction, commitment, loyalty of personnel;
- a_{14} – career management;
- a_{15} – implementation of personnel certification procedures and providing feedback;
- a_{16} – implementation of the personnel training and development system;
- a_{17} – assessment of the effectiveness of personnel management;
- a_{18} – ensuring reasonable personnel transfer;
- a_{19} – execution of personnel firing procedures.

It is clear that not every HR service and not every organizational system provides management of all the elements shown in Figure 1. In addition, the scheme presented in Figure 1 has conditional nature. This convention is that the sequence of activation of the elements of the personnel management cycle may change, some elements of the cycle may be combined, etc.

4. Corporate culture of the organization

The corporate culture of the organizational system, both directly and indirectly, should contribute to the strengthening of the vector of the organization's effectiveness as a whole and to the improvement of the quality of personnel, their involvement, satisfaction and loyalty. In the case of an imperfect corporate culture, the opposite effects can naturally be observed.

4.1. Goals of improving corporate culture

The main goals of developing and improving the corporate culture of the organizational system are:

- strengthening the positive image of the organizational system;
- achievement of efficiency and comfort of industrial relations of personnel;
- development of employees' sense of involvement in the activities of the organization, affinity of interests and goals;
- other goals, depending on the field of activity, the size of the organization, the life cycle of the organizational system, the external environment, etc.

4.2. Definition and role of corporate culture

Today, there are several definitions of the corporate (internal or organizational) culture of an organization [26, 27]. Here are some of them that best fit the purposes of this article and that highlight different angles of this multifaceted concept.

Definition 3. Corporate culture is a system of common values, traditions, rituals, ethical standards, beliefs, symbols, formal and informal rules of behavior of members of the organization, their interaction with each other and the environment, transmitted between employees over time.

Definition 4. Corporate culture is determined primarily by the management style, the decision-making process, the incentive system and the reaction of the organization's management to possible errors and failures in the activities of employees.

Definition 5. Corporate culture is determined by the psychological climate in the organization and the system of relations between the employees of the organization.

Definition 6. Corporate culture is a set of behavior patterns acquired by the organization in the process of adaptation to the external environment and internal integration, which have shown their effectiveness and are shared by most of the organization's members.

The role of corporate culture in the development of the organization is extremely important, as it directly affects all personnel of the organization in parallel with the formal organizational mechanism. A positive corporate culture creates conditions for highly motivated personnel [28, 29]. A perfect

corporate culture concentrates the efforts of personnel on the values of the professional activity of the organization's employees, as a way of realizing the values of self-development of employees [30, 31]. At the same time, a positive corporate culture emphasizes the value of the organization as a condition for realizing the self-development of the elements of the organizational system.

An organization with a harmonious corporate culture performs all the components of the life cycle of personnel management, shown in Figure 1, much better and more efficiently than such organizations in which the corporate culture is not sufficiently developed. An effective corporate culture contributes to the successful execution of the organization's business processes, and also allows the creation and scaling of successful ambitious projects. Such a corporate culture increases the degree of involvement, satisfaction and loyalty of employees. On the other hand, in the presence of a developed corporate culture, the satisfaction of the organization's customers and partners increases, their number dynamically expands, and their composition becomes more qualitative and reliable.

On the other hand, an ineffective corporate culture significantly, although sometimes imperceptibly, invisibly affects the level of quality of the organization's business processes. The success of organizations often largely depends on the atmosphere created by the culture embedded in them, its improvement tendencies and development dynamics.

In many successful organizations with an effective corporate culture, even when recruiting personnel, a greater priority is given to the similarity of the candidates' culture with the organization's culture, the ability to quickly adapt and perceive the organizational culture, than the candidates' professional skills.

The overadditive effect is one of the most important indicators of the effectiveness of a highly developed team [32]. It is the ability of the team as a whole to achieve much greater gains in work than can be done by a community of people of the same size who work independently of each other and are not united by a system of defined relationships [33].

Definition 7. Synergy is a total effect, which consists in the fact that when two or more factors interact, their action significantly outweighs the effect of each individual component in the form of their simple sum [34, 35].

The knowledge and efforts of several people can be organized in such a way that they are mutually reinforcing. Approximately this phenomenon describes the overadditive effect as a state of affairs, which is usually conveyed using the phrase "the whole is greater than the sum of the individual parts"

Definition 8. Dysynergy is a decrease in the efficiency of the system functioning as a result of the negative influence of its elements on each other [36].

5. A mathematical model of the personnel management system and the influence of corporate culture on the quality of the organization's functioning

Each of the elements of the personnel management system significantly depends on the level and characteristics of the corporate culture of the organizational system. Note that with some degree of convention, the quality of the personnel management system and the efficiency of the organizational system can be described by a separable function

$$F(a_1, \dots, a_{19}) = \sum_{i=1}^{19} \rho_i f_i(a_i), \quad (1)$$

where $f_i(a_i)$ – the quality functions of the management of elements of the personnel management system, listed in the previous section;

$\rho_i, \rho_i > 0$ – relative weighting factors that reflect the intensity of the influence of corporate culture on the elements of the life cycle of personnel management and are determined, in particular, by expert evaluation.

The weighting factors of the influence of corporate culture on the elements of the HR cycle are normalized, that is, they must satisfy the condition

$$\sum_{i=1}^{19} \rho_i = 1, \quad i = 1, \dots, 19. \quad (2)$$

Sometimes idealized weighting factors are used for greater clarity:

$$\rho'_i = \rho_i / \max_{j=1, \dots, 19} \rho_j, \quad i = 1, \dots, 19. \quad (3)$$

Thus, $\max_{j=1, \dots, 19} \rho'_j = 1$, and other weighting factors reflect the level of influence of corporate culture on the elements of the life cycle of personnel management in percentage terms. In many specific cases, for individual subject areas, the representation of weighting factors in the form (3) is convenient and clear.

It should be noted that determining the normalized values of weighting factors of type (2) is not a trivial task and significantly affects the behavior of system (1).

At the same time, it is obvious that some components of personnel management, in particular corporate culture, are objects that cannot be measured by direct methods.

All elements of the personnel management cycle are interconnected by the corporate culture of the organizational system. Corporate culture is a cementing substance that significantly affects the activity of the organizational system and largely determines the effectiveness of all external and internal displays of the organizational system. Perfect corporate culture creates synergistic and overadditive effects of organizational system activity [36]. If decision-makers in the organizational system do not pay enough attention to improving the corporate culture, the effects of the organization's activities can be significantly reduced [34]. That is, an unsuccessfully built corporate culture can lead to the fact that the effect of dissynergy will be observed in the organization.

5.1. Determining the similarity measure of experts' conclusions based on their selected subsets of objects

An important stage of expert evaluation processes is the analysis of a set of expert opinions, the formation of expert groups based on the analysis of advantages, and the calculation of the similarity measures of expert opinions. Determining the structure of experts' preferences and the similarity measures of expert opinions can also be an independent problem. Pairwise relations between elements are interpreted as preference relations or as degrees of similarity–difference between objects and , [37, 38]. It is based on this that we will build a scheme for determining such relations.

Let on the set of complete objects $a_i \in A$, $i \in I$ each of the k experts select the desired subsets of objects $A^j \subseteq A$, $j \in L = \{1, \dots, k\}$.

The problem is to determine the similarity measures of the experts' preferences $A^j \subseteq A$, $j \in L$, based on the selected subsets.

The general system of axioms that must be satisfied by similarity measures consists of:

- *axioms of the limitation* of the similarity measure μ ; in the general case assume that $0 \leq \mu \leq 1$;

- *axioms of symmetry* of the similarity measure, i.e. $\mu(A^1, A^2) = \mu(A^2, A^1)$;

- *axioms of transitivity*, i.e. if the relations $\mu(A^1, A^2) = 1$ and $\mu(A^2, A^3) = 1$ takes place, then relation $\mu(A^1, A^3) = 1$ is true, where $A^1, A^2, A^3 \subseteq A$.

We will also define additional requirements for the similarity function. Since the similarity measures of the experts' preferences are introduced on the subsets of the chosen objects, it is obvious that they should depend on the cardinality of the subsets $A^1, A^2 \subseteq A$, their intersection and union, as well as on the total volume of the set A .

Let's introduce the following notations:

$$x \in \{x_1, x_2, x_3, x_4\}.$$

$$x_1 = A \supseteq A^1 \cup A^2; \quad x_2 = A^1; \quad x_3 = A^2; \quad x_4 = A^1 \cap A^2.$$

the symbol "*" denotes a fixed value $x_i, i = 1, \dots, 4$.

We will also introduce additional requirements for the similarity function of experts' opinions:

- $\mu(x_1^1, *, *, *) > \mu(x_1^2, *, *, *)$, if $x_1^1 > x_1^2$, that is, the similarity measure of the selected subsets is greater, the larger the total volume of the set A . is at fixed values of the other components of the vector x ;
- $\mu(*, x_2^1, *, *) > \mu(*, x_2^2, *, *)$, if $x_2^1 < x_2^2$, that is, there is an inverse dependence between the value of the similarity measure and the value x_2 ;
- $\mu(*, *, x_3^1, *) > \mu(*, *, x_3^2, *)$, if $x_3^1 < x_3^2$, that is, there is also an inverse dependence between the value of the similarity measure and the value x_3 ;
- $\mu(*, *, *, x_4^1) > \mu(*, *, *, x_4^2)$, if $x_4^1 < x_4^2$, that is, the similarity measure directly depends on the intersection of these subsets at fixed values of the other components of the vector x .

We will calculate the similarity measures of experts' preferences that satisfy the system of axioms and additional requirements for the similarity function according to the formulas [39]:

$$\mu_{12}^{(1)} = \frac{|A^1 \cap A^2|}{|A^1 \cup A^2|} \cdot \left(1 - \frac{|A^1 \cup A^2| - |A^1 \cap A^2|}{|A|} \right), \quad (4)$$

$$\mu_{12}^{(1)} = \frac{|A^1 \cap A^2|}{\max(|A^1, A^2|)} \cdot \left(1 - \frac{|A^1 \cup A^2| - |A^1 \cap A^2|}{|A|} \right), \quad (5)$$

$$\mu_{12}^{(1)} = \frac{|A^1 \cap A^2|}{|A^1 \cup A^2|} \cdot \left(1 - \frac{|A^1 \cup A^2| - \min(|A^1|, |A^2|)}{|A|} \right), \quad A_1, A_2 \subseteq A. \quad (6)$$

In the case of several experts, the similarity measures of the type (4)–(6) can be combined into the corresponding metric vectors for the purpose of further analysis. In particular, on the following stages may:

- define coalitions of experts with a similar structure of preferences;
- calculate the degree of consistency of the conclusions of the group of experts;
- identify "antagonist experts" whose preferences are very different from the conclusions of the majority of group representatives;
- calculate other characteristics.

6. Computational experiment

In order to experimentally determine the level of influence of corporate culture on the elements of the life cycle of personnel management, board members of one of the organizations in Kyiv (Ukraine) were asked to choose those that have the greatest effect on the quality of the functioning of the personnel management system in a specific organization - the LTD "Modern Trade Technologies". The results of the survey were presented binary (1 – the element of the HR cycle is significantly influenced by corporate culture; without significance – not significantly). All the data received from the board members of the LTD "Modern Trade Technologies" was summarized in Table 1.

Table 1

Results of a survey of board members regarding the impact of corporate culture on elements of the personnel management life cycle

Numbers of experts	<i>a1</i>	<i>a2</i>	<i>a3</i>	<i>a4</i>	<i>a5</i>	<i>a6</i>	<i>a7</i>	<i>a8</i>	<i>a9</i>	<i>a10</i>	<i>a11</i>	<i>a12</i>	<i>a13</i>	<i>a14</i>	<i>a15</i>	<i>a16</i>	<i>a17</i>	<i>a18</i>	<i>a19</i>
BM_1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BM_2	1		1	1	1		1	1	1		1	1	1	1		1	1	1	
BM_3		1		1		1	1	1	1			1	1		1	1	1	1	
BM_4	1	1			1	1		1			1	1		1		1			1
BM_5		1	1	1	1	1	1	1	1	1	1	1	1	1					1
BM_6	1	1	1	1		1	1	1	1		1	1		1		1			
BM_7		1	1	1	1	1		1	1	1		1	1	1	1	1			1
BM_8		1		1	1	1	1	1	1			1		1	1				1
BM_9		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
Number of votes for significant influence	4	8	6	8	7	8	7	8	8	3	6	8	6	8	4	7	4	6	2

The following denotations are used in Table 1:
 BM – board member;

ai – the element number of the HR cycle according to Figure 1.

Based on the data received from the board members and presented in Table 1, a non-strict ranking of the elements of the HR cycle according to the level of their influence of the corporate culture introduced in the organization was carried out. The scheme presented in Table 2 was used to make a decision on assigning an element of the HR cycle to one of the classes.

Table 2

The principles of assigning elements of the HR cycle to one of the classes

Class number	Verbal description of the class	The popularity of the HR cycle element among board members in absolute terms	Popularity of the HR cycle element among board members in percentage
1	Significant impact	8-9	80-100%
2	Temperate impact	6-7	60-79%
3	Barely noticeable impact	4-5	40-59%
4	Weak impact	3	25-39%
5	No impact or invisible impact	1-2	0-24%

Thus, based on the results of the analysis of Table 1 and Table 2, the following ranking of the elements of the life cycle of personnel management was determined:

$$R = a_2 \sim a_4 \sim a_6 \sim a_8 \sim a_9 \sim a_{12} \sim a_{14} \succ a_3 \sim a_5 \sim a_7 \sim a_{11} \sim a_{13} \sim a_{16} \sim a_{18} \succ a_1 \sim a_{15} \sim a_{17} \succ a_{19} \succ a_{10} \quad (7)$$

Based on this ranking, we obtain the ratio between the weighting factors of the relative impact of the organization's corporate culture on the elements of the organization's life cycle, presented in Figure 1:

$$\rho_2 = \rho_4 = \rho_6 = \rho_8 = \rho_9 = \rho_{12} = \rho_{14} > \rho_3 = \rho_5 = \rho_7 = \rho_{11} = \rho_{13} = \rho_{16} = \rho_{18} > \rho_1 = \rho_{15} = \rho_{17} > \rho_{19} > \rho_{10} \quad (8)$$

Taking into account ranking (7) and relations (8), let's calculate the weighting factors of the influence of corporate culture on the elements of the life cycle of the personnel management system. To do this, we will apply one of the methods of automated metrication of ordinal relationships between alternatives, such as the method of equal intervals.

To calculate the limits of the intervals of the change of the weighting factors, we will first use their point estimates. We will assume that the value intervals of each of the point estimates of the weighting factors are equal, that is $\rho_i^u - \rho_i^l = \alpha$ for $\forall i = 1, \dots, 19$, where

$\alpha > 0$ – any positive number,

ρ_i^l – the lower limit of the interval of values of the i-th weighting factor,

ρ_i^u – the upper limit of the interval of values of the i-th weighting factor.

It is clear that $\rho_{i+1}^l = \rho_i^l$, $\rho_{i+1}^u = \rho_i^u$, at $\rho_{i+1} = \rho_i$. And when $\rho_{i+1} < \rho_i$, we have $\rho_{i+1}^l = \rho_i^u$.

Let's set the value of the heuristic α equal to 1: $\alpha = 1$. Taking into account ratio (8) and the described method of equal intervals, let's fill in the table of interval point estimates taking into account condition (7).

Table 3

Table of interval point estimates of the lower and upper limits of the weighting coefficients

The index of the weighting factor of the element of the HR cycle	Point estimate of the lower limit of the weighting factor	Point estimate of the upper limit of the weighting factor
2	0	1
3	0	1
4	0	1
8	0	1
9	0	1
12	0	1
14	0	1
3	1	2
5	1	2
7	1	2
11	1	2
13	1	2
16	1	2
18	1	2
1	2	3
15	2	3
17	2	3
19	3	4
10	4	5

To normalize the obtained point estimates, we divide the values given in Table 3 by half the sum of all the lower point estimates and all the upper point estimates:

$$\left(\sum_{i=1}^{19} (5 - \rho_i^l) + \sum_{i=1}^{19} (5 - \rho_i^u) \right) / 2.$$

As a result, we will obtain Table 4 of the normalized values of the weighting factors of the relative influence of the corporate culture of the organization on the elements of the life cycle of personnel management.

Table 4

Table of normalized values of the lower and upper limits of the intervals of the weighting factors

The index of the weight factor of the element of the HR cycle	Point estimate of the lower limit of the weighting factor	Point estimate of the upper limit of the weighting factor
2	0,061	0,076
3	0,061	0,076
4	0,061	0,076
8	0,061	0,076
9	0,061	0,076
12	0,061	0,076
14	0,061	0,076
3	0,046	0,061
5	0,046	0,061
7	0,046	0,061
11	0,046	0,061
13	0,046	0,061
16	0,046	0,061
18	0,046	0,061
1	0,031	0,046
15	0,031	0,046
17	0,031	0,046
19	0,015	0,031
10	0,000	0,015

On the results of the analysis of Table 1, according to formula (4), the similarity measures of the judgments of the board members were determined and summarized in Table 5.

Table 5

Similarity measures of judgments of board members determined by formula (4)

Conditional numbers of board members	BM_1	BM_2	BM_3	BM_4	BM_5	BM_6	BM_7	BM_8	BM_9
BM_1	1	0,39	0,18	0,25	0,39	0,37	0,28	0,14	0,40
BM_2	0,39	1	0,31	0,20	0,44	0,43	0,32	0,25	0,60
BM_3	0,18	0,31	1	0,11	0,31	0,29	0,43	0,47	0,59
BM_4	0,25	0,20	0,11	1	0,20	0,39	0,20	0,21	0,21
BM_5	0,39	0,44	0,31	0,20	1	0,43	0,59	0,49	0,60
BM_6	0,37	0,43	0,29	0,39	0,43	1	0,31	0,34	0,44
BM_7	0,28	0,32	0,43	0,20	0,59	0,31	1	0,49	0,60
BM_8	0,14	0,25	0,47	0,21	0,49	0,34	0,49	1	0,51
BM_9	0,40	0,60	0,59	0,21	0,60	0,44	0,60	0,51	1

Table 1 was also analyzed and according to formula (5) the similarity measures of the judgments of the board members were determined and summarized in Table 6.

Table 6

Similarity measures of judgments of board members determined by formula (5)

Conditional numbers of board members	BM_1	BM_2	BM_3	BM_4	BM_5	BM_6	BM_7	BM_8	BM_9
BM_1	1	0,46	0,24	0,35	0,50	0,45	0,38	0,18	0,47
BM_2	0,46	1	0,37	0,28	0,54	0,43	0,32	0,25	0,60
BM_3	0,24	0,37	1	0,15	0,37	0,29	0,43	0,47	0,59
BM_4	0,35	0,28	0,15	1	0,24	0,39	0,20	0,21	0,21
BM_5	0,50	0,54	0,37	0,24	1	0,43	0,59	0,49	0,60
BM_6	0,45	0,43	0,29	0,39	0,43	1	0,31	0,34	0,44
BM_7	0,38	0,32	0,43	0,20	0,59	0,31	1	0,49	0,60
BM_8	0,18	0,25	0,47	0,21	0,49	0,34	0,49	1	0,51
BM_9	0,47	0,60	0,59	0,21	0,60	0,44	0,60	0,51	1

To analyze the data in Table 1, formula (6) was also applied, the similarity measures of the judgments of the board members were determined and summarized in Table 5.

Table 7

Similarity measures of judgments of board members determined by formula (6)

Conditional numbers of board members	BM_1	BM_2	BM_3	BM_4	BM_5	BM_6	BM_7	BM_8	BM_9
BM_1	1	0,48	0,27	0,30	0,35	0,43	0,33	0,21	0,37
BM_2	0,48	1	0,39	0,26	0,41	0,49	0,38	0,32	0,52
BM_3	0,27	0,39	1	0,19	0,33	0,39	0,49	0,54	0,55
BM_4	0,30	0,26	0,19	1	0,26	0,51	0,30	0,32	0,28
BM_5	0,35	0,41	0,33	0,26	1	0,49	0,59	0,53	0,52
BM_6	0,43	0,49	0,39	0,51	0,49	1	0,39	0,42	0,44
BM_7	0,33	0,38	0,49	0,30	0,59	0,39	1	0,53	0,52
BM_8	0,21	0,32	0,54	0,32	0,53	0,42	0,53	1	0,51
BM_9	0,37	0,52	0,55	0,28	0,52	0,44	0,52	0,51	1

Note that all similarity measures calculated by formulas (4)-(6) are logically justified, intuitively accepted and understandable. Let's combine the values of similarity measures presented in Tables 5-7 into the only one Table 8.

Table 8 presents the range of values of similarity measures of judgments of board members based on the use of formulas (4)-(6). This data can be used for various purposes:

- determination of the degree of agreement of the board members on the issue of the influence of corporate culture on the organization's activities;

- identifying coalitions of board members regarding their judgments about the role of corporate culture in the organization;

Table 8

Similarity measures of judgments of board members determined by formula (4)-(6)

Conditional numbers of board members	BM_1	BM_2	BM_3	BM_4	BM_5	BM_6	BM_7	BM_8	BM_9
BM_1	1	0,39	0,18	0,25	0,39	0,37	0,28	0,14	0,40
	1	0,46	0,24	0,35	0,50	0,45	0,38	0,18	0,47
	1	0,48	0,27	0,30	0,35	0,43	0,33	0,21	0,37
BM_2	0,39	1	0,31	0,20	0,44	0,43	0,32	0,25	0,60
	0,46	1	0,37	0,28	0,54	0,43	0,32	0,25	0,60
	0,48	1	0,39	0,26	0,41	0,49	0,38	0,32	0,52
BM_3	0,18	0,31	1	0,11	0,31	0,29	0,43	0,47	0,59
	0,24	0,37	1	0,15	0,37	0,29	0,43	0,47	0,59
	0,27	0,39	1	0,19	0,33	0,39	0,49	0,54	0,55
BM_4	0,25	0,20	0,11	1	0,20	0,39	0,20	0,21	0,21
	0,35	0,28	0,15	1	0,24	0,39	0,20	0,21	0,21
	0,30	0,26	0,19	1	0,26	0,51	0,30	0,32	0,28
BM_5	0,39	0,44	0,31	0,20	1	0,43	0,59	0,49	0,60
	0,50	0,54	0,37	0,24	1	0,43	0,59	0,49	0,60
	0,35	0,41	0,33	0,26	1	0,49	0,59	0,53	0,52
BM_6	0,37	0,43	0,29	0,39	0,43	1	0,31	0,34	0,44
	0,45	0,43	0,29	0,39	0,43	1	0,31	0,34	0,44
	0,43	0,49	0,39	0,51	0,49	1	0,39	0,42	0,44
BM_7	0,28	0,32	0,43	0,20	0,59	0,31	1	0,49	0,60
	0,38	0,32	0,43	0,20	0,59	0,31	1	0,49	0,60
	0,33	0,38	0,49	0,30	0,59	0,39	1	0,53	0,52
BM_8	0,14	0,25	0,47	0,21	0,49	0,34	0,49	1	0,51
	0,18	0,25	0,47	0,21	0,49	0,34	0,49	1	0,51
	0,21	0,32	0,54	0,32	0,53	0,42	0,53	1	0,51
BM_9	0,40	0,60	0,59	0,21	0,60	0,44	0,60	0,51	1
	0,47	0,60	0,59	0,21	0,60	0,44	0,60	0,51	1
	0,37	0,52	0,55	0,28	0,52	0,44	0,52	0,51	1

- determination of the degree of agreement of the board members within the coalitions identified on the basis of the analysis of the values of the similarity measures;
- construction of the elements of the similarity-difference matrix between the judgments of the board members in the form of a membership function to a fuzzy set;
- determining the competence of the board members on the issue of corporate culture based on the axiom of immutability;
- other important metrics, indicators and ratios.

But all these possibilities are not part of the tasks of this work and require further research.

7. Prospects for further research

In addition to the goals of studying the influence of the corporate culture of the organization, which are indicated in the previous section, several more areas of perspective research can be noted. For further structuring of issues related to corporate culture and formalization of recovery tasks, the following tasks should be considered:

- describe and detail the set of constituent elements of corporate culture;
- formalize metrics for selecting the most effective elements of corporate culture;
- choose the elements of corporate culture that are most essential for its improvement;
- build a model for determining the effectiveness of corporate events;
- by means of expert assessment, select a subset of the most effective corporate measures among all those involved in the organization's personnel management;
- determine the coefficients of relative importance of corporate events according to their impact on corporate culture and the HR cycle as a whole.

8. Conclusions

As a result of the conducted research, several urgent tasks were solved, which are directly related to the implementation of a harmonious corporate (organizational, internal) culture of the organization. The following tasks were formalized and described:

- the set of components of the life cycle of the organizational system is defined;
- a ranking of the constituent elements of the HR cycle was constructed according to incomplete rankings;
- the weighting factors of the influence of corporate culture on each of the elements of the HR cycle are determined;
- similarity measures of decision-makers based on their relationship to the structure and effectiveness of the organization's corporate culture were calculated.

Thus, the study of issues related to the impact of corporate culture on the organization's activities has received further development and improvement. In the following works, it is planned to deepen this direction of research. This will contribute to the further study of the influence of corporate culture on the activity of the organization's personnel management system. Improving and harmonizing corporate culture will contribute to increasing the effectiveness of the organization's activities [40, 41].

9. References

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