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THEORETICAL STUDY OF THE PROCESS OF CLEANING COTTON BEFORE PILING UP

Abstract: *The article examines the structures of cleaners describing the separation of large and small weed impurities from the cotton mass, will determine the parameters for calculating the cleaning effect of having an elastic bond with cotton.*

Key words: *cotton, technology, theory, equation, force, model, fibre.*

Language: *English*

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Introduction

The optimal number of working bodies for pile and saw drum cleaners are 6-14 and more, and its further increase does not increase the cleaning efficiency. At the same time, the number of drums in the pile drum cleaner, which is the first cleaner in the technological process, does not exceed 6 when cleaning low-grade raw cotton. It should also be taken into account that the harvesting of seed cotton by machine harvesting leads to an increase in the number of contaminants in it. The degree of contamination of raw materials collected in machine harvesting is from 8% to 30%, and higher mostly picked with a cotton swab. This underscores the need to improve the technique and technology of ginning cotton before the ginning process.

In the currently available technologies, after ginning, the seed cotton is cleaned from small impurities and then from large impurities. Pile drum cleaners are used for cleaning small contaminants, and sawdust drum cleaners are used for large contaminants. Considering that mechanical cleaning can damage the fibre and seeds, great attention is paid to the selection of the optimal number of seed cotton and fibre cleaning (the number of cleaning refers to the number of saw drums involved in cleaning the seed cotton).

This can be understood as follows. Experts have obtained graphs of the dependence of fibre classes (varieties) on the number of cleaning drums when changing the appearance of fibre by hand and machine-picked cotton. The fibre class (type) increases significantly when the number of cleaning drums increases from 1 to 6; As it increases from 6 to 12, the cleaning intensity decreases. Further increase in the number of drums does not lead to an improvement in fibre quality Table 3.12. However, as the number of cleaning drums increases, the quality of the fibre deteriorates as a result of the negative impact of the mechanical processing of the fibre. If the number of cleaning drums is not increased too much when processing for machine-picked cotton, the deterioration of the appearance of the fibre will not be noticeable. As the number of cleaning drums increases, the appearance of the fibre deteriorates the micronaire performance. It is necessary to minimize the mechanical impact on the process by maximizing the cleaning of the technological process of processing of seed cotton with the working bodies, as well as the rational placement of cleaners and reducing the number of transport devices.

Experiments were conducted to study the impact of fibre on quality indicators as a result of increasing the number of drums for cleaning raw cotton in the coordinated technological process of the enterprise.

The test used And-35, a variety of raw cotton, its initial quality indicators: industrial-grade III, class 2, moisture 12.5%, impurity 11.9%, maturity 0.7%, the degree of mechanical damage to the seed 1.5%.

Table 1. The following table shows the interaction between fibre qualities as a result of the increase in the number of cleaning drums.

Selection industry Types	Mechanical of seeds %		damage	Short fibre content %			Staple weight length of fibre, mm			Mass of defective and dirty mixtures,%		
Types	4	8	12	4	8	12	4	8	12	4	8	12
C-6524 II/2	1.9	1.9	2.1	7.7	7.7	7.9	32.4	32.2	32.2	2.3	2.3	2.4
And-35 III/2	3.7	3.8	3.9	9.5	9.0	9.8	31.3	31.2	31.1	3.9	3.9	3.9
And-35 IV/2	5.1	5.1	5.6	12.	12.5	12.2	30.4	30.1	30.0	8.5	8.6	8.7

Mechanical damage to the seed%, short fibre content %, fibre staple length mm in mm, mass fraction of defective and dirty mixtures%, when the number of cleaning drums is 6-8-12 in different selection varieties of raw cotton, with a working capacity of 5 tons/hour, the following are shown in the graphs. (Figure 1.1)

The selected raw cotton in each selection and industrial variety was carried out 3 times on experimental equipment, samples of raw cotton cleaned in the technological process were taken and laboratory analysis was carried out.

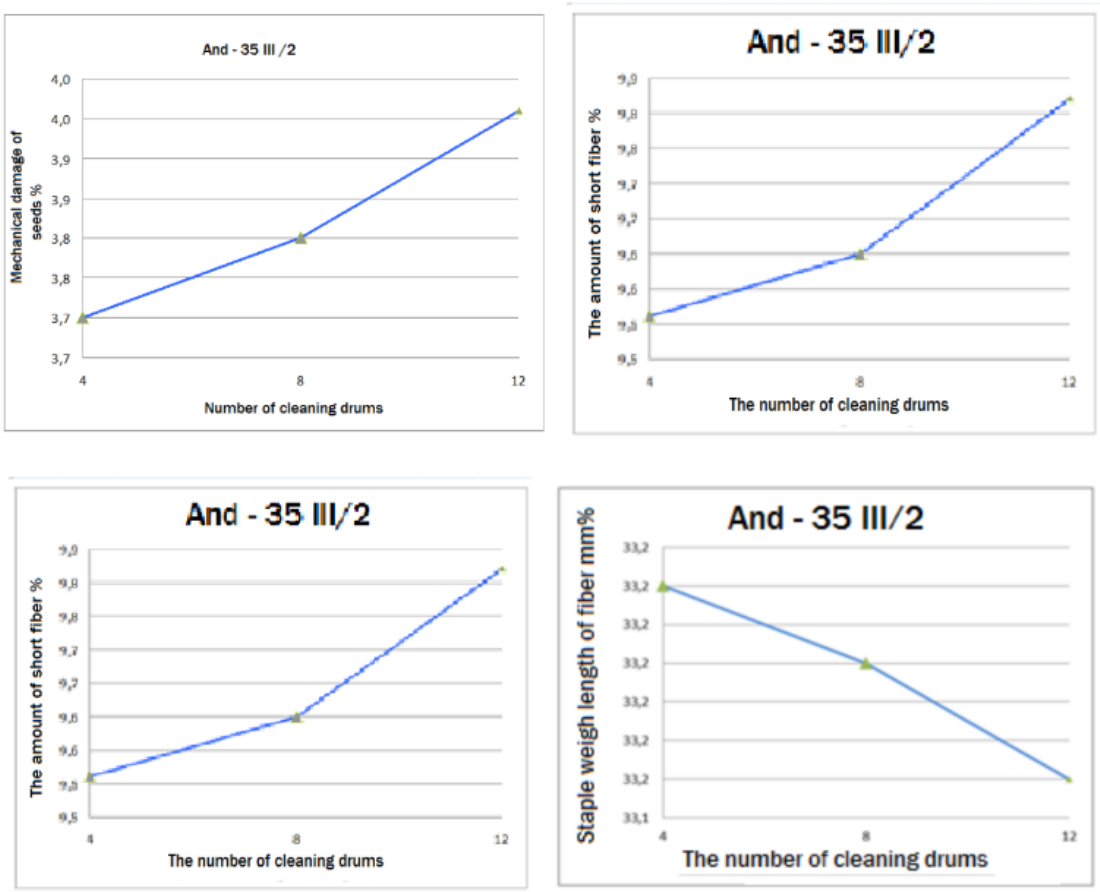

Figure 1. Mechanical damage to the seed, the amount of short fibre, the staple weight length of the fibre in mm, the mass fractions of defects and contaminants are given.

The results of the analysis show that the effect of cleaning frequency on cleaning performance at different work efficiencies is shown in the graph, when the number of drums for cleaning raw cotton increases from 4 to 12 at 5 t/h, mechanical damage to seeds from 3.70% to 3.96%; short fibre size, 9.51% to

9.82%; staple weight length of fibre from 31.35 mm to 31.15 mm; the mass of defective and contaminated compounds increased from 3.90% to 3.99%. Subsequent experimental work used S-6524, II-nav.2-class. 2-grade raw cotton, its initial quality indicators: moisture 10.5%, contamination 9.6%, mechanical damage to the seed 1.90, from 1.98%; short fibre, from 7.70% to 7.93%; staple weight length of fibre from 32.40 mm to 32.20 mm; the mass of defective and contaminated compounds increased from 2.30% to 2.47%.

And-35, IV-nav.2-class cotton raw material variety was used, its initial quality indicators: moisture 14.5%, contamination 15.5% mechanical damage of seeds from 5.10,% to 5.63%; short fibre, from 12.50% to 12.72%; staple weight length of fibre from 30.45 mm to 30.05 mm; the mass of defective and contaminated compounds increased from 8.50% to 8.76%. When analyzing the results obtained, we can see a decrease in quality indicators as a result of the mechanical processing of raw cotton and its fibre products in the coordinated technological process of the ginnery. It is obvious that in the cleaning of low-grade and high-pollution cotton is the maintenance of quality and the introduction of its technology.

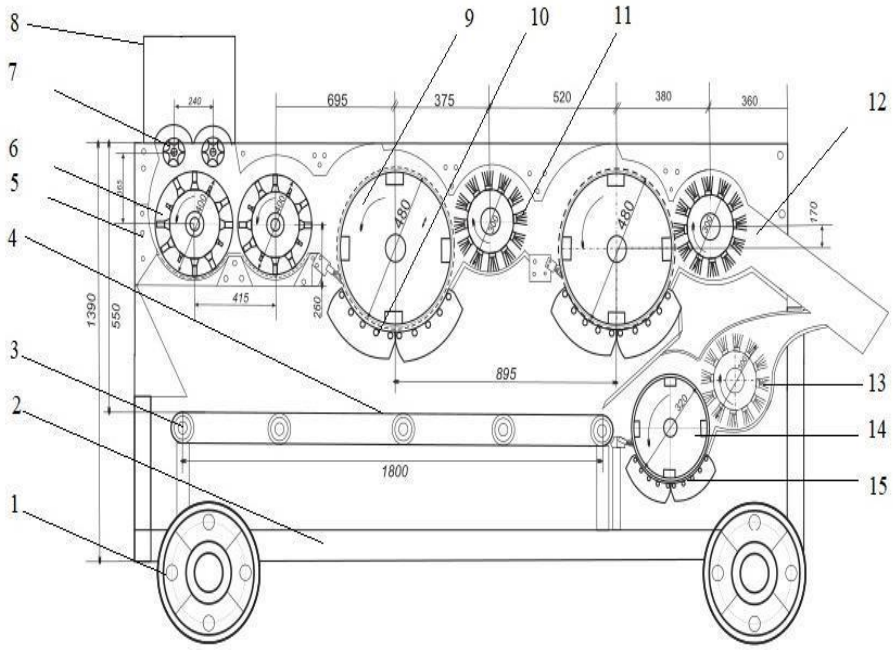

Figure 2. Schematic diagram of a cotton cleaning machine.

1 wheel, 2 device base, 3 collecting tape, 4 rollers, 5 mesh surface, 6 pile drum, 7-pile supplier, 8-pile receiving hopper, 9-ply drum, 10-ply grate, 11-ply drum, 12-pound cotton pipe, 13-ply drum, 14-ply drum, 15-ply ribbed grid.

Flow 1-XP (RX-1), EN 177 saw sections, UXK cotton ginning units. The EN 177 saw section is the main part of the 1XP ginnery and 1RX regenerators, and the high-impurity cotton raw material is fully processed by this technological process.

To clean the normal cleaning sections of cotton, the 3UXK unit with parallel-mounted cotton cleaning units is combined, the interchangeable UXK has 6 sections, 6 pile connections and 1 XK cleaner located in the last block.

The research and testing were carried out based on the "Coordinated Technology of Cotton Processing (PDQI-2016)", which has been used in the ginning industry of the Republic of Uzbekistan since 2016.

Table 2. Structural quality indicators of cotton fibre obtained from production according to the sequence scheme of the technological process

Sequence diagram of the technological process	Composite quality indicators of cotton fibre obtained from production						
	Breeding and industrial-grade S-6524 II / 2						
	Starting pollution, %	Total defects, %	Minor pollution	Ulyuk %	Broken seeds, %	Fibrous bark, %	Spun fibre, %
SS-15A 2SB-10 UXK DPZ-180	9,60	4,42	1,14	0,93	0,69	1,01	0,07

MKO new SS-15A 2SB-10 UXK DPZ-180	**4,50**	**2,85**	**0,96**	**0,91**	**0,65**	**0,98**	**0,05**

The technological process of the ginning industry was carried out according to the sequence scheme, selection and industrial varieties S-6524 II/2 according to the guidelines for determining the quality of cotton fibre from production and determined based on the following tables and graphs Table 3.13. Selection variety S-6524, industrial-grade second grade, initial contamination rate of second-grade cotton raw material -9.6%; humidity level-10.5%. Before washing, the cleaning efficiency was 4.5% when the cleaning process was performed on the newly introduced device, i.e. the cleaning efficiency was 53.1%. (Figure 1.4). After the cleaning process of S-6524 II/2 industrial grade cotton, the amount of fine defects is cleaned from 4.42% to 2.85%, the total amount of fine impurities is from 1.14% to 0.96%, the amount of fibrous fibre is from 0.93% to 0.91%, the amount of broken seeds is from 0.69% to 0.65%, The decrease in fibre seed husk from 1.01% to 0.98%, the amount of spun fibre from 0.07% to 0.05%, the increase in the quality of fibre products was determined based on the analysis.

Table 3. Structural quality indicators of cotton fibre obtained from production according to the sequence scheme of the technological process

Sequence diagram of the technological process	**Composite quality indicators of cotton fibre obtained from production**						
	Breeding and industrial-grade And-35 III/2						
	Starting pollution, %	**Total defects, %**	**Minor pollution**	**Ulyuk %**	**Broken seeds, %**	**Fibrous bark, %**	**Spun fibre, %**
SS-15A 2SB-10 UXK DPZ-180	11,90	5,19	1,19	1,16	0,83	1,28	0,12
MKO new SS-15A 2SB-10 UXK DPZ-180	5,40	3,46	1,05	0,98	0,76	1,06	0,09

Selection variety And-35, industrial-grade third grade, initial contamination rate of second-grade cotton raw material 11.9%; humidity level 13.5%; Before cleaning, the cleaning efficiency in the newly introduced device was 5.4%, ie the cleaning efficiency was 54.6%. The results of the comparative study show that after the cleaning process of And-35 III / 2 industrial grade cotton, the number of fine defects is 5.19% to 3.46%, the amount of fine impurities is 1.19% to 1.05%, the amount of fibrous fibre is 1.16% to 0.98%, the amount of broken seeds is 0.83. from 0.76 per cent, fibrous seed husk from 1.28 per cent to 1.06 per cent, and the amount of spun fibre from 0.12 per cent to 0.09 per cent, which led to an increase in the quality of fibre products.

Table 4. Structural quality indicators of cotton fibre obtained from production according to the sequence scheme of the technological process

Sequence diagram of the technological process	**Composite quality indicators of cotton fibre obtained from production**						
	Breeding and industrial-grade And-35 IV / 2						
	Starting pollution, %	**Total defects, %**	**Minor pollution**	**Ulyuk %**	**Broken seeds, %**	**Fibrous bark, %**	**Spun fibre, %**
SS-15A 2SB-10 UXK DPZ-180	**15,50**	**8,63**	**2,45**	**1,87**	**1,36**	**2,14**	**0,23**
MKO new SS-15A 2SB-10 UXK DPZ-180	**6,80**	**4,94**	**1,67**	**1,63**	**1,21**	**1,90**	**0,16**

Selection variety And-35, industrial-grade fourth grade, the second-grade cotton raw material has an initial contamination rate of 15.5% and a moisture content of 13.5%. Before cleaning, the cleaning efficiency of the newly introduced device was 6.8%, ie the cleaning efficiency was 56.1%. The results of the comparative research test show that after the cleaning process of And-35 IV / 2 industrial grade cotton, the amount of fine defects is 8.63% to 4.94%, the amount of fine impurities is 2.45% to 1.67%, the amount of fibre is 1.87% to 1.63%, the amount of broken seeds is 1.36. Based on the analysis, it was found that the quality indicators improved due to a decrease of 1.21 per cent.

Table 5. The new device shows the effect of the distances between the saw drum and the ribbed grids on the cleaning efficiency and quality level of the cotton.

Selection and industrial variety	Cotton pollution level,%	The distance between the saw and the rib mm device	Work efficiency, t/s	Device cleaning efficiency, %	The amount of raw cotton in the waste, %	The amount of raw cotton in the waste, relative to the total amount of ginned cotton, %	Mechanical damage to seeds, %
S-6524 II/2	8.3	12-14	3.0	48	4.4	0.1	1.98
	9.6	14-16	3.0	53.1	4.5	0.3	1.99
	9.4	16-18	3.0	55.3	4.7	0.2	1.97
And-35 III/2	11.5	12-14	2.8	51.3	4.8	0.4	3.81
	11.9	14-16	2.8	54.6	4.9	0.5	3.85
	11.7	16-18	2.8	55.5	4.9	0.6	3.86
Анд-35 IV/2	14.7	12-14	2.5	51.0	5.3	0.5	
	14.7	14-16	2.5	56.1	5.6	0.6	5.15
	15.5	16-18	2.5	55.7	5.5	0.5	5.19

The results of a comparative study obtained during the technological treatment of raw and unpolluted cotton from the Garam area are given above. The device, which was introduced into production in a new design, allows to carry out pre-ginning cleaning of cotton, the use of new technology in ginning plants, the loss of raw materials while maintaining the quality of cotton products within the norm, reducing fuel and electricity consumption and ensuring a high level of revenue from the sale of fibre at the end of production. In summary, after cleaning processes of industrial varieties S-6524 II / 2, And-35 III / 2, And-35 IV / 2, it was found that the cleaning efficiency from small, large and general defects is high.

Based on a small sample of cotton fibre, the traditional methods of testing using a tool were identified, in which a test sample was obtained by repeatedly averaging and reducing the number of samples selected from different locations after fibre cleaning machines. These methods are used in the assessment of the quality of cotton fibre, in the work of breeders, cotton gins and textile enterprises in the quality control of products in the technological process. [3] The following table shows the methods for determining the fibre quality of fibre products obtained from production in the laboratory system HVI 900 SA of Namangan regional laboratory by length, toughness, elongation at break, micronaire, colour and contamination.

Table 6. Republican Center for Certification of Cotton Fiber "Sifat", Namangan regional laboratory Results of production of fibre products in the laboratory system HVI 900 SA

Selection and industrial grade	High average length (UHML) mm, inch	Micronaire Indicator (Mic),%	Specific tensile strength Strength (Str), cN/tex	Light reflection coefficient Reflectance (Rd),%	Yellowness Rate Yellowness + b),	Trash code (T),%	Short fibre index (SFI), mm	Long same Index (Unf), %
And-35 III/2	(28.7)1.13	5.2	37.8	66.5	8.0	13	9.8	82.8
And-35 III/2	(28.9)1.14	5.1	36.9	66.3	8.2	19	12.2	81.6
And-35 III/2	(28.1)1.11	5.2	39.1	67.7	7.9	11	8.1	83.6
And-35 III/2	(28.8)1.14	5.2	35.9	66.1	8.6	18	9.8	83.5
And-35 III/2	(29.8)1.17	4.9	39.7	66.6	7.7	14	7.0	83.4
And-35 III/2	(28.0)1.10	5.0	35.4	67.6	7.8	15	13.3	81.0

S6524 II/2	**(29.8)1.17**	**5.1**	**43.1**	**67.4**	**8.3**	**13**	**7.9**	**84.0**
S6524 II/2	**(29.601.16**	**4.9**	**41.1**	**69.9**	**7.4**	**13**	**8.9**	**83.5**
S6524 II/2	**(29.3)1.15**	**4.9**	**39.2**	**68.7**	**7.6**	**10**	**10.8**	**83.3**
S6524 II/2	**(29.8)1.17**	**4.9**	**41.2**	**70.7**	**7.3**	**15**	**13.3**	**81.0**
S6524 II	**(29.3)1.15**	**5.0**	**39.3**	**67.5**	**7.6**	**9**	**10.2**	**83.1**

Conclusions

Studies have shown that during the movement of raw materials along the mesh surface, a contact force is formed between the organic particles in the cotton and the mesh surface, under the influence of which a flash occurs, resulting in reduced productivity and a negative impact on cotton quality. Proper organization and introduction of equipment in the technological process will reduce the level of damage to raw cotton, which will significantly increase the economic efficiency of the enterprise. In addition, uniformity in Unf-length indicates a decrease in short fibres in the free fibre content, an increase in specific tensile strength, and an increase in Elg-length elongation.

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INTERVAL METHOD OF MATHEMATICAL MODELING OF WELL LOCATION FOR OBTAINING A CONTINUOUS LINE OF CRACKS USING NON-EXPLOSIVE DESTRUCTIVE MIXTURE (NDM)

Abstract: *This article discusses the problem of obtaining a solid straight line of cracks when using non-explosive destructive mixtures in rocks. An interval version of the mathematical model and an algorithm for solving this problem have been substantiated and obtained. A theorem is proved that summarizes the result obtained. An interval strip with a limited width is shown, where the centers of the wells should be located.*

Key words: *well, fracture, non-explosive destructive mixture (NDM), interval, interval width, middle of the interval, coordinates of the well center, strength, extensibility.*

Language: *English*

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Introduction

When using non-explosive destructive mixtures (LDS), it is very important to determine the location of the wells to obtain a solid straight line of cracks in the fractured rocks. Their location and the formation of cracks in a straight line depends on the structure, strength and degree of elongation, etc. processed breeds. Cracks appear in rocks after applying LDCs. These cracks are formed as a result of chemical-physical reactions of the applied LDC. Fractures can form anywhere in the well and develop in any direction. As a result, the resulting material may be unusable or some of it has to be rejected. For this reason, experts in this area are conducting research. Generally speaking, the formation of these cracks depends on many factors. For example, they depend on the composition of the mixture used, the material of the rock, the diameter and depth of the boreholes, the distance between the boreholes, strength, rock formation rate, etc. are taken into account. In this case, the solution of the problem of obtaining a solid line as a result of emerging cracks, when using LDCs, becomes a difficult task. If one or another method is used, then it is possible to give direction to these fractures in order to end up with connected fractures, which ultimately form a continuous line of fractures between the wells. One of these options is proposed in article [4]. In this article, in the process of solving this problem, a theorem is mathematically modeled and proved, which states that the centers of the wells are located along a straight line if the coordinates of these centers satisfy a certain condition. We present this theorem from [4].

Theorem. If the following condition is satisfied: the distance between the points of the coordinate axes $x_1, x_2, \dots, x_n$ and $y, \dots, y_n$ must be equal, i.e.

$$x_2 - x_1 = x_3 - x_2 = \dots = x_n - x_{n-1} = a,$$
$$y_2 - y_1 = y_3 - y_2 = \dots = y_n - y_{n-1} = b,$$

then the points $M_1(x_1; y_1)$, $M_2(x_2; y_2)$, …, $M_n(x_n; y_n)$, which are the centers of the wells, lie on one straight line given by the equation

$$y - y_1 = \frac{b}{a}(x - x_1) \qquad (1)$$

The result of this theorem is confirmed by examples, as well as by experimental data. This theorem is a real solution to this problem.

Below, a mathematical model will be given in the interval version, where the problem of the mutual arrangement of wells according to the design development for splitting off part of the rock from the main mass is solved, without causing damage to the non-design one, i.e. not developed part of the breed. The solution of this problem in the interval variant, or rather by the methods of interval analysis [2], is motivated by the fact that the diameter, depth of the well, as well as the distance between them can vary within a certain interval, depending on many parameters of the developed rock [3]. For example, according to [3], the borehole diameter $d \in [60; 100]$*мм*, depth $h \in [6d; 10d]$, distance between wells $l = 1000\frac{df}{\sigma}$*мм* etc., here f is the coefficient of rock expansion, σ is the coefficient of rock strength. For this reason, naturally, these parameters need to be considered in a certain interval. Consideration of the mathematical model in the interval version guarantees two-sided estimates of these parameters for the lower and upper boundaries of the obtained intervals.

Consider the following problem: at what location of the wells can a continuous fracture be obtained between the wells?

In order to answer this question, we will proceed as follows.

Taking into account the given motivation of the interval option, the well diameter d and the coordinates of the well center $M_i(x_i; y_i)$are taken as an interval value, ie $\boldsymbol{d} = [\underline{d}, \overline{d}]$, $\boldsymbol{x}_i = [\underline{x_i}, \overline{x_i}]$ and $\boldsymbol{y}_i = [\underline{y_i}, \overline{y_i}]$, here $\underline{x_i}$-is called the lower bound and $\overline{x_i}$–is the upper bound of the interval $\boldsymbol{x}_i$, respectively, which are real numbers. Further, the intervals, according to the generally accepted rules, are designated in bold, and real numbers in regular fonts. In what follows, all arithmetic operations on interval values will be carried out, according to [1], in the complete interval arithmetic of Kaucher, which is usually denoted ***KR***. Интервальное пространство и классическую интервальную арифметику в этом пространстве обозначим через ***IR*** [1].

Let, $*\in\{+,-,\cdot,/\}$, then $*\in \boldsymbol{KR}$ means that operations of addition, subtraction, multiplication and division are performed in full interval arithmetic ***KR.***

Now let's get down to solving the problem.

Without loss of generality, we will proceed as follows. The considered intervals are located in the positive part of the abscissas and ordinates. Then these intervals are positive and non-zero containing intervals. The intersection of the intervals $\boldsymbol{x}_i$ and $\boldsymbol{y}_i$ in R^2 form rectangles containing points $M_i(x_i; y_i)$, the sides of which are equal to $\overline{x_i} - \underline{x_i}$, $\overline{y_i} - \underline{y_i}$ respectively.

We present some characteristics of interval quantities according to [2], which we will use in further reasoning.

The middle of the interval $\boldsymbol{a} = [\underline{a}, \overline{a}]$ is the quantity $mid(\boldsymbol{a}) = \frac{1}{2}(\underline{a} + \overline{a})$, the width of this interval is the quantity $wid(\boldsymbol{a}) = \overline{a} - \underline{a}$.

The interval version of a straight line is considered in [5], in the form of a generalized line, defined as a strip containing rectangles $\boldsymbol{x}_i \cap \boldsymbol{y}_i$ obtained as a result of intersection of intervals $\boldsymbol{x}_i$ and $\boldsymbol{y}_i$. In the real version of the problem under consideration, according to [4], the coordinates of the point should satisfy the condition:

1. abscissas of point $x_2 - x_1 = x_3 - x_2 = \ldots = x_n - x_{n-1} = a$, (*)
2. the ordinates of the point $y_2 - y_1 = y_3 - y_2 = \ldots = y_n - y_{n-1} = b$. (**)

Note that $x_i \in \boldsymbol{x}_i$ and $y_i \in \boldsymbol{y}_i$for all i = 1, 2,…, n.

Now, using the introduced notation, we rewrite equalities (*) and (**) in the following form

$$\mathrm{mid}(\boldsymbol{x}_2) - \mathrm{mid}(\boldsymbol{x}_1) = \mathrm{mid}(\boldsymbol{x}_3) - \mathrm{mid}(\boldsymbol{x}_2) = \cdots = \mathrm{mid}(\boldsymbol{x}_n) - \mathrm{mid}(\boldsymbol{x}_{n-1}) = a, \qquad (2)$$

$$\mathrm{mid}(\boldsymbol{y}_2) - \mathrm{mid}(\boldsymbol{y}_1) = \mathrm{mid}(\boldsymbol{y}_3) - \mathrm{mid}(\boldsymbol{y}_2) = \cdots = \mathrm{mid}(\boldsymbol{y}_n) - \mathrm{mid}(\boldsymbol{y}_{n-1}) = b, \qquad (3)$$

where a and b are constant numbers.

Further, as in the real case [4], we require the location of the middle of the intervals Mi on one straight line, since the middle of these intervals, by definition, are real numbers. Then these points lie on one straight line and satisfy the equation of the straight line

$$\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1}.$$

Substituting in this equation instead of x and y the corresponding interval values, we obtain

$$\left.\begin{array}{c}\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_2)-\mathrm{mid}(\boldsymbol{x}_1)}=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_2)-\mathrm{mid}(\boldsymbol{y}_1)},\\ \frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_3)-\mathrm{mid}(\boldsymbol{x}_1)}=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_3)-\mathrm{mid}(\boldsymbol{y}_1)},\\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots\\ \frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_n)-\mathrm{mid}(\boldsymbol{x}_1)}=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_n)-\mathrm{mid}(\boldsymbol{y}_1)}\end{array}\right\} \qquad (4)$$

By term addition of the left and right sides of equality (4), respectively, gives

$$\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_2)-\mathrm{mid}(\boldsymbol{x}_1)}+\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_3)-\mathrm{mid}(\boldsymbol{x}_1)}+\cdots+\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{\mathrm{mid}(\boldsymbol{x}_n)-\mathrm{mid}(\boldsymbol{x}_1)}=$$
$$=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_2)-\mathrm{mid}(\boldsymbol{y}_1)}+\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_3)-\mathrm{mid}(\boldsymbol{y}_1)}+\cdots+\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{mid}(\boldsymbol{y}_n)-\mathrm{mid}(\boldsymbol{y}_1)} \qquad (5)$$

By virtue of equalities (2) and (3), we can write

$\mathrm{mid}(\boldsymbol{x}_2)-\mathrm{mid}(\boldsymbol{x}_1)=a,\ \mathrm{mid}(\boldsymbol{x}_3)-\mathrm{mid}(\boldsymbol{x}_1)=2a,\dots,\mathrm{mid}(\boldsymbol{x}_n)-\mathrm{mid}(\boldsymbol{x}_1)=(n-1)a$ and $\mathrm{mid}(\boldsymbol{y}_2)-\mathrm{mid}(\boldsymbol{y}_1)=b,\mathrm{mid}(\boldsymbol{y}_3)-\mathrm{mid}(\boldsymbol{y}_1)=2b,\dots,\mathrm{mid}(y_n)-\mathrm{mid}(y_1)=(n-1)b.$

Further, using the properties of the interval operation [1], the denominators of the fractions in equality (5) will be replaced by the corresponding numbers, this is possible since the denominators contain numbers, then we have

$$\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{a}+\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{2\mathrm{a}}+\cdots+\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{(\mathrm{n}-1)\mathrm{a}}=$$
$$=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{b}}+\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{2\mathrm{b}}+\cdots+\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{(\mathrm{n}-1)\mathrm{b}}. \qquad (6)$$

In equality (6), putting the common factors outside the bracket, we get:

$$\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{a}\left(1+\frac{1}{2}+\cdots+\frac{1}{(\mathrm{n}-1)}\right)=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{b}}\left(1+\frac{1}{2}+\cdots+\frac{1}{(\mathrm{n}-1)}\right).$$

Reducing the expressions in parentheses in both parts of the last equality, we have:

$$\frac{\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)}{a}=\frac{\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)}{\mathrm{b}}. \qquad (7)$$

After making simple transformations, we rewrite the last equality in the following form:

$$\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)=\frac{b}{\mathrm{a}}(\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)). \qquad (8)$$

Equation (8) defines the strip widths on the plane located in the first quarter of the *Oxy* plane.

This means that the centers of the wells are located within this strip, and the distance between the centers of the wells is constant, i.e. equal, this follows from conditions (2) and (3). The coordinates of the well centers are located at points $\mathrm{M}_i(mid(\boldsymbol{x}_i);\ \mathrm{mid}(\boldsymbol{y}_i))$. The direction of the strip determines the $\frac{b}{\mathrm{a}}$ value. The distance between the centers of the wells is defined by the equalities

$$\mathrm{M}_{i+1}(\mathrm{mid}(\boldsymbol{x}_{i+1});\ \mathrm{mid}(\boldsymbol{y}_{i+1}))-\mathrm{M}_i(\mathrm{mid}(\boldsymbol{x}_i);\ \mathrm{mid}(\boldsymbol{y}_i))=l, \qquad (9)$$

where $i=1,2,\dots,n-1$.

Now let us determine the width of the resulting strip, given by equation (8).

This is the same as specifying the width of the intervals $\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)$ and $\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)$. Determine the width of the interval $\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1)$.

By definition and the interval width property

$$wid(\boldsymbol{x}-\mathrm{mid}(\boldsymbol{x}_1))=wid(\boldsymbol{x})+wid(\mathrm{mid}(\boldsymbol{x}_1))=wid(\boldsymbol{x})+\mathrm{mid}(\boldsymbol{x}_1)=$$
$$=\overline{x}-\underline{x}+\frac{1}{2}(\overline{x}_1+\underline{x}_1)=\left(\overline{x}+\frac{1}{2}\overline{x}_1\right)-\left(\underline{x}-\frac{1}{2}\underline{x}_1\right). \qquad (10)$$

In the same way, we get the result for the interval $\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1)$:

$$wid(\boldsymbol{y}-\mathrm{mid}(\boldsymbol{y}_1))=\left(\overline{y}+\frac{1}{2}\overline{y}_1\right)-\left(\underline{y}-\frac{1}{2}\underline{y}_1\right). \qquad (11)$$

From equality (10) and (11) it is seen what the width of the resulting strip given by formula (8).

Consequence. Since we need to find the strip with the smallest width, in equality (8) the expressions $\boldsymbol{x} - \text{mid}(\boldsymbol{x}_1)$ and $\boldsymbol{y} - \text{mid}(\boldsymbol{y}_1)$, without loss of generality, can be replaced by $wid(\boldsymbol{x})$ and $wid(\boldsymbol{y})$, which are often found and are convenient for use in practical tasks. Then we get

$$wid(\boldsymbol{y}) = \frac{b}{a}\, wid(\boldsymbol{x}). \qquad (12)$$

If we put $wid(\boldsymbol{x}) = minx_i$ and $wid(\boldsymbol{y}) = miny_i$ for all i=1, 2, …, n, then equality (12) takes the form

$$\min_i y_i = \frac{b}{a}\min_i x_i. \qquad (13)$$

Equality (13) is of practical value, since engineers work with real numbers, not intervals, and this equality sets the strip with the smallest width. Figure 1 shows the determination of the swath width and the location of the well centers, for three points as the center of the wells.

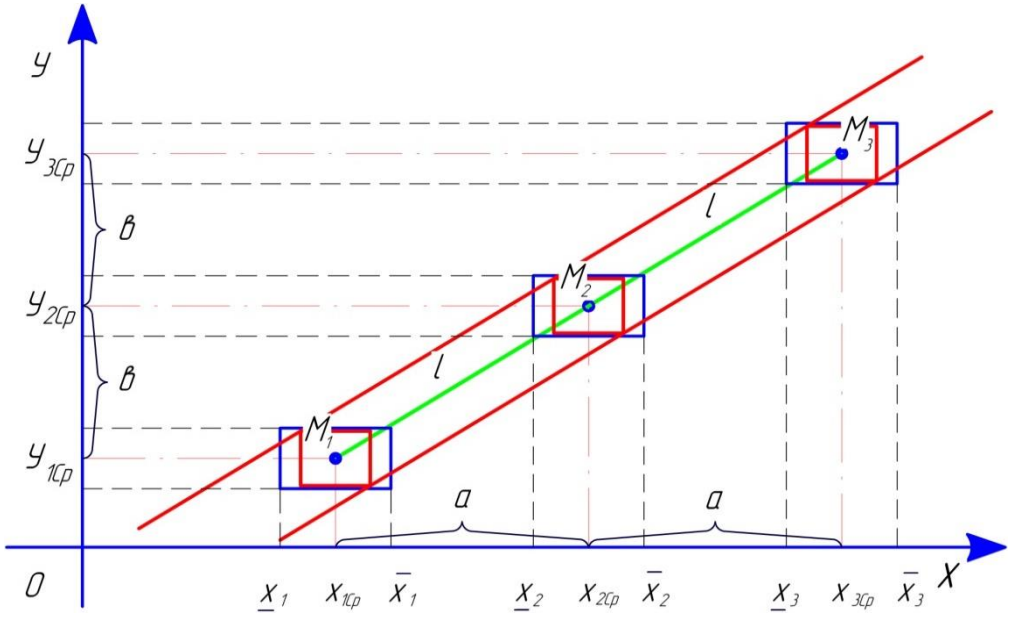

Figure 1. The image of the strip and the location of the centers of the wells.

It is known that the smallest area of a rectangle is equal to the area of a square obtained from this rectangle with a smaller side.

Further, let us denote by ρ the width of the strip and by c the side of the square obtained from the rectangle $\boldsymbol{x}_i \cap \mathbf{y}_i$. The side of a square is determined by the following equality

$$c = \begin{cases} \min\limits_i x_i, & if\ \min\limits_i x_i \le \min\limits_i y_i \\ \min\limits_i y_i, & if\ othewise. \end{cases}$$

for $i = 1, 2, \ldots, n$.

In this case, the bandwidth ρ will be equal to

$$\rho = \sqrt{2}c, \qquad (14)$$

if the strip is sloping and

$$\rho = c, \qquad (15)$$

In this case, the well, like a circle, is inscribed in a square with side c, therefore, for the diameter of the well, the inequality

$$d \le \rho.$$

Thus, the derivation of equation (8) and, as a consequence, equation (12) and equality (13), are the solution to the problem posed. Equalities (14) and (15) determine the width of the resulting strip. As a result of obtaining these equations, the following theorem was proved.

Theorem. If for the intervals $\boldsymbol{x}_i, \boldsymbol{y}_i \in \boldsymbol{IR}$, i=1, 2, …, n, conditions (2) and (3) are satisfied, then

1) the coordinates of the points of the center of the wells are located along the strip determined by equality (8), and the smallest width of this strip is given by equalities (14) (or (15));

2) the distance between the wells is determined by equality (9).

Figure 2 shows a general view of the location of wells in the area of processed rocks, specified by the customer's technical regulations.

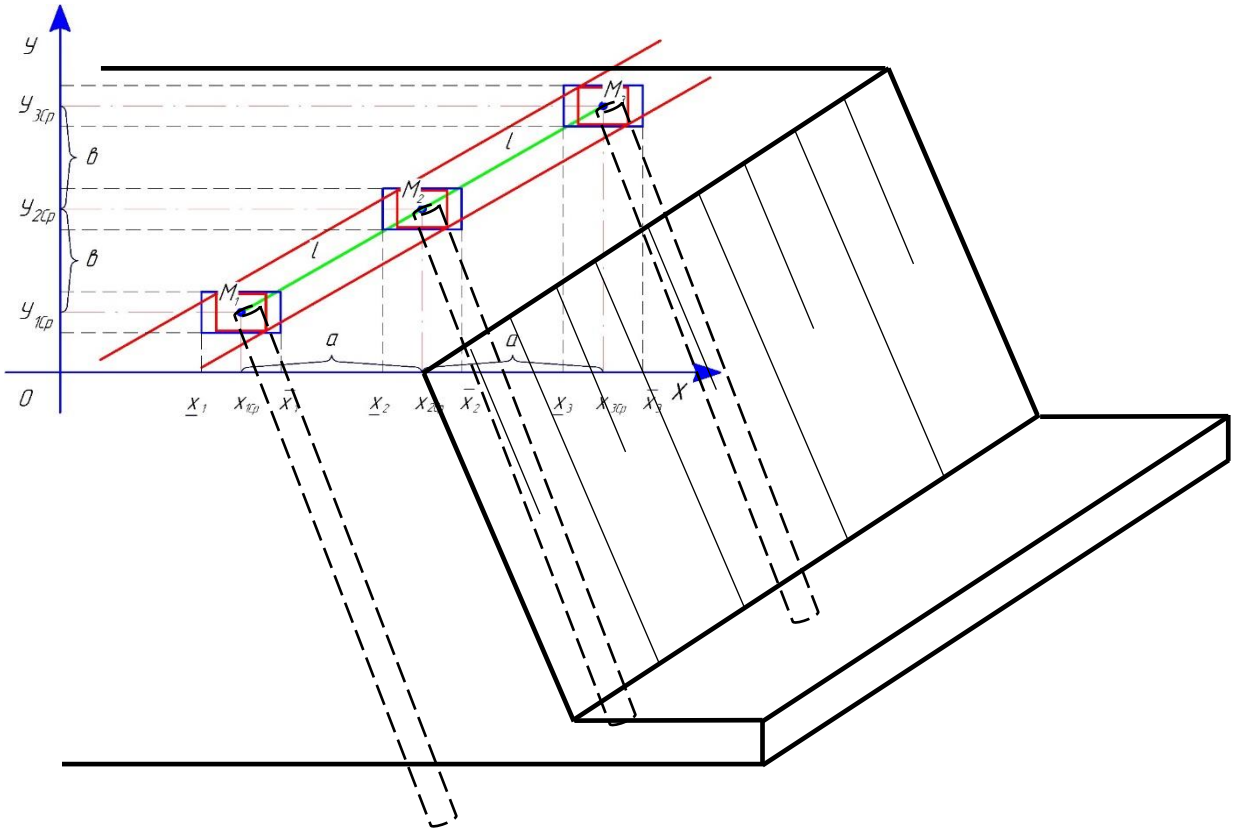

Figure 2. Images of a general view of the location of wells in the area of the treated rocks.

Conclusion

In recent years, there has been an intensive search for methods for the effective development of rocks. Arbitrary location of wells, when used for blasting purposes, after the explosion of the rock, those parts of the rock mass that were not the object of design development will suffer. The shock is free from the explosion, forming many cracks in this part of the mountain range, loosening it, which can subsequently lead to emergency situations. It is these circumstances that force researchers to search for optimal solutions. The solution of the problem posed in the interval variant gives a wide range for the location of the wells, but indicates the exact boundaries, which is one of the essential factors in the consideration of the tasks of blasting operations on rocks. If equality (8) determines the width of the strip for the location of the wells, then using equalities (12) and (13) it is possible to obtain the exact boundaries of the strip width and coordinates of the center of the wells, respectively.

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STUDY OF THE EFFECT OF FUNGICIDES IN FIELD CONDITIONS FROM VEGETABLE CROPS AGAINST TOMATO DISEASE

Abstract: *It is known that the tomato plant is one of the most important food crops. In recent years, tomatoes have been found to cause various diseases and damage to crops. One such disease is tomato fruit black mold (alternariosis). The lycopersici stimulates the gifomycete fungus. The leaves, stems and fruits of the plant are damaged. On the fruits of tomatoes develops a disease of dark brown or black, sunken appearance, and they pass into the fruit. The resulting disease is more common in areas where the fruit is attached to the twig.*

Key words: *microorganisms, fungi, vegetation, fungicides, alternariosis, vegetable crops, tomatoes.*

Language: *English*

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Introduction

UDC 632.9+582.288

In Uzbekistan, it has been reported that Alternaria solani, a fungus caused by the fungus Alternaria solani, has been detected in greenhouses and has affected 70-80% of crops, but according to the author, the disease is most likely caused by the fungus A. alternata. The most important of the conditions necessary for the strong development of the disease - the presence of high humidity for a long time. By removing the lower leaves of the tomato and ensuring that the humidity is 70-80% by heating and ventilating the greenhouse, the crop will not be severely damaged. In order to prevent the accumulation of infection, damaged plant debris should be removed from the greenhouse and disposed of. If there is a strong risk of disease development, it is recommended to spray the crop fungicide. If fungicides are used regularly against the pathogen, it is necessary to develop a carefully prepared program of application of the fungicide, taking into account the possibility that the pathogen will also develop resistance to them [7,10].

In order to increase the yield and quality of vegetable crops grown in the country, the use of modern technology in their cultivation, the introduction of productive and local varieties, as well as a number of factors play a special role in effective protection of vegetables from various diseases [1,4,2].

Research results.

The fight against the disease in the fields is carried out on the basis of complex agrotechnical, biological, chemical and other measures. The importance of chemical control measures in the protection of the plant and its crop is high. The chemical method has several drawbacks and pollutes the environment. But their effects are fast and highly effective. In the research of S.Ya. Popov and others we can find information about anti-disease drugs and the history of their use. Sulfur preparations have been used as fungicides for many years and are still widely used in agriculture [3].

The chemical method has several drawbacks and pollutes the environment. But their effects are fast and highly effective. Proper use of fungicides is important in protecting crops and increasing yields.

The list of pesticides and agrochemicals allowed in the territory of the Republic of Uzbekistan (list, 2016) includes 124 fungicides and 69 seeds. Of such a wide range of drugs, 12 have been recommended for alternariosis of vegetable plants [8,11].

According to Khojaev, the correct use of chemicals is important in protecting crops and increasing productivity.

Insufficient research on the effectiveness of fungicides against diseases of vegetable crops, as well as the use of fungicides against fungal diseases, prompted the implementation of these studies [5,6,9].

During the study, the biological efficacy of Folicur 25% em.k. against tomato alternariosis was studied, the results obtained are presented in Table 1. If we pay attention to the data in the table, the consumption of Folicur 25% em.k drug from 0.5 l / ha to 1.0 l / ha - when used in moderation, the disease is 65.0% to 2.0% compared to control, 0.5 l / ha. Expenditures were reduced from 65.0% to 5.0%.

Table 1. Biological effectiveness of Folicur 25% em.k fungicide against alternariosis during the growing season of tomatoes,% (Tashkent region, Tashkent district "Yakhyakhon Ziyo Nur Agro" farm 2014 y).

Experiment options	Preparation of use, kg / ha	Damage %				Preparation Biologically effective, %		
		Until processing disease development, %	day			day		
			15 days	30 days	45 days	15 days	30 days	45 days
Folicur	0,5	65,0	5,0	12,0	35,0	69,4	66,2	45,3
Folicur	1,0	65,0	2,0	14,0	35,0	**73,4**	63,7	45,3
Unprocessed control	-	65,0	76,0	81,0	86,0	-	-	-
EKF $_{05}$=						2,3		

Folicure 25% em.k drug at a dose of 0.5 l / ha to 1.0 l / ha - its effectiveness was observed to be high, ie from 69.4% to 73.4%, increasing the dose leads to a decrease in the effectiveness of the drug arrival was noted. So, Folicure 25% em.k. Consumption of the drug at around 1.0 l / ha is a good norm in the fight against the disease. Based on the results obtained, we can conclude that the follicle is 25% em.k. application of the drug against alternariosis of tomatoes is highly effective.

The most effective rate of application of folicul preparations for alternariosis in vegetable crops is 1.0 l / ha. So Folicure 25% em.k. drug gives good effect against alternariosis, we now plan to try drugs for alternariosis in vegetable crops that have not been used before.

Table 2. Infection of tomatoes with alternariosis during the growing season,% (Temir Kadam farm, Qibray district, Tashkent region, 2015)

Experience variaty	consumption rate, kg / ha, l / ha	until processed	15 days	30 days	45 days
Ridomil Gold MTs 68% s.d.g.	1,5	74,0	5,0	13,0	35,0
	2,5	74,0	2,0	10,0	32,0
Fundazol 50% n.kuk. (default)	1,5	77,0	9,0	19,0	39,0
	2,5	77,0	6,0	27,0	44,0
Unprocessed control	-	77,0	87,0	90,0	97,0
EKF$_{05}$=			0,9	1,4	2,4

Two field experiments were conducted to test new drugs against alternariosis during the growing season of plants.

In our first experiment, Ridomil Gold MTs was found to be 68% s.d.g. preparations were obtained. For comparison, Fundazol 50% n.kuk. fungicide was applied. During the experiment, 77% of the plant leaf damage was noted. Less damage to the fruit was observed (Table 2).

Ridomil Gold MTs, when used at a dose of 1.5-2.5 kg / ha, is effective and protects the plant from disease throughout the growing season.

Based on their experiments, we can conclude that both drugs are highly effective in tomato alternariosis during the growing season of the plant.

Conclusion.

Alternariosis fungal disease is very dangerous for tomatoes, and if no measures are taken to control it, the quantity and quality of the crop will fall sharply. The most effective rate of application of folicul 25% emk drugs for alternariosis in vegetable crops is 1.0 l / ha. Folicur 25% em.k. When applied at a consumption rate of 0.5 to 1.0 l / ha, plant damage decreased from 65.0% to 2.0%.

When Fundazol 50% n.kuk was used at a consumption rate of 2.5 kg / ha, plant damage decreased from 77.0% before treatment to 2.0% after 15 days.

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STUDY OF THE INFLUENCE OF GRAPHENE NANOFILLERS ON THE PROPERTIES OF COMPOSITES BASED ON POLYPROPYLENE

Abstract*: The paper studies the effect of graphene nanofillers on the physical and mechanical properties of composites based on polypropylene. Methods for the homogeneity of the system with the introduction of nanofillers are proposed. The possibility of using graphite nanofillers to obtain composites based on polypropylene is shown.*

Key words*: graphene, polypropylene, modification, physical and mechanical properties.*

Language*: English*

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Introduction

Methods for obtaining polymer composite materials depend and are determined, first, by the state of aggregation, as well as the type and type of filler introduced [1]. Most of the methods for producing polymer composites include the stage of making so-called press powders either by the wet method, for example, by impregnation with resins, or by the dry method, for example, by rolling. These technological solutions are multi-stage and expensive, environmentally harmful, and lead to wear and tear of technological equipment. Today in developed countries, it is used, showing the prospects for the use of graphite nanotubes, nanofibers, graphene particles as effective modifiers [2]. Despite the availability of a number of results obtained in this field, until now there is no general concept of filling polymers with graphene nanofillers. Combining graphite nanofillers with a polyolefin matrix is a very successful way to combine the mechanical properties of nanostructures with the advantages of composite materials based on polyolefins. The unique properties of graphite nanostructures make them ideal reinforcing agents in polymer matrices [3].

It is difficult to incorporate graphene particles into a polymer matrix. In order to realize the properties of graphite nanostructures, an extended interfacial area between the nanostructures and the polymer is required. The use of solution technology does not allow achieving the goals of

nanomodification, and the properties of such a composite are significantly low. The physical and mechanical properties of polyolefins reinforced with graphene nanofillers do not significantly improve, since weak interfacial adhesion at the polymer – nanofiller phase interface interferes with the connection [4].

The introduction of nanofillers into the melt under intense loads is an alternative method for thermoplastic polymers. The advantages of this technology are high productivity, compatibility with standard polymer processing technologies, and standard equipment. Therefore, there is growing interest in the inclusion of graphite nanoparticles in polymer matrices to obtain materials with improved characteristics [5].

Our research is devoted to the creation of composites based on polypropylene and graphite nanoparticles. For the study, we used Chinese-made nano graphene powders [6,7,8].

Polypropylene (grade 01030) was used as a polymer matrix. A laboratory extruder (temperature from 150 to 20 ° C) was used to move the nanocomposites. After dry mixing, all components were added simultaneously to the hopper. To assess the properties, samples were obtained under pressure at 185–225 ° C on an LMU-500 injection-molding machine [9,10,11].

Commercially produced graphene nanofillers inevitably contain impurities, have different defectiveness, high van der Waals interaction, which leads to the aggregation of graphite structures and complicates their uniform distribution in the polymer matrix. For uniform dispersion of nanofillers in a polypropylene matrix, an UZS-01 ultrasonic mixer was additionally used. Polypropylene nanocomposites were prepared by diluting a propylene glycol-based concentrate, a nanofiller, in a polypropylene matrix while mixing in a melt. Then, standard samples were prepared under pressure by the casting method [12,13,14].

The physical and mechanical properties of polymer nanocomposites largely depend on the dispersion of the filler and the interfacial interaction at the interface. Efficient stress transfer at the polypropylene - nanofiller interface determines the high strength characteristics of the material. Table 1 shows the properties of nanofilled polypropylene.

Table 1. Influence of graphite nanofillers on the properties of composites based on polypropylene

Composition	Melt flow rate, g / 10 min	Flexural strength, MPa	Impact strength, kJ / m^2	Strength at rupture, MPa
Polypropylene	2,7	36	70	38
Polypropylene + graphite nanoparticles, 4:1 wt rel.	3,1	44	86	49

It can be noted that in the case of using graphene, the effect of significant strengthening of the composite and an increase in its impact toughness at a degree of filling of 0.01 wt. % can presumably be associated with two circumstances: both graphene surfaces are used in the formation of contacts between the matrix and the filler; not excluded are "through" interactions "matrix - matrix" through the graphene layer, the thickness of which approximately corresponds to the atomic diameter of carbon [15,16,17].

In addition, when using ultrasonic action, when graphene particles are introduced, they are disaggregated due to the so-called wedging effect. As you know, an ultrasonic emitter creates waves with a high frequency, macromolecules and aggregates begin to vibrate under the action of a sound wave, alternately pressure and vacuum are created in the medium, high local pressures arise, spherical shock waves are formed, which lead to the destruction of nanofiller agglomerates.

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DIGITALIZATION OF THE REPUBLIC OF UZBEKISTAN: CURRENT STATE AND DEVELOPMENT TRENDS

Abstract: *Today, information technologies are an integral part of almost all spheres of everyday life of society. The information and industrial revolution are accompanied by the active introduction of informatization processes into the economy. This article analyzes the current situation of the introduction of digital technologies into the economy of the Republic of Uzbekistan, as well as provides statistics on investments in the field of information and communication technologies and some recommendations for improving the efficiency of digital economy development.*

Key words: *Digital economy, digitalization, information and communication technologies, investment, Internet, national economy, development, efficiency, digital technologies.*

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Introduction

Currently, the digital economy is the main engine of economic growth for any country and is one of the main directions in the economy. The digital economy is showing high growth rates in most countries of the world. The impact of digitalization is reflected in government structures and civil society institutions, in the economic and social spheres, in science and education, culture and lifestyle of people. This is due to the fact that, in general, communication services allow the full use of the existing potential, significantly contribute to achieving the goals of sustainable economic growth, prosperity, democracy, peace and stability.

In the Republic of Uzbekistan, the President approved the Strategy "Digital Uzbekistan-2030" [1], in accordance with which programs for the digital transformation of regions and industries for 2020-2022 are being implemented. The strategy includes more than 220 priority projects providing for the improvement of the e-government system, the development of the domestic market of software products and information technologies.

Digitalization, which is becoming a new stage of economic and technological development, has dramatically changed people's lives, created huge opportunities and increased competition in the international arena. Now such digital technologies as

big data, artificial intelligence, neurotechnology's, quantum technologies, cloud and mobile technologies, virtual and augmented reality technologies, cross-exchange, blockchain technologies play a decisive role.

Research methodology

The methodological basis of this work was legislative and regulatory legal acts on the development of digitalization in the country, in particular, Decree of the President of the Republic of Uzbekistan No.-5349 "On further improvement of information technologies and communications" [2] dated February 19, 2018, Decree of the President of the Republic of Uzbekistan No.-5953 [3] "About the state program for the implementation of the action strategy for the five priority areas of development of the republic of Uzbekistan in 2017-2021 in the "year of development of science, education and the digital economy". In addition, the article uses modern statistical methods and observation methods used in the collection and processing of statistical data based on expert evaluation and comparison. Graphic, analytical, structural analysis and other methods are also widely used in the work.

Main part

Investments in the field of information and communication technologies (ICT) are very important for the development of the country's economic potential, which stimulate innovative development, lead to increased labor productivity, cost reduction and the emergence of new types of economic activities, and, equally importantly, improve the quality of life of the population.

It is advisable to consider the process of digitalization in a broad and narrow sense. The first is understood as multidimensional organizational and technological processes of mass application of new digital technologies in production and management in order to reduce costs and increase the speed of business processes [5]. In the second, narrower, technical plan, it means the transition from an analog form of transmission, processing and presentation of data (information) to a digital one, carried out through the use of appropriate technologies and platforms. The transition to the digital economy is a step towards improvement the economic situation of the country. In order to take measures, it is necessary for the State to regulate the management of socio-economic development. It should ensure the interaction of the government, employers and the education system [6].

The concept of the national strategy "Digital Uzbekistan 2030" should be evaluated as a strategy aimed at: accelerated digital development of the country, the formation of a digital economy based on data; creating a favorable environment for the development of innovative products; improving the efficiency of public administration, providing convenient public services to the population and business entities [7]. New economic and technological conditions require the creation and implementation of approaches to assist the population in mastering the key competencies of the digital economy, ensuring mass digital literacy and personalization of education.

According to the Presidential Decree, it is planned to increase the share of the digital economy in the country's GDP by 2 times by 2023 and increase the volume of services in this field of ICT by 3 times, bringing their exports to 100 million USD [4]. In 2019, Uzbekistan ranks 95th in the information and communication development index among 176 countries and the share of information technologies in the country's GDP is only 2.2%. For comparison: in South Korea - 9%, Japan - 5.5%, China and India - 4.7%.

Over the past three years, the economy of Uzbekistan has grown at an accelerated pace, which was accompanied by an annual increase in the volume of investments in fixed assets almost twice, including in the field of ICT and communications.

The volume of investments in the type of economic activity "information and communication" in 2017 increased 2.4 times compared to 2016. In 2018, there was a decrease in investment volumes by almost 2 times, and in 2019 this indicator increased by 3 times.

Table 1. Dynamics of changes in the volume of investments in fixed assets in 2017-2020 (billion UZS) *

	2017	2018	2019	2019 (6 months)	2020 (6 months)
Total investments in fixed assets, of which:	**60719,2**	**107333,0**	**189924,3**	**85775,1**	**84806,7**
in the field of "information and communications"	1891,2	966,0	3241,3	1115,1	1983,4
Foreign direct investment and loans, including:	**12395,2**	**14660,4**	**58786,7**	**32438,2**	**37748,5**
in the field of "information and communications"	1177,5	205,2	1175,7	616,3	830,5

** Source: open data portal of the Republic of Uzbekistan - data.gov.uz*

In the first half of 2020, the volume of total investments in fixed assets decreased slightly, while the volume of foreign direct investment and loans, on the contrary, increased. Despite the decrease in the total volume of investments, investments in the field of information and communication technologies and communications were directed by about 1.8 times, and foreign direct investment and loans - 1.3 times more, compared to the same period last year. The share of investments in the field of information and communication technologies and communications also increased from 1.3% to 2.3% of total investments, and in the volume of foreign direct investment and loans - from 1.9% to 2.2%.

In the field of information and communication technologies, there was also an increase in the number of newly created enterprises, with the exception of 2020, when 34 fewer enterprises were created than in the same period of 2019, due to the impact of the coronavirus pandemic. At the same time, the share of enterprises in the field of ICT and communications in the total number of enterprises has not changed in the last three years and averaged 2%.

Table 2. The number of existing and newly created enterprises with the participation of foreign capital*

Enterprises with foreign capital	**2018**	**2019**	**2020**
Operating enterprises, including:	6294	9014	11082
in the field of "information and communications"	**196**	**296**	**296**
Total newly created (in January-June), including:	1601	1715	926
in the field of "information and communications"	**20**	**38**	**28**

** Source: open data portal of the Republic of Uzbekistan - data.gov.uz*

Among the enterprises of ICT and communications, the main share of the total number of enterprises is made up of enterprises providing communication services – 30%, computer programming - 29%, publishing - 17%, as well as in the field of information - 15%. In 2019, 9 major investment projects worth 177.5 million USD were implemented in the ICT industry, in accordance with the Investment Program. The sources were foreign investments in the amount of 97.14 million USD, foreign loans guaranteed by the state - 53.38 million USD and own funds of enterprises for 26.93 million USD. The growth of investments in the field of ICT and communications contributed to the improvement of the production indicators of the industry [8]. In 2019, the total volume of services rendered in the field of ICT and communications increased by 104% and reached 10.6 trillion UZS. At the same time, the volume of computer programming services has grown almost 2.5 times - from 443.3 billion UZS in 2017 to 1078 billion UZS in 2019. The total export of communication and information services in 2019 increased by 30% and amounted to $ 176.0 million, and the export of software products and services increased by 2 times – from 8.0 million USD to 15.8 million USD.

Most of the investment projects are related to improving infrastructure and expanding access of the population and organizations to a broadband communication network. The length of fiber-optic communication lines laid in 2018 was 26.6 thousand km, in 2019 – 36.6 thousand km, and in 2020 it is planned to increase this figure to 48.6 thousand km. The number of broadband ports for Internet connection also grew 1.5 times annually and amounted to 1.2 million in 2018, 1.9 million in 2019, 2.6 million in 2020, and 3.2 million ports in 2021 [9].

Opportunities for access to the Internet have expanded, in particular, for social institutions (schools, hospitals, kindergartens). So, if in 2019 only 34% of social institutions were covered by such access, then in 2020 this indicator will be brought to 90%, and in 2021 – to 100%.

The total bandwidth of the external (international) Internet communication channel has been increased 10 times since 2018 – from 110 Gbit/s to 1200 Gbit/s. In 2021, it is planned to increase the bandwidth of the international Internet communication channel by 2.5 times - up to 3000 Gbit/s, and the bandwidth of regional networks to regional centers by 2 times - up to 400 Gbit/s, and from regional to district centers by 1.5 times - up to 60 Gbit/s.

In order to develop mobile communication networks, 6 thousand new mobile base stations were installed within three years, as a result, their total number exceeded 26 thousand [10]. The expansion of the network of mobile base stations allowed to create conditions for the provision of services (to increase the coverage) of mobile communications for 96% of the country's population, and the level of coverage of broadband (high-speed) mobile Internet connection to 70%.

At the same time, it should be noted that the expansion of the network of mobile communication stations is due to the installation of new stations that ensure the operation of 3G / 4G networks, that is, networks of the 3rd and 4th generations. In particular, in 2019 alone, more than 2.2 thousand such stations were installed and launched. Installing stations for

3G/4G networks allows you to increase the speed of the Internet channel used by subscribers.

Considering the attraction of foreign direct investment, proposals will also be developed for the phased sale of state assets of local mobile operators, as well as for creating favorable conditions for attracting private investment in the development of telecommunications networks in rural areas on the site of the so-called "last mile", that is, the section of the communication line from the switching device of the service provider to the subscriber [12,13].

In accordance with the Investment Program for 2020-2022, approved by the Presidential Decree on January 9, 2020, a number of major projects are planned to be implemented in the field of ICT. In particular, during 2020-2022, it is planned to attract a total of 676.8 million USD to the ICT sector. investments, of which 491.2 million USD – foreign direct investment and 178.3 million USD - foreign loans under a state guarantee.

Table 3. Projected investment in the ICT sector in 2020-2022 (million dollars) *

	2020	2021	2022
Total investment amount, including:	**178,7**	**241,7**	**256,4**
foreign direct investment	139,2	171,9	180,1
foreign loans under state guarantee	37,5	67,7	73,1

** Source: Data from the website of the Ministry for the Development of Information Technologies and Communications of the Republic of Uzbekistan*

In order to further develop the field of ICT and the digital economy, on April 28, 2020, the President signed a decree "On measures for the widespread introduction of the digital economy and e-government", which set new goals and objectives for the development of these areas [11, 16].

The resolution, in particular, provides for the accelerated formation of the digital economy and an increase in its share in the country's GDP by 2 times by 2023, as well as the development of the "electronic government" system and bringing the share of electronic public services to 60% by 2022.

In addition, a complete modernization of the country's digital infrastructure, the availability of modern telecommunications services in the regions, as well as the connection in 2020-2021 of all healthcare institutions, schools, preschool education organizations, villages and mahallas to the high-speed Internet and improving the quality of communication services will be provided [14].

Among the priority areas, the development of "digital entrepreneurship" through the production of software products and the creation of technological platforms, as well as an increase in the volume of services in this area by 3 times, bringing their exports to 100 million USD by 2023, are also highlighted.

The resolution also approved lists of priority projects in 2020-2022 for the further development of e-government (104 projects in total), as well as the widespread introduction of modern ICT in the real sector of the economy (87 projects). A total of 17.6 trillion UZS will be allocated for the implementation of priority projects in the field of ICT in 2020-2022, of which 13.6 trillion UZS will be allocated for telecommunication infrastructure development projects [15].

The resolution also approved "roadmaps" for the further development of the Technological Park of Software products and information technologies, as well as the introduction of digital technologies in agriculture and water management in 2020-2021. Among the activities of the roadmap for the introduction of digital technologies in the field of agriculture, the development of the "Concept of Smart Agriculture" and the "Concept of Water Management development for 2020-2030" were planned. In addition, it is planned to improve the geoinformation and cadastral system of land accounting [17].

The growth of investments in informatization and telecommunications not only pursues the goal of increasing the export of IT services, but also stimulates innovative development, promotes the emergence of new types of economic activities, increases labor productivity and the quality of life of the population.

Conclusion

The experience of foreign countries shows that the digital economy is developing simultaneously in a wide range of directions and cannot be built by a limited number of companies, even if they are given special powers and resources. Therefore, the main role in the digital economy should be played by private business with a strong entrepreneurial and innovative approach, and the state should create infrastructure and conditions for private initiative.

The state can stimulate the digitalization of economic processes by the following actions:

- act as an organizer of common technological platforms that unite various organizations, or as a regulator that prescribes requirements for the use of certain technological solutions, since without synchronization of the processes of implementing standard technological solutions in entire segments of the economy, their widespread distribution is impossible;

- constantly improve the existing regulatory framework regulating the development of the digital economy, and do it in a dialogue mode and considering the opinions of users, developers and service providers, who in practice will face new types of objects and subjects of information legal relations that require legal registration;
- to become a participant in the overall process of digitalization of relations, including developing the "Electronic Government" system and the list of public services provided in electronic format;
- stimulate and encourage the introduction of information systems, electronic services in organizations and introduce tax incentives for the development of digital technologies, as well as cross-border online trade;
- to train personnel in the necessary quantities, both IT specialists and programmers themselves, as well as qualified users who are able to use constantly updated digital technologies;
- to ensure security against cyber threats, as well as the confidence of all entities involved in the digital economy to one degree or another that the data collected, stored and used by them is protected from possible criminal actions;
- to expand international cooperation and create attractive conditions for the influx and introduction of advanced information technologies in all spheres of economic activity.

At the same time, the main thing is that the development of ICT in the country, including affordable high-speed Internet, keeps pace with the interest of business to introduce digital technologies into various production processes to increase labor productivity, reduce costs, as well as increase production and profits

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LINGUISTIC CLASSIFICATIONS RELATED TO DISCOURSE AND ITS CLASSIFICATIONS

Abstract: *Leaning language is rather different than from its investigation. Because language is defined as natural and social process; moreover, to clarify it changes through years and social interactions than accelerated by up to date technologies and social media. The present article is about linguistics classifications that related to discourse and its own classifications where two types of communication cross: oral and written. Furthermore, this paper discusses discourse and its own classifications from the point of pragmatics, conversation analysis, psychology, philosophy, anthropology, ethnology. In terms of sociology, discourse and speech is just a means of communication that is used by people. You can find more about these on the pages.*

Key words: *Discourse, discursive analysis, modern linguistics, method, feedback, pragmatics, conversation analysis, textual linguistics, and relevance theory, computer linguistics, artificial intelligence, psychology, philosophy, logic, sociology, anthropology, ethnology.*

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Introduction

As a result of the development of linguistics, new fields began to emerge. Different fields of modern linguistics differ from each other in the object of research, methodological issues, and at the same time require each other. Discourse is one of the most important issues in pragmatic linguistics and cognitive linguistics. Many modern linguists connect the concept of discourse directly with the text [1]. In some cases, it is recognized as a collection of combined texts. The text can be considered the same [2]. Zellig Harris was the first to use the terms discourse and discursive analysis as a method of connected speech and writing analysis. In general, if we look at the history of the emergence and formation of the concept of discourse, the views expressed in the 60s of the last century can be divided into two:

1- Harris (1952)

2-Mitchell (1957) (Coulthard 1985: 3).

The main findings and results

Zellig Harris's article "Discourse Analysis" provides some initial comments on discourse. According to him, discourse analysis is a formal analysis of interconnected oral and written speech, while not requiring the analyst to analyze the meaning of each morpheme. Discourse, according to Zellig Harris (1951), "In modern descriptive linguistics, more than one word is usually not taken into account. The linguist usually considers the interdependence of the elements in only one sentence at a time. This gives

a possible description of the material because the interrelationship of the elements within each word (or word type) is developed and the other speech has a sequence of words, i.e. interrelationships described as a sequence of elements. This limitation means that nothing is said about the interrelationship between all the words in the sequence". As an example of the application of the Harris approach, he cites a text containing the following four sentences as an example:

Daraxtlar bu yerda kuzning o'rtalarida aylanadi.

Daraxtlar bu yerda oktyabr oyining oxirida aylanadi.

Birinchi sovuq kuzning o'rtasidan keyin keladi.

Biz oktyabr oyining oxiridan keyin isitishni boshlaymiz.

The trees rotate here in mid-autumn.

The trees here turn around in late October.

The first frost comes after mid-autumn.

We will start heating after the end of October.

The purpose of the analysis is to distinguish units of text that are equivalent in distribution but do not have the same meaning; these are only considered to be true equivalents for the text [3, p. 30].

Grenoble (2000), commenting on Harris's description of the discourse, says:

"Harris makes discourse-analytical research more interesting. He argues that linguistic research is based on feedback elements, that discourse should be considered a continuation of thought. Harris argues that the study of the relationship between words within the discourse required more information than the processing of the theoretical apparatus of the period in the volume of speech analysis. While this is true for the 1950s and 1960s, it is approximate, but in the 1970s a variety of approaches emerged, such as pragmatics, conversation analysis, textual linguistics, and relevance theory" [4].

According to Harris and Grenoble's definition of discourse, discourse is based on the interrelationship of words in any form of speech. This definition, as one of the first definitions of discourse, can be said to represent only one aspect of it. This is because the relationship between the words does not reveal the whole point of the discourse. At the same time it represents a certain aspect. The Collins concise English dictionary, published in 1988, provides seven different interpretations of discourse:

Discourse: 1. Verbal communication, talk, conversation. 2. A formal treatment of a subject in speech or writing. 3. A unit of text used by linguistic phenomena that range over more than one sentences. 4. To discourse: the ability to reason (archaic). 5. To discourse on/upon to speak or write about formally. 6. To hold discussion 7. To give forth (music) (archaic) [5]. It appears that discourse has the following 7 etymological meanings:

1. Verbal communication; conversation, conversation; 2. A means of formal communication in speaking or writing a topic 3. A unit of text used by linguists to analyze linguistic phenomena involving several sentences; 4. Speech: ability to think (archaic); 5. Formal speaking or writing; 6. Discussion; 7. (Music) (Archaic) (14th century, from Medieval Latin.)

The Longman Dictionary of English defines discourse as follows:

Discourse. 1. Conversation, especially of a formal nature; formal and orderly expression in the form of ideas in speech or writing [6].

While there is not enough clear information about the history of the origin of many concepts and terms in linguistics, there is still no clear explanation for the complexity of the interpretation of "text" and "discourse". Because the two concepts are so similar and interrelated, linguists need special research [15, pp. 37-50].

In the 1950s, in the process of developing Emile Benvinist's theory, he used the term discourse, which is characteristic of French linguistics, in a new sense, describing it as "speech mastered by the speaker" [7]. In 1952, Zelig Harris published an article entitled Discourse analysis, which deals with the method of speech in relation to complementary units. While Benwinist considered discourse to be the speaker's interpretation of speech, Harris's research was a sequence of sentences, a piece of text larger than a sentence.

Professor T.A. van Dyke interpreted the discourse in a much broader (complex speech phenomenon). Discourse is an event of communication between the listener and the speaker that takes place at a specific time and place in a particular context. This communication can be verbal, verbal, written, verbal or nonverbal. Examples include a regular conversation with a friend, a dialogue between a doctor and a patient, and reading a newspaper [1].

In the discourse, T.A. van Dyke emphasizes only the oral form of communication and calls it "text" or "conversation". In this case, the discourse is interpreted as a completed or ongoing "product" of the process of communication with the recipients, that is, in general, the discourse is the product of the written or oral communication process.

The broad and narrow concepts of discourse have the same general meaning in the context of the term "discourse", such as "this discourse", "these discourses", "its discourse" in the objects of the situation.

According to linguists, including T.A. Van Dyke and Z.Y. Turayeva [8], the concept of "discourse" is as vague as "concepts of language, society, ideology". There is no clear and generally accepted explanation that covers all aspects of the use of discourse.

The same can be said of the text. Many linguists have not been able to explain the term "text" in the process of studying the text, its essence, and its characteristics [9-10]. Various authors have pointed to different aspects of this situation: D.S. Likhachev to the existence of its owner, which creates a certain content in the text; O.L. Kamensky on his important role as a tool in verbal communication; A.A. Leontyev noted the functional completeness of the speeches and others.

Another traditional interpretation of the text is, first, as a written form of language; secondly, there is a mixture of correct and metonymic meanings: the term "text" means a part of the text. Note the comment by I.R.Galperin: "Text is a written document that is objectified in the form of a document, literary in accordance with the type of document, rounded by various lexical, grammatical, logical, methodological links (title) and a number of units (expressive units) are the result of a speech process with a certain focus and a pragmatic structure completed content [11]. It should be noted that the definitions of the text given here may be questioned and may lead to objections.

As an example, Y.S. Kubryakov noted that "not all texts have a title (individual poems, advertising texts, announcements). About a number of texts it can be assumed that they were not completed by the author; in many cases the poems also end with three dots pointing to an unfinished content. In addition to written texts, texts for oral speeches can also be considered (usually referred to as "message / speech / lecture text", etc.). Finally, not all texts can be presented as a sequence of super-phrase units - it must be admitted in any case, Entries such as "*No entry*" or "*Cutting flowers are strictly prohibited*" are considered separate texts [12].

However, it should be noted that the concepts of speech (discourse) and text have recently become more popular.

Discourse (speech) is an object of interdisciplinary research. In the study of speech, in addition to theoretical linguistics, computer linguistics, artificial intelligence, psychology, philosophy, logic, sociology, anthropology, ethnology, literature, samiotics, historiography, religion, law, pedagogy, translation practice and theory, etc. 'are permanently connected. Each of these subjects studies speech in its own way.

The concept of discourse changes traditional notions of speech, text, dialogue, style, and even language. There are three main classes of commentary that belong to individual authors and the use of the term "discourse" in accordance with different national traditions [16, pp. 311-318].

The first class includes the absolute linguistic use of the term, which was first used in Harris's Discourse-Analysis. The use of the term "discourse" in linguistics is also different, mainly considering the traditional formation and definition of concepts such as text, speech and dialogue. On the one hand, discourse is considered as speech in a communicative situation, and therefore is seen as a category with a more explicit social meaning compared to an individual's speech activity. According to N.D. Arutyunov, "discourse is a conversation of life" [13]. On the other hand, the analysis of modern (mid-1970s) practice is concerned with the study of the laws of information movement in the process of communication through replication exchange; thus being a peculiar continuation of a rather structural lineage whose origin goes back to Harris (although it is not usually so called), it describes some structure of the interaction. At the same time, emphasis is placed on the dynamic nature of speech, which aims to distinguish between the traditional notion of speech and the stability of text. The first class of interpretation of the term "discourse" occurs mainly in the scientific tradition of the English language.

The second class of use of the term "discourse" has gone beyond the scope of science in recent years and has become popular in journalism, referring to French structures and poststructuralists, primarily M. Foucault. These expressions explain traditional notions of style ("style means man") and individual language ("Dostoevsky's style", "Pushkin's language", etc.). The term "speech" understood in this way (also made as Foucault used and often used as a synonym with the term "speech practice") describes a way of speaking and has an absolutely clear definition - WHICH or WHO is speaking because researchers are not interested in any speech, but its specific types are determined by a wide range of parameters. Here, speech is a stylistic identity that contains a specific idea. In addition, it is assumed that the way of speaking mainly determines and creates the subject of the conversation, the relevant institutions.

Finally, there is a third case of the term "discourse" associated with the name of the German philosopher and sociologist Y. Habermas. It may be more specific than the previous concept, but it has important features. In this third concept, "speech" is a special ideal type of communication that takes place in the maximum removal of social reality, traditions, authority, communication situations, etc., and is aimed at critically discussing and justifying the thoughts and actions of the participants.

The three macro concepts listed above (as well as their types) interact and interact with each other. Of course, these views are not exceptions, but complement each other.

The three macro concepts listed above (as well as their types) interact and interact with each other. Of course, these views are not exceptions, but complement each other.

Speaking about the difference between speech and text, T.A. van Dyke argues that speech is spoken text (parole - speech), and "text" is the abstract grammatical structure of spoken words (langue -

language). Thus, speech is a concept related to real speech movement, and "text" is a concept related to the language system or formal linguistic knowledge, linguistic competence. In addition, the concepts of "speech" and "text" are sometimes unreasonably divided into two forms of communicative activity - the use and non-use of the letter. However, the communication event can be oral or written, as the speech is "text + situation". It is unreasonable to say that Dostoevsky's "biblical speech" or "Dostoevsky's speech". There is "religious speech" but there is no "biblical speech" because there is no clear social situation, no portrait of the author, and no dialogue (interaction between author and recipient).

In modern linguistics, the term "discourse" is close to the concept of "text", but refers to a dynamic, time-consuming feature of communication; on the contrary, text is mainly a static object, formed as a result of linguistic activity. As mentioned above, discourse is a "vital" speech. Therefore, unlike the term "text", the term "speech" does not apply to ancient and other texts; their connection is not directly restored with living life [13, p. 137].

Sometimes "discourse" involves two components at the same time: the dynamic process of language activity written in its social context and its outcome (i.e., the text). Sometimes it is not appropriate to replace the notion of "discourse" with the phrase "linked text" because any simple text is in fact interconnected.

According to E.S. Kubryakova, from a cognitive and linguistic point of view, the concepts of "speech" and "text" are related to the cause-and-effect relationship: the text is created in speech and is its product. Although the text is formed in the course of a certain process, it is studied in its entirety. This separates him from speech. Speech is a phenomenon that is being studied in its current state and time in relation to its origin and development. In the encyclopedic dictionary of linguistics under the editorship of V.N.Yartsev, speech (discourse) is described as a coherent text with extra linguistic-pragmatic, socio-cultural, psychological and other factors: secretion and their mechanisms of consciousness (cognitive processes) [14, pp. 85-90]. Speech includes speech paragraphic support, which performs the following basic functions determined by speech structure: rhythmic ("auto-dynamic"), referent, which connects words with the subject area of language use, semantic (see, facial expressions and gestures that accompany certain meanings), emotional and evaluative, the function of influencing the interlocutor, i.e. illocative power (gestures, motives, beliefs). On the one hand, the speech focuses on the pragmatic situation involved in determining its communicative adequacy, explaining its objections and contradictions.

The concepts of "discourse" and "dialogue" are very close in meaning. Speech, like any communicative action, represents two main functions - the speaker (author) and the receiver. However, the role of speaker and receiver can be redistributed in turn as interlocutors; in which case they switch places around a particular conversation. If the task of the speaker during a speech (or an important part of the speech) belongs to one person, such a speech is a monologue, but it is also wrong to assume that the monologue is a person talking to him: along with the monologue his receiver will also be. In fact, monologue is considered to be a special case of communication, although it is completely different from traditional communication. The words "text" and "dialogue" in general differ in structure and content, and are formed by connotations that prevent their free use. That is why the term "speech" is so convenient to use as a general term that unites all types of language.

Since the structure of speech implies two opposite functions, such as the speaker and the listener (receiver), the process of language communication can be considered as a general situation. Modeling the construction processes of speech (origin, synthesis) is not the same as modeling the processes of speech comprehension (analysis). In linguistics, there are two types of actions - speech (e.g., choosing a lexical tool when calling a specific object) and those who learn the concept of speech by the receiver (e.g., how the listener understands lexical tools, words, and associating them with one or more objects) are available. There is also a third perspective - to consider the process of language communication in terms of the text that emerges in the speech process (e.g., the words in the text can be considered regardless of the origin of the speaker) and the text. The same is true of the compositions compared to other parts.

Conclusion

A text is a combined semantic connection of lexical units whose main features are connection and integrity. Oral and written text acquires "textuality" in terms of structure - external relations, internal meaning, the ability to comprehend in a timely manner, the implementation of the necessary communication conditions, etc., for both texts - something of written and oral significance, their identity, a special branch of philology - a legal form studied in textology. The correctness of the text is provided not only by the language units and their connections, but also by the general knowledge base, the communicative background, so the acceptance of the text depends on the presuppositions. Explaining the concepts of text and speech, modern researchers have argued that text as language material is not always consistent speech, that is, discourse. Not every text is speech, but speech is always text, and vice versa. Because every speech is a text, speech theory is characterized by a high degree of linguistic unity

(characterized by the completeness, integrity, connection, and other general features of the text and speech); as well as issues related to speech units, their structure, and segmentation methods with the linguistic text. In order to distinguish between the concepts of "discourse" and "text", speech theory always emphasizes the active, dynamic aspect of language: the concept of "discourse" differs from text because it represents language as a process that takes into account the influence of extra-linguistic factors in communication presented as text.

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TO THE QUESTION ABOUT THE INTRODUCTION OF A FINANCIAL ACCOUNT IN THE SNA OF UZBEKISTAN: METHODOLOGICAL ASPECT

Abstract: *In this article developed recommendations for the formation and implementation of a financial account in the national accounts of Uzbekistan, a list of the main sources of information used in the formation of reports of financial assets and liabilities of the country, as well as a proposal for the creation of an Interdepartmental working group for the development of agreed indicators of non-financial and financial accounts, harmonization of indicators of SNA and macroeconomic statistics.*

Key words: *SNA, financial account, balance of financial assets and liabilities, financial instruments, methodology, institutional unit, non-financial and financial corporation, FWTW matrices, transactions, revaluation*.

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Introduction

In the Resolution of the President of the Republic of Uzbekistan dated August 3, 2020 "On measures to further improve and develop the national system of statistics of the Republic of Uzbekistan" No. PP-4796 is presented, the "National Strategy for the Development of Statistics of the Republic of Uzbekistan in 2020 - 2025" developed jointly with the World Bank, the main goal of which is is the integrated development of the entire national statistics system of the country, contributing to the increase in the relevance of statistics that meet the requirements of users, to improve the management and coordination of the statistics system.

In the 13th paragraph, the second paragraph, the V section, the second chapter, it is indicated that for the full implementation of the 2008 SNA practice, it is required to study and implement methodological developments in accordance with international standards by achieving consistency between national accounts, government financial statistics and the balance of payments.

Therefore, at this stage of the country's economic development, the development of methodological recommendations for the adaptation and consistency of the system of indicators of the balance of payments with the national accounts of Uzbekistan is one of the primary tasks of the State Committee of the Republic of Uzbekistan on Statistics.

Based on this, it should be emphasized that at the current stage of economic development, the absence of a “financial account” in national accounting does not allow us to fully assess the reason for the growth (or decrease) of the public debt, to determine due to what factors and institutional sectors the amount of lending or borrowing of the national economy changes.

And from the point of view of macroeconomic analysis, the absence of indicators and the “financial account” in general in national accounting does not allow assessing the external equilibrium of Uzbekistan and determining the degree of vulnerability of the domestic economy to external shocks.

In this regard, the development of methodological recommendations for the formation and implementation of the financial account in national accounting is relevant.

The role and place of the financial account in national accounting. The system of national accounts

(SNA) is a conceptual basis for the formation of data on the economic development of the national economy - reflecting the results of the production of goods and services, the generation of income and their distribution, the redistribution of income between institutional units, as well as information on their use and savings.

The financial account is the final account of the national accounting system. It displays changes in financial assets and liabilities, as well as lending or borrowing of institutional sectors of the national economy with the rest of the world.

From the point of view of economic theory, the balance of the national economy and the rest of the world should be equal in size to the balancing item of the capital account. The identity between the balancing item of the capital account and the balance of the financial account is an important feature of the system of accounts as a whole.

The financial account reflects transactions in financial assets and liabilities that are carried out between institutional units that are residents of a given country, and between institutional units-residents and the rest of the world [8].

When performing financial transactions, financial assets are formed or eliminated, and, accordingly, liabilities are created for institutional units, which leads to a change in the owner of the financial asset.

This (financial) account shows the relationship between the financial results of the activities of institutional units with the results of activities associated with production and education, distribution and redistribution of income.

The left side of the financial account shows the acquisition of financial assets minus their disposal, and the right side of the account shows the commitment minus their repayment.

In the financial account, in terms of assets and liabilities, the same financial instruments are used that will be used in the financial balances of assets and liabilities of institutional units, as well as in accumulation accounts for financial transactions.

The methodology for the formation of the financial account and balances of financial assets and liabilities can be improved as the methodological approaches for assessing the indicators of interconnected accounts, in particular, the capital account, as well as government finance statistics, balance of payments and international investment position, improve and change. In addition, the methodological basis is the development of international institutions improving in the field of filling gaps in statistical data used in the preparation of financial accounts.

Conceptual and terminological aspect of the research. Due to the presence of various explanations of economic categories in the system of national accounts and economic theory, we have given preference to the manual "System of National Accounts - 2008" for disclosing the economic essence of statistical values (institutional sectors and financial instruments and others) used in the development of recommendations for the formation of "financial accounts ".

Initially, let us dwell on the categories of the institutional unit involved in the formation of the financial account.

An institutional unit is an economic unit that is capable of owning assets on its own behalf, taking obligations, participating in economic activities and entering into transactions with other units [8]. In table 1, we present the institutional sectors, their definition and coding in the financial account of the SNA.

Table 1. Coding and definition of institutional sectors in the SNA

Code	Sector	Definition
S11	***Non-financial corporations***	are institutional units that are principally engaged in the production of market goods and non-financial services.
S12	***Financial corporations***	are institutional units that are principally engaged in financial services including financial intermediation.
S13	***General government***	consists of institutional units that, in addition to fulfilling their political responsibilities and their role of economic regulation, produce services (and possibly goods) for individual or collective consumption mainly on a non-market basis and redistribute income and wealth.
S14+	***Households***	are institutional units consisting of one individual or a group of individuals. All physical persons in the economy must belong to one and only one household. The principal functions of households are to supply labour, to undertake final consumption and, as entrepreneurs, to produce market goods and non-financial (and possibly financial) services.
S15	**Non-profit institutions serving households (NPISHs)**	are legal entities that are principally engaged in the production of non-market services for households or the community at large and whose main resources are voluntary contributions.

S2	**The rest of the world**	the rest of the world consists of all non-resident institutional units that enter into transactions with resident units, or have other economic links with resident units.

Since in the financial account, among institutional units, the largest participation belongs to financial corporations - they need to be classified into subsectors in order to provide more in-depth and refined data at a relatively low level.

In table 2, we present the coding and definition of the subsectors of financial corporations: central bank, investment funds, other financial corporations, insurance corporations.

According to the SNA guidelines, non-state pension funds (NPFs) are included in financial corporations. It should be noted that the non-state pension fund (NPF) is a social security organization, one of the main subjects of which is the non-state pension provision (NPF) of the fund participants. Since there is no non-state pension fund in Uzbekistan, we deliberately did not consider it and did not include it in the institutional subsector of financial corporations.

If this fund develops in the near future in Uzbekistan, it will not be difficult to include it in the subsectors of the country's financial corporations.

Definition and classification of financial instruments used in the formation of a financial account. To compile a full-fledged national accounting of Uzbekistan, in our opinion, one of the important issues is the definition of financial instruments and their classification, in order to form sub-accounts of the financial account.

Financial instruments are monetary contracts between parties. They can be created, traded, modified and settled. They can be cash (currency), evidence of an ownership interest in an entity or a contractual right to receive or deliver in the form of currency (forex); debt (bonds, loans); equity (shares); or derivatives (options, futures, forwards) [15].

Table 2. Coding and definition of institutional subsectors of financial corporations in the SNA

Code	Subsector	Definition
S12	***Financial corporations***	
S121	***Central Bank***	The central bank is the national financial institution that exercises control over key aspects of the financial system.
S124	***Investment funds***	investment funds are collective investment schemes that raise funds by issuing shares or units to the public. The proceeds are invested predominantly in financial assets, other than short-term assets, and in nonfinancial assets (usually real estate)
S125	***Other financial corporations***	Other financial corporations are institutional units providing financial services, where most of their assets or liabilities are not available on open financial markets.
S128	***Insurance corporations***	Insurance corporations include corporate entities, mutual funds and other entities whose main function is to provide life insurance, accident, sickness, fire or other insurance to selected institutional units or groups of units or reinsurance services to other insurance corporations.

The classification of financial instruments developed by us complies with the methodological principles of the 2008 SNA and can be used in the formation of a financial account (and its subaccounts), as well as in compiling the balance of financial assets and liabilities of Uzbekistan.

The definition, classification and coding of financial instruments used in the formation of the financial account of the SNA are presented in table 3.

Financial instruments used to form a financial account are classified and coded in the following order: monetary gold and special drawing rights (F1), cash and deposits (F2), debt securities (F3), loans and borrowings (F4), shares and other forms equity participation (F5), insurance and pension reserves (F6), accounts receivable / payable (F8).

Table 3. Definition, classification and coding of financial instruments used in the formation of the financial account of the SNA

Code	Financial instruments	Definition
	F1. Monetary gold and special drawing rights	
F11	***Monetary gold***	Monetary gold is gold to which the monetary authorities (or others who are subject to the effective control of the monetary authorities) have title and is held as a reserve asset. It comprises gold bullion (including gold held in allocated gold accounts) and unallocated gold accounts with non-residents that give title to claim the delivery of gold.
F12	***Special drawing rights***	Special Drawing Rights (SDRs) are international reserve assets created by the International Monetary Fund (IMF) and allocated to its members to supplement existing reserve assets. The Special Drawing Rights Department of the IMF manages reserve assets by allocating SDRs among member countries of the IMF and certain international agencies (collectively known as the participants).
F2. Currency and deposits		
F21	***Currency***	Currency consists of notes and coins that are of fixed nominal values and are issued or authorized by the central bank or government. (Commemorative coins that are not actually in circulation should be excluded as should unissued or demonetized currency.)
F22+ F29	***Deposits***	These include bank accounts, demand deposits (deposits), letters of credit, as well as time deposits, mandatory reserves of credit institutions with the central bank and a reserve position with the IMF. Transactions between credit institutions (including non-resident banks), both in terms of deposits and in terms of loans, are classified in accordance with the 2008 SNA as deposits. They can be exchanged for banknotes and coins on demand at face value without penalties or restrictions and can be directly used to make payments by check, transfer, postal order, debiting, crediting or other means of payment.
F3	***Debt securities***	These are circulating instruments; the lake is a garden of debt. These include promissory notes, bonds, free certificates of deposit, commercial paper, promissory notes, asset-backed securities and other instruments that are commonly traded in the financial markets.
F4	***"Loans and borrowings"***	"Loans and borrowings" includes long-term and short-term loans and borrowings, repurchase agreements, and claims or liabilities to the International Monetary Fund (IMF) in the form of loans and borrowings and other transactions. Loans between two credit institutions are classified as deposits in accordance with the 2008 SNA and are not part of the Loans and Loans instrument.
F5	***"Shares and other forms of participation in capital"***	"Shares and other forms of participation in capital" includes shares, including shares of joint stock investment funds, depositary receipts for shares, investment shares of mutual funds and other participation in capital. Shares and other forms of participation in capital represent˘the owner's funds in the capital of the institutional unit.
F6	***"Insurance and pension reserves"***	"Insurance and pension reserves" include insurance reserves for life insurance, reserves for insurance other than life insurance, and entitlements to retirement and non-retirement benefits. Insurance and pension reserves are liabilities of organizations of the subsectors "Insurers", "Non-state pension funds" and the sector "Rest of the World" and the assets of participants in insurance and pension programs.
F8	***"Accounts receivable/ payable"***	This financial instrument has commercial loans and other receivables/ payables. In addition, this instrument includes data on financial derivatives.

Main sources of information. To form a financial account and a balance of financial assets and liabilities, it is necessary to develop a scheme, form and list of data, which should act as a fundamental information basis.

We have developed a list of the main sources of information used in the formation of the financial

account and the balance of financial assets and liabilities of Uzbekistan is preliminary and can be expanded as necessary with quality data (Table 4).

Balances of financial assets and liabilities. The balance of assets and liabilities is a report drawn up at a certain point in time, containing data on the value of assets owned by an institutional unit or a group of institutional units, and the value of liabilities that are assumed by an institutional unit or a group of institutional units [8, p. 13.2.].

The value of assets and liabilities has a character of variability based on the point in time of the operation being performed, due to changes in prices and other actions that affect their volumes.

All actions are reflected in the following: financial operations; revaluation of assets and liabilities; other changes in the volume of assets and liabilities.

Therefore, these actions should be reflected in the accounts and sub-accounts of national accounting, in particular, in the system of national accounts of Uzbekistan. In our opinion, it is necessary to open the following accounts and sub-accounts for financial transactions and assessment of balance sheet indicators of assets and liabilities of institutional sectors in accordance with the methodological principles of the 2008 SNA.

For example: account "Consolidated accounts for the domestic economy"; account "Consolidated accounts for non-financial corporations"; account "Consolidated accounts for financial corporations"; account "Consolidated accounts in the banking system"; account "Consolidated accounts for investment funds"; account "Consolidated accounts for other financial institutions"; account "Consolidated accounts for insurance organizations"; account "Consolidated accounts for public administration"; account "Consolidated Household Accounts"; account "Consolidated accounts for non-profit organizations serving the household (NPISH)"; account "Consolidated accounts for the rest of the world".

It is important to note that the balance sheets of financial assets and liabilities contain data on the stocks of financial assets and liabilities at a particular point in time, as well as information on the stocks of non-financial assets. When compiling the balance sheet, financial assets and liabilities denominated in foreign currency are converted into national currency at the exchange rate (on the last business day of the reporting period).

And another important point in compiling the balance sheet of financial assets and liabilities is that the balance sheet indicators of financial assets and liabilities are measured at market value. If the assessment of balance sheet indicators in market prices is not possible, then they can be used in the balance sheet of financial assets and liabilities in the form of nominal value.

Financial instruments: transactions, revaluation and other changes in the volume of assets and liabilities.

According to the manual on the system of national accounts, a transaction is an economic flow, which is an interaction between institutional units by mutual agreement or an action within one institutional unit, which, from an analytical point of view, it is advisable to consider as a transaction, often in view of the fact that the unit operates in two different qualities [8, p. 3.51].

Table 4. The list of the main sources of information used in the formation of the financial account and balance of financial assets and liabilities of Uzbekistan

N/N	Name and reporting forms
	Foreign economic activity database
1	Balance of payments of Uzbekistan
2	International investment position of Uzbekistan
3	International Investment Position of the Banking Sector
	Securities database
4	Report on the progress of the placement of securities - form No. 1TSB
5	Securities report - form No. 2TSB
6	Register of equity securities of issuers that are not credit institutions
7	Data of the stock exchange "Tashkent"
8	Central securities depository data
9	Data from the OTC trading system "Elsis SAVDO"
	Government Finance Statistics Database
10	Report on debts on taxes and fees, penalties and tax sanctions to the budgetary system of the Republic of Uzbekistan
11	Balance of execution of the consolidated budget of the Republic of Uzbekistan and budgets of extra-budgetary funds

12	Information on the state internal and external debt of the Republic of Uzbekistan, expressed in government securities
13	Information from the register of state property and blocks of shares (stakes) that are in state ownership
14	Information on investments of the Pension Fund of the Republic of Uzbekistan
	Database on the activities of non-financial corporations and financial corporations
15	Statistical register of business entities
16	Form 1-corkhona (annual). Report on the main indicators of the economic activity of the organization
17	Balance sheet - Form N 1;
18	Statement of financial results - form N 2;
19	Cash flow statement - form N 4;
20	Equity statement - Form N 5.
21	The turnover sheet for the accounting accounts of a credit institution
22	Reporting data of the Central Bank of the Republic of Uzbekistan
23	Register of state registration of credit institutions

Transactions represented in the financial account are an economic flow that reflects the creation, transformation, exchange, transfer or disappearance of the economic value of financial instruments (items) of institutional sectors, the domestic economy and the "rest of the world" and lead to a change in the volume, structure or value of assets and the obligations of the institutional unit.

In addition, revaluation and other changes in the volume of assets (liabilities) are reflected in the financial account. The revaluation account reflects changes in the value of assets and liabilities and net worth, not related to transactions, which occur only as a result of changes in the level and structure of prices. It should be noted that the value of an asset, expressed in foreign currency units, changes as a result of an increase or decrease in the exchange rate.

The Other Changes in Asset Account (OCVA) records the remaining changes in the value of assets and liabilities of institutional units or sectors as a result of reclassification of institutional units or financial assets or force majeure circumstances (in particular, natural disasters or catastrophes). The OCVA account reflects changes in the value of assets due to changes in the number of assets or their physical characteristics.

In the event that transactions on financial assets and liabilities are measured in foreign currency, they are converted into the national currency at the appropriate rates during the period of action of the reporting year. It is very important to add that all transactions are recorded at market prices. Also, if necessary, they can be calculated at other prices.

In our opinion, in order to record data on financial instruments, in order to record the movement of transactions, revaluation and other changes in the volume of assets and liabilities, it is necessary to create the following consolidated accounts and sub-accounts, which will contribute to the formation of the "Financial account" in the system of national accounts: account "Consolidated Accounts for Monetary Gold and Special Drawing Rights from the Rest of the World"; account "Consolidated accounts for cash currency and deposits"; account "Consolidated accounts for debt securities"; account "Consolidated accounts for credits and loans"; account "Consolidated accounts for shares and other forms of participation in capital"; account "Consolidated accounts for insurance and pension reserves";- account "Consolidated accounts for receivables / payables"; account of revaluation of assets and liabilities; account of other changes in the volume of assets (OCVA).

We recommend creating sub-accounts for financial transactions and balances of financial assets and liabilities for each account. For example, subaccount "Financial transactions on insurance and pension reserves" and subaccount "Balance of financial assets and liabilities for insurance and pension reserves".

Some Final Views on Forming a Financial Account and Balance of Financial Assets and Liabilities

1. In order to reduce the adaptation and implementation of indicators of the "Balance of Payments of the Republic of Uzbekistan", "International Investment Position of the Republic of Uzbekistan", "Statistics of Public Finance of the Republic of Uzbekistan" when compiling a financial account and a balance of financial assets and liabilities, as well as for fruitful joint work of of the Bank of the Republic of Uzbekistan, the Ministry of Finance of the Republic of Uzbekistan and the State Committee of the Republic of Uzbekistan on Statistics, in our opinion, it is institutionally necessary to create an “Interdepartmental Working Group on the development of agreed indicators of non-financial and financial accounts of the System of National Accounts (SNA), harmonization of indicators of the SNA and other areas macroeconomic statistics.

2. When compiling the “Financial accounts of Uzbekistan and the balance of financial assets and liabilities”, it is advisable to use balance matrices interpreted as “From-Whom-to-Whom”, which are widely used in international practice and contain

detailed information about the relationship between the lender and the borrower in the context of financial instruments. It should be noted that From-Whom-to-Whom matrices of financial flows and stocks (FWTW matrices) are presented and proposed for use in the Manual on the System of National Accounts 2008 (European Commission, IMF, OECD, UN, World Bank, 2012).

3. When forming the financial account and the balance of financial assets and liabilities, the methodological basis for the formation of data on securities, information on debt bonds and equity shares issued in the domestic market, should be the "Guidelines for the formation of securities statistics" (2015) and "Guidelines according to the system of national accounts - 2008 ".

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COVID-19 AND NASAL CONDITIONS

Abstract: *The nasal epithelium expressing enriched angiotensin-converting enzyme II (ACE2), a key receptor for the penetration of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) into cells, can serve as the first barrier to protect the respiratory tract from viral infection. Recent studies have shown that patients with coronavirus disease 2019 (COVID-19) have been found to have a higher viral load in the nasal cavity than in the pharynx, and otolaryngologists should carefully consider infection prevention in clinical practice for the treatment of nasal conditions. Moreover, several studies have shown that anosmia is one of the clinical characteristics of COVID-19, but the exact prevalence and mechanism remain unclear. So far, the concomitant pathology of allergic rhinitis and chronic rhinosinusitis is not the main risk factor for severe COVID-19. However, we need to develop strategies in clinical practice for the treatment of nasal diseases during a pandemic. In this article, we reviewed the current evidence of a link between COVID-19 and nasal conditions such as olfactory dysfunction associated with COVID-19, allergic reactions, rhinitis and chronic rhinosinusitis.*

Key words: *coronavirus infection, nasal cavity, chronic rhinitis, epithelium.*
Language: *Russian*
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COVID-19 И СОСТОЯНИЯ НОСА

Аннотация: *Носовой эпителий, экспрессирующий обогащенный ангиотензин-превращающий фермент II (ACE2), ключевой рецептор проникновения в клетки коронавируса 2 тяжелого острого респираторного синдрома (SARS-CoV-2), может служить первым барьером для защиты дыхательных путей от вирусной инфекции. Недавние исследования показали, что у пациентов с коронавирусной болезнью 2019 (COVID-19) была обнаружена более высокая вирусная нагрузка в полости носа, чем в глотке, и отоларингологи должны тщательно рассматривать профилактику инфекций в клинической практике для лечения состояний носа. Более того, несколько исследований показали, что аносмия является одной из клинических характеристик COVID-19, но точная распространенность и механизм остаются неясными. Пока что сопутствующая патология аллергического ринита и хронического риносинусита не является основным фактором риска тяжелой формы COVID-19. Однако мы должны разработать стратегии в клинической практике для лечения заболеваний носа во время пандемии. В этой статье мы рассмотрели текущие доказательства связи между COVID-19 и состояниями носа, такими как обонятельная дисфункция, связанная с COVID-19, аллергические реакции, ринит и хронический риносинусит.*

Ключевые слова: *коронавирусная инфекция, полость носа, хронический ринит, эпителий.*

Введение

Тяжелый острый респираторный синдром, коронавирус 2 (SARS- CoV-2) был идентифицирован как возбудитель пневмонии неизвестной этиологии, обнаруженное в декабре 2019 г. Ухань, Китай [1]. Он классифицируется как

бета-коронавирус по с тяжелым острым респираторным синдромом, коронавирусом (SARS-CoV) и ближневосточный респираторный синдром (MERS)-CoV. Заболевание, вызванное инфекцией SARS-CoV-2, получило название коронавирусная болезнь 2019 (COVID-19) Всемирной организацией здравоохранения (ВОЗ) [2]. COVID-19 быстро распространился по всем во всем мире с более чем 92,5 миллионами случаев и убили более 2,0 миллионов человек во всем мире по состоянию на январь 2021 года.

Пандемия COVID-19 сильно повлияла на несколько аспекты клинической области отоларингологии, в том числе профилактика инфекций и ведение пациентов с обоими стационарные и амбулаторные. Было подтверждено, что риск факторы, влияющие на тяжесть COVID-19, включали коморбидность злокачественных опухолей, хроническая обструктивная легочные заболевания, хронические заболевания почек, заболевания печени, ожирение, гиперлипидемия, гипертония, диабет 2 типа и иммуносупрессия после трансплантации органов, а также как пожилой возраст и курение, по сравнению со здоровыми людьми [3-6]. Следует также учитывать сопутствующие заболевания ВИЧ, беременность, и продолжение использования системных кортикостероидов или биологических противоревматические препараты, модифицирующие заболевание (bDMARD) нацелены на медиаторы воспаления, включая некроз опухоли фактор (TNF) и IL-6 [7-12]. Однако знания о взаимосвязь между инфекцией SARS-CoV-2 и верхним

Заболевания дыхательных путей остаются ограниченными. Назальные условия, в том числе аллергический ринит и хронический риносинусит (XPC), высоко распространены во всем мире, затрагивая до 40% населения [13]. Отоларингологи должны знать и обновлять характеристики и меры противодействия COVID-19, потому что дыхательных путей носовой полости и носоглотки два основных путей вирусной инфекции, в том числе SARS- CoV-2. В этом обзоре мы обобщили предыдущие отчеты и знания о связи между COVID-19 и назальным состояния, в том числе аносмия, связанная с COVID-19, аллергическая ринит и СВК.

Сообщается, что решающую роль играют два фактора человеческого хозяина. при инфекции SARS-CoV-2. Для проникновения вируса в клетки человека спайк (S) белок, экспрессируемый на поверхности SARS-Cov-2, связывается с рецептор ангиотензинпревращающего фермента II (ACE2), как в SARS-CoV [14]. Трансмембранная сериновая протеаза серин 2 (TMPRSS2) расщепляет и активирует белок S SARS-CoV-2, обеспечивая слияние вируса с клеткой [15]. Другими словами, ACE2 – это рецептор-связывающий домен SARS-CoV-2, и это важно для стыковки с S-белком SARS-CoV-2, а TMPRSS2 необходим для расщепления прикрепленного белка S для проникновения вируса в клетку путем слияния мембран. Это было показали, что антитело, блокирующее эти сигналы входа, может предотвратить вирусную инфекцию in vitro, и ожидается, что это антитело быть кандидатом в терапевтические агенты [16]. Это также идентифицировано что противопаразитарное соединение ивермектин может влиять на прикрепление шипа к клеточной мембране и несколько клинических испытаний для определения эффективности ивермектина на COVID-19 все еще проходят. ACE2 и TMPRSS2 экспрессия была обнаружена как в носовой, так и в легочной ткани в человека с помощью иммуногистохимии. В частности, человек назальные эпителиальные клетки показали самую высокую экспрессию ACE2 среди всех исследованных клеток в верхних и нижних дыхательных путях. Ziegler et al. показали, что экспрессия ACE2 была повышается за счет стимуляции интерферонов (IFN) и гриппа вирусная инфекция в эпителиальных клетках носа человека. Это было продемонстрировали, что IL-13, ключевые цитокины воспаления 2 типа, снижение экспрессии ACE2 в культивируемых через носовые полости на границе раздела воздух-жидкость клетки, собранные у детей-астматиков чисткой щеткой. Смит и другие. показали, что воздействие сигаретного дыма дозозависимо повышенная экспрессия ACE2 в легочной ткани. Регламент экспрессии ACE2 также был связан с различными другими факторов, таких как ожирение, пол и сопутствующие хронические заболевания. заболевания, в том числе аллергические [17]. Эти выводы могут быть связано с различием между людьми в восприимчивость к инфекции SARS-CoV-2 или тяжесть COVID-19. Помимо того, что ACE2 является рецептором SARS-CoV-2, он имеет был идентифицирован как тканезащитный пептид, предотвращающий сужение сосудов, фибропролиферация и апоптоз эпителия клетки и экспрессия медиаторов воспаления путем регулирования изменение ангиотензина (Ang) II на Ang 1-7 в легких. Однако точная роль ACE2 при заболеваниях носа имеет еще не выяснено.

Носовая полость служит первым барьером для защиты нижние дыхательные пути от аллергенов и патогенов, таких как бактерии и вирусы. Более высокие вирусные нагрузки были обнаружены в нос, чем в горле из мазков, взятых у пациентов с COVID19 вскоре после появления симптомов [18]. Эти результаты могут свидетельствовать о том, что полость носа экспрессирует обогащенный рецепторы вируса и

содержит высокую вирусную нагрузку, и это важный орган для проникновения SARS-CoV-2 и COVID-19 разработка. Следовательно, мы должны быть знакомы с контрмеры для клинического ведения ринологии во время пандемии.

ХРС определяется как состояние, при котором наблюдается длительный хронический воспаление в придаточных пазухах носа более 12 недель. Патофизиология СВК неоднородна и разнообразна. эндотипы были продемонстрированы, показывая их паттерны воспаления, включая доминирующее воспаление 2 типа, воспаление не 2-го типа доминантного или смешанного типа. В Японии, диагностические критерии эозинофильного ХРС (ЭХРС) как тугоплавкие ХРС были установлены по данным мультицентра масштабное эпидемиологическое исследование под названием «Японская Эпидемиологическое исследование устойчивых эозинофильных хронических больных Исследование риносинусита »(Исследование JESREC). Это было сообщили, что воспаление 2 типа играет важную роль в патофизиология ЭХРС и неэозинофильных ХРС показывает воспаление, не относящееся к типу 2, например с преобладанием нейтрофилов [19]. Часто встречающиеся симптомы ЭКРС - выделения из носа, заложенность носа, заложенность носа и потеря обоняния. В механизм обонятельной дисфункции при ЭКРС был изучен. считается комбинированным нарушением с сенсорной дисфункцией в обонятельных нервах и обонятельных щелях. В сравнении к COVID-19, клиническая история потери обоняния при ЭХРС включает хроническое начало и часто сопутствующие назальные непроходимость и ринорея. Хотя рецептор ACE2 и экспрессия TMPRSS2 в клетки носового эпителия, по-видимому, модулируются типом 2 воспаление, неизвестно, активируются ли они или снижается у пациентов с СВК, у которых наблюдается неоднородный воспалительный фон. Chhiba et al. сообщили, что коморбидность риносинусита у пациентов с COVID-19 был связан со значительно более низким риском госпитализация по сравнению с отсутствием риносинусита [20]. Однако они не определили риносинусит как хронические и острые, а также считали эндотипом фон в их исследовании. ХРС не является основным риск COVID-19; однако его реальный риск может зависеть от фенотип и / или эндотип. Пока есть ограниченное свидетельство связи между ХРС и COVID-19. Мы должны рассмотреть меры профилактики инфекций, когда мы приступаем к носовой эндоскопии и биопсии тканей, чтобы диагностировать и оценивать признаки СВК в носовой полости. Во время пандемии было предложено, чтобы мы избегать или переносить процедуры с высоким риском, такие как аэрозольные генерации событий и должны носить личное защитное оборудование (СИЗ), если мы продолжаем и не можем исключить возможность COVID-19 [21]. Для лечения ХРС мы обычно выполняем комбинированные фармакотерапия, включая терапию антибиотиками, INS и краткосрочные системные кортикостероиды (ГКС), а также биологии, нацеленные на воспаления 2 типа, и эндоскопические хирургия носовых пазух (FESS). Несколько организаций предложили, что важно продолжать назначать долгосрочные препараты контроля, включая местные кортикостероиды, SCS и биологии для поддержания хорошего управления для пациента с хроническими воспалительными заболеваниями дыхательных путей. Глобальная инициатива по астме (GINA) предлагает которые прописали ингаляционные кортикостероиды и самые низкие возможную дозу SCS следует продолжать, чтобы предотвратить потенциальный риск обострения у пациентов с тяжелым астма. Нет достаточных данных о том, что биологические нацеленное на воспаление 2 типа (включая дупилумаб) увеличить риск заражения SARS-CoV-2 или тяжесть COVID-19. Американская академия аллергии, астмы и Иммунология предполагает, что пациенты с астмой продолжают использовать биологические препараты, чтобы контролировать свои симптомы вовремя пандемии [22]. Врачи должны судить и переоценивать потребность и назначить самую низкую дозу ГКС для лечения симптомы и биологическую терапию следует продолжать в течение невосприимчивые случаи, которые подходят для них, чтобы ограничить потребность в СКС по мере возможности [23]. Нам следует подумать о переносе операций в режим ожидания. случаев и до операции скрининг на COVID-19, потому что FESS – это, процедура с высоким риском, при которой образуются аэрозоли. Если мы не можем исключить возможность заражения SARS-CoV-2, мы следует использовать соответствующие средства индивидуальной защиты всего тела, включая маски, протекторы и халаты во время операции.

Заключения.

Хотя в некоторых предыдущих отчетах основное внимание уделялось связь между COVID-19 и состояниями носа, в этом отчете кратко излагаются текущие рекомендации и предложения. для лечения заболеваний и состояний носа во время пандемии. Полость носа показывает высокую вирусную нагрузку. и высокие уровни экспрессии рецептора ACE2. Имеет важную роль в распространении инфекции SARS-CoV-2, и отоларингологи должны обратить внимание на инфекцию профилактика в

клинических ситуациях с заболеваниями носа и болезни. Механизм обоняния, связанного с COVID-19 считается, что дисфункция связана с повреждением сустентакулярных клеток экспрессия рецептора ACE2, а не повреждение обонятельной сенсорный нейрон, но необходимы дальнейшие исследования. Для лечение заболеваний носа во время пандемии, мы следует выбрать соответствующее лечение для поддержания адекватного контроль симптомов с учетом потенциального влияния на инфекцию SARS-CoV-2 и тяжесть COVID-19. Пациенты должны быть заинтересованы в том, чтобы уведомлять своего лечащего врача в случае обострения или изменения привычного образа жизни. симптомы для поддержания качества жизни, хотя носовые такие состояния, как аллергический ринит и СВК, не вызывают быть высоким риском COVID-19.

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CHRONIC RHINOSINUSITIS IN PATIENTS WITH COVID-19

Abstract: *The new coronavirus (COVID-19) has caused a deadly pandemic, which now significantly affects the whole world. It is believed that otolaryngologists are at high risk of infection, since the virus is located in the nasal cavity, nasopharynx and oropharynx. Despite the fact that valuable work has been published on several topics in rhinology, we discuss in more detail other aspects of our specialty. There are several issues concerning rhinological practice that need to be clarified both for the current epidemic and for future expected "waves". In addition, as the pandemic subsides, guidelines are needed to optimize safe practices as we start admitting more patients again. These include safety-related protocols, rhinological procedures in the office, replacement of endoscopy with imaging, and understanding the appropriate role of telemedicine. We discuss these aspects of rhinology, as well as practical issues related to telemedicine and billing, as these issues are becoming increasingly important for rhinologists both in the present and in the future.*

Key words: *Coronavirus disease, fungal infections, mucormycosis, chronic rhinosinusitis.*

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ХРОНИЧЕСКИЙ РИНОСИНУСИТ У БОЛЬНЫХ С COVID-19

Аннотация: *Новый коронавирус (COVID-19) вызвал смертельную пандемию, которая теперь значительно влияет на весь мир. Считается, что отоларингологи подвержены высокому риску заражения, поскольку вирус находится в полости носа, носоглотке и ротоглотке. Несмотря на то, что была опубликована ценная работа по нескольким темам в ринологии, мы более подробно обсуждаем другие аспекты нашей специальности. Есть несколько вопросов, касающихся ринологической практики, которые необходимо прояснить как для текущей эпидемии, так и для будущих ожидаемых «волн». Кроме того, по мере того как пандемия утихает, необходимы руководящие принципы для оптимизации безопасных методов, поскольку мы снова начинаем принимать больше пациентов. К ним относятся протоколы, относящиеся к безопасности, ринологические процедуры в офисе, замена эндоскопии визуализацией и понимание соответствующей роли телемедицины. Мы обсуждаем эти аспекты ринологии, а также практические вопросы, касающиеся телемедицины и выставления счетов, поскольку эти вопросы приобретают все большее значение для ринологов как в настоящем, так и в будущем.*

Ключевые слова: *Коронавирусное заболевание, грибковые инфекций, мукормикоз, хронический риносинусит.*

Введение

Коронавирусное заболевание 2019 года (COVID-19), вызванное тяжелым острым респираторным синдромом, коронавирусом 2 (SARS-CoV-2), является первичным острым респираторным заболеванием, которое может привести к тяжелому острому респираторному синдрому (ARDS), полиорганной

недостаточности и даже смерть. Следовательно, определение факторов риска и защиты от COVID-19 имеет решающее значение для разработки эффективных стратегий вмешательства и профилактики. Как ворота дыхательных путей, физиологические и патологические состояния носовой полости могут существенно влиять на развитие заболеваний нижних дыхательных путей [1]. Хронический риносинусит (ХРС) - одно из наиболее распространенных воспалительных заболеваний носовой полости, которым страдает от 5 до 12% взрослого населения [2]. Тем не менее, влияние ХРС на COVID-19 остается в значительной степени неизвестным. В нескольких исследованиях сообщалось о низкой частоте (0% - 3%) коморбидности ХРС у пациентов с COVID-19 [3-7]. Однако эти исследования были основаны на анализе медицинских карт пациентов с COVID-19, который может недооценивать реальную частоту ХРС. сопутствующая патология из-за неполного учета в условиях реальной экстренной помощи. Что еще более важно, остается неясным, связана ли коморбидность ХРС с тяжестью заболевания COVID-19 [8-12].

Здесь мы ретроспективно проанализировали 117 пациентов с COVID-19, и прошли последующее наблюдение по телефону в течение 1 месяца после выписки. Диагноз был подтвержден положительным результатом анализа полимеразной цепной реакции с обратной транскриптазой в реальном времени для SARS-CoV-2 образцов мазков из горла или носоглотки. Информация о пациентах с COVID-19 о демографических характеристиках, лабораторных данных, лечении и осложнениях была получена с помощью форм для сбора данных, извлеченных из электронных медицинских карт. Сопутствующие заболевания, включая ХРС, определялись на основании самоотчета пациентов при поступлении, а точность записей о сопутствующих заболеваниях проверялась опытными врачами во время последующего наблюдения. Тяжесть COVID-19 при поступлении и госпитальные осложнения определялись согласно соответствующим руководящим принципам [13,18]. Для анализа использовались результаты лабораторных исследований, проведенных вскоре после госпитализации. Чтобы избежать влияния смешивающих переменных, был проведен многомерный логистический регрессионный анализ и сопоставление оценок предрасположенности (СОП) пациентов с ХРС и без ХРС.

В общей сложности 72 (6,1%) пациента сообщили о диагностированном врачом ХРС. Возраст и статус курения были сопоставимы между пациентами с COVID-19 с ХРС и без, тогда как пациенты с COVID-19 с ХРС, как правило, преобладали среди мужчин, чем пациенты без ХРС (59,7% против 48,5%; P = 0,07). У пациентов с COVID-19 с ХРС была более высокая частота сопутствующей астмы (6,9% против 2,2%; P = 0,01). Не было значительных различий в отношении других основных сопутствующих заболеваний, включая гипертонию, диабет, злокачественные новообразования и хроническую обструктивную болезнь легких, между пациентами с COVID-19 с и без ХРС. Хотя пациенты с COVID-19 с ХРС, как правило, чаще страдали от лихорадки, чем пациенты без ХРС (87,5% против 78,0%; P = 0,07), не было никакой разницы в частоте лихорадки между пациентами с ХРС и без него после поправки на сопутствующие тучные факторы, включая возраст, пол, статус курения и сопутствующие заболевания. Никаких существенных различий в других основных симптомах, включая кашель, одышку и диарею, не наблюдалось между пациентами с ХРС и без ХРС до и после поправки на смешивающие факторы. Кроме того, не было значительной разницы в результатах большинства лабораторных тестов, включая количество нейтрофилов, лимфоцитов и эозинофилов в крови, а также уровни димера D-D, IL-6 и IL-10. Разница в уровнях сердечного тропонина I и IL-8 между пациентами с ХРС и без него исчезла после внесения поправки на добавляющие ожирения. Более того, мы не обнаружили значительных различий в доле тяжелых случаев при поступлении, осложнений, включая ОРДС и стационарное лечение, включая искусственную вентиляцию легких и глюкокортикоиды, и дней госпитализации между пациентами с и без ХРС до и после поправки на сопутствующие факторы. Далее был проведен анализ СОП. Возраст, пол, статус курения и все сопутствующие заболевания были выбраны для СОП. Нам удалось сопоставить 72 пациента с COVID-19 без ХРС и 72 пациента с ХРС в соотношении 1:1. Все симптомы и результаты лабораторных тестов были сопоставимы между пациентами с COVID-19 с ХРС и без него после СОП. Важно отметить, что мы не обнаружили значительных различий в тяжелых случаях при госпитализации, осложнениях, лечении в стационаре и днях госпитализации между пациентами с ХРС и без него по результатам анализа СОП.

В этом исследовании, чтобы уменьшить предвзятость, вызванную потенциально неполными медицинскими записями при поступлении, мы перепроверили записи сопутствующих заболеваний с пациентами по телефону. Это может быть причиной того, что распространенность ХРС (6,1%) в нашей когорте COVID-19 была выше, чем ранее сообщалось в Китае и Европе (0–3%) [19], что близко к распространенности ХРС в целом населения Китая (8%). 5 Это говорит о том, что

коморбидность ХРС не может повышать восприимчивость к COVID-19. Совсем недавно Chhiba et al6 сообщили, что пациенты с риносинуситом имеют более низкий риск госпитализации по поводу COVID-19, чем пациенты без риносинусита. Распространенность риносинусита в их исследовании составила 13,3%; однако они не различали острый и хронический риносинусит [20]. Более того, показатель госпитализации может не полностью отражать тяжесть COVID-19. В этом исследовании мы обнаружили, что количество нейтрофилов и лимфоцитов, а также сывороточные уровни димера D-D и IL-6, которые были идентифицированы как маркеры тяжести COVID-19, 7'8 были сопоставимы между пациентами с COVID-19 с ХРС и без. Что еще более важно, не было никакой ассоциации ХРС заболеваемость по тяжести заболевания при поступлении, ИВЛ количество дней пребывания, ОРДС и госпитализации пациентов с COVID-19, предполагая, что ХРСне может изменять проявление болезни COVID-19 тоже нет.

В общей сложности 117 этиологически подтвержденных пациента с коронавирусной болезнью 2019 (COVID-19) были выписаны, крупнейшей специализированной больницы для лечения пациентов с COVID-19 и прошли телефонное наблюдение через 1 месяц после выписки, были ретроспективно включены в исследование характеристик COVID-19. Диагноз COVID-19 был основан на руководстве по диагностике и лечению COVID-19, выпущенном Всемирной организацией здравоохранения. Диагноз был подтвержден положительным результатом анализа обратной транскриптазы-полимеразы-цепной реакции в режиме реального времени на коронавирус 2 тяжелого острого респираторного синдрома в образцах мазков из горла или носоглотки. Пациенты с COVID-19 при поступлении были классифицированы на тяжелые и нетяжелые формы в соответствии с рекомендациями Американского торакального общества по внебольничной пневмонии. Пациенты, которые соответствовали 1 основному критерию или как минимум 3 второстепенным критериям, были определены как тяжелый тип: основные критерии: (1) септический шок с потребностью в вазопрессорах; (2) дыхательная недостаточность, требующая искусственной вентиляции легких; и второстепенные критерии: (1) частота дыхания> 30 вдохов / мин; (2) отношение PaO2 / FiO2 <230; (3) многодолевые инфильтраты; (4) замешательство / дезориентация; (3) уремия (уровень азота мочевины в крови> 20 мг / дл); (6) лейкопения (количество лейкоцитов <4000 клеток / мкл); (7) тромбоцитопения (количество тромбоцитов <100000 / мкл); (8) переохлаждение (внутренняя температура <36 ° C); и (9) гипотония, требующая агрессивной жидкости.

Реанимация

Информация о пациентах с COVID-19 о демографических характеристиках, результатах лабораторных исследований, лечении и осложнениях была получена с помощью форм для сбора данных, извлеченных из электронных медицинских карт. Были выполнены лабораторные измерения, включая стандартные анализы крови, биохимию крови, функцию свертывания крови и биомаркеры инфекции. Медицинские карты пациентов были просмотрены и проанализированы командой хорошо обученных врачей. Сопутствующие заболевания, включая хронический риносинусит (ХРС), определялись на основании самоотчета пациентов при поступлении, а точность записей сопутствующих заболеваний проверялась опытными врачами во время последующего наблюдения. Результаты лабораторных исследований, проведенных вскоре после поступления, были использованы для анализа разницы между пациентами с ХРС и без ХРС.

Острое повреждение печени было определено как желтуха с уровнем общего билирубина> 3мг/дл и резким повышением уровня аланинаминотрансферазы, по крайней мере, в 2 раза превышающим верхний предел нормального диапазона. Острый респираторный дистресс-синдром был определен как Pa02 / Fi02 <300 мм рт. Ст. В соответствии с Берлинским определением. Острое повреждение почек определялось в соответствии с Руководством по заболеванию почек: улучшение общих результатов с резким снижением функции почек и увеличением содержания Cr в сыворотке до> 1,5 раз от исходного уровня. Острое повреждение миокарда определялось как повышенное значение сердечного тропонина в сыворотке выше 99-го перцентиля верхнего референсного предела. Шок определялся как систолическое артериальное давление <80 мм рт. Ст. И пульсовое давление <30 мм рт.

Заключение

У нашего отчета есть несколько потенциальных ограничений. Во-первых, сопутствующие заболевания, о которых сообщают сами люди, могут привести к неправильной оценке распространенности. Во-вторых, Мы не включали в этот отчет случаи со смертельным исходом, потому что было трудно подтвердить сопутствующие заболевания у этих пациентов. Однако мы попытались подтвердить записи коморбидности ХРС у 15 умерших пациентов с COVID-19, поступивших в тот же период со своими близкими родственниками, и обнаружили,

что частота коморбидности ХРС в этих летальных случаях (1 из 15, 6,7%) была сопоставимо с таковой в выписанной когорте (6,1%). В-третьих, отсутствует информация о приеме лекарств перед приемом. В-четвертых, ХРС можно подразделить на ХРС с носовыми полипами и без них. Тем не менее информация о подтипах ХРС у большинства пациентов отсутствовала. Поэтому было невозможно определить, имеет ли ХРС с или без носовых полипов разные ассоциации с COVID-19. В-пятых, бессимптомные пациенты и пациенты с легкими симптомами, которые не были госпитализированы, не были включены в это исследование. Исследования этих амбулаторных пациентов с COVTD-19 были бы полезны для получения полной картины связи между ХРС и COVID-19.

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A DIGITAL MODEL OF CLIMATE VARIABILITY

Abstract: *A digital model of climate variability with a number of variables has been developed (5+4+4+4=17) and parameters (5*5+4*4+4=45). Two systems of linear equations for 5 and 4 z-variability. The first is with the right part equal to u-variability (for 5 z-variability), the second is v-variability (for the other 4 z-variability).. A mathematical multidimensional model is correctly transformed into a system of semantic equations with unknown m z-variability, m u-variability, m v-variability, in the presence of knowledge indicators. The uncorrelation of m u-variability with m v-variability exactly corresponds to the independence of the meaning of each u-variability from the meaning of each v-variability. Transformation of one multidimensional linear equation of cognitive meanings of variability zi1,...,zi5 of z-variables z1,z2,...,z5 and the meaning of one u-variable into m linear equations of values of 5 z-variability characterizing the variability of negative consequences for human economic activity gives m values of 5 z-variability and m values of one u-variability. Transformation of one multidimensional linear equation of cognitive meanings of variability zi6,...,zi9 of z-variables z6,...,z9 and one v-variable into m linear equations with 4 z-variability characterizing climate variability gives m values of 4 z-variability, m values of one of the 4 v-variability. The values and the number of indicators are the control parameters of the digital model. They are equal to 4+27=31, where 4 is the number of variances of hidden variables, 16+11=27 is the number of indicators.*

An example of modeling the values of variability of climate change indicators is carried out. The values of parameters and variables (various in the sense of interpretation) of the digital model of climate variability are found. They numerically and visually show that the types of dependencies of climate change indicators correspond to reality (Figures 4-8).

Key words: *digital model, climate, variability.*
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ЦИФРОВАЯ МОДЕЛЬ ИЗМЕНЧИВОСТЕЙ КЛИМАТА

Аннотация: *Разработана цифровая модель изменчивости климата. Две системы линейных уравнений для 5-и и 4-х z- изменчивостей. Первая - с правой частью, равной u-изменчивости (для 5 z-изменчивостей), вторая - v-изменчивости (для других 4 z-изменчивостей).. Математическая многомерная модель корректно преобразуется в систему смысловых уравнений с неизвестными m z-изменчивостями, m u-изменчивостями, m v-изменчивостями, при наличии индикаторов знаний. Некоррелированность m u-изменчивостей с m v-изменчивостями точно соответствует независимости смысла каждой u-изменчивости от смысла каждой v-изменчивости. Трансформация одного многомерного линейного уравнения когнитивных смыслов изменчивостей zi1,...,zi5 z–переменных z1,z2,...,z5 и смысла одной u–переменной в m линейных уравнений значений 5 z-изменчивостей, характеризующих изменчивости негативных последствий для хозяйственной деятельности человека, дает m значений 5 z-изменчивостей и m значений одной u-изменчивости. Трансформация одного многомерного линейного уравнения когнитивных смыслов изменчивостей zi6,...,zi9 z–переменных z6,...,z9 и одной v–переменной в m линейных уравнений с 4-мя z-изменчивостями,*

характеризующих изменчивости климата, дает т значений 4 z-изменчивостей, т значений одной из 4-х v-изменчивостей. Величины и количество индикаторов являются управляющими параметрами цифровой модели. Их количество равно 4+27=31, где 4-количество дисперсий скрытых переменных, 16+11=27-количество индикаторов.

Приведен пример моделирования значений изменчивостей показателей изменений климата. Найдены значения параметров и переменных (разнообразные по смыслу интрпретации) цифровой модели изменчивости климата. Они численно и визуально показывают соответствие реальности видов зависимостей показателей изменений климата (Рисунки 4-8).

***Ключевые слова**: цифровая модель, изменчивость, климат.*

Введение

«Негативное воздействие деятельности человека на климат скрывается за высокими заборами промышленных и сырьевых предприятий, а редкие катастрофы, инциденты (вброс в море нефти из буровых платформ, из тонущих танкеров, отравление фауны, флоры океана неустановленными лицами, или при ошибках во время учений, запусков летающих объектов) быстро ликвидируются, но остаютсразрушительные, «губительные для …» последствия, портящие не только климат. Негативное воздействие деятельности человека на климат является важнейшей проблемой, эту проблему должны решать люди с другими статусами» [1].

Исследуемая нами система «изменение климата - природные и хозяйственные последствия» обладает асимметрией информации и неполными данными. Актуальными являются системные формализованные междисциплинарные теории негативного воздействия деятельности человека (по неизвестным причинам) на климат и влияние изменений климата (зависящих от скрытых факторов) на деятельность человека. Пока ограничимся моделированием в системе «изменение климата - природные и хозяйственные последствия».

Имеются разнообразные исследования, посвященные разным аспектам изменений климата Земли, проведенные в рамках разных отраслей знаний. Имеются краткие сжатые в словесные фразы-результаты. Среди них выберем результаты, приведенные в материалах Всемирного банка (заказ ООН)[1]. «Богатые страны, которые давно входят в число промышленно развитых, несут основную ответственность за возникновение проблемы изменения климата, в то время как беднейшие общины и страны больше всего страдают от последствий, поскольку, как правило, именно они принимают на себя главный удар сильных наводнений, засух, бурь и других предсказуемых явлений, средств на эффективную борьбу с которыми у них не хватает». По сути, из-за изменения климата, оставляющего людей в нищете, можно потерять то, чего удалось добиться в сфере мирового развития»[11].

Деятельность человека является «измеряемой ричиной» негативных последствий от изменений климата. Измерения показателей изменений климата менее доступны (их можно считать неполными), чем измерения показателей негативной деятельности или негативных послдствий для человека от изменений климата. Существует также и другая группа людей, чья деятельность повлияла на климат. Данные по последствиям - показатели негативных последствий для человека более доступны и полны, чем трудно измеряемые показатели непредсказуемых климатических явлений (ураганы, сильные дожди). Поэтому индикаторы присутствия знаний мы выделяем в 1-ой (из 2-х) группе z–переменных, в матрице A_{54}.

Введем показатели деятельности человека и изменений климата, введем параметры, переменные, изменчивости переменных, математические функции, уравнения, системы уравнений, системы многомерных когнитивных уравнений смыслов изменчивости переменных, надлежащие критерии, функции ограничений, целевую функцию.

Наша цифровая модель должна включать в себя больше переменных, параметров, чем модель [1]. Возможности модели возрастут, если будут введены в многомерную модель фиктивные переменные, дисперсии (измерители изменчивости переменных) которых обладали бы полезными свойствами. Например, сохраняли сумму дисперсий при линейных преобразованиях. А доля и число доминирующих дисперсий были бы относительно большими. Большое количество доминирующих дисперсий означает наличие большого количества скрытых факторов, влияющих на изменение климата. Применялась длинная цепь модельных цифровых многомерных объектов из ОМ АИКП: $(A_{54},\Lambda^2_{44})\rightarrow A_{54}$; $(B_{44},\Lambda^2_{44})\rightarrow(B_{44})$; $(A_{54},B_{44})\rightarrow(U_{24,4}V_{24,4})$; $(U_{24,4},V_{24,4})\rightarrow(Z_{24,4},Z_{24,4})$.

В нашей модели мы собираемся оцифровывать (5+4)+(4+4)=17 показателей из 4-х множеств переменных $((U_{24,4},V_{24,4})\rightarrow(Z_{24,4},Z_{24,4}))$,

[1] https://www.un.org/ru/youthink/climate.shtml.

характеризующих изменеичивость климата и их последствия для жизни людей.

Обратная Модель Анализа Избыточно-Канонических Переменных

Метод избыточных переменных изложен в статье [1], метод канонических переменных изложен в статье [3], метод избыточно-канонических переменнх с одинаковыми дисперсиями (Прямая Модель АИКП)– в статье [4]. Избыточно-канонические переменные с различными дисперсиями[5] – результат последовательного преобразования матриц z-переменных методами избыточных [2], затем – методом канонических переменных [3]. Индексы избыточностей 4 пар множеств переменных исследованы в терминах RV-коэффициентов в статье [4].

Здесь излагается Обратная Модель Анализа Избыточно-Канонических Переменных (ОМ АИКП) с одинаковой матрицей Λ_{pp} =diag(λ_1,…,λ_p) дисперсий избыточно-канонических u- и v-переменных. В статье [6] мы сформировали новую структурную матрицу (Таблица 5 [6]) и провели моделирование рассматриваемых ниже матричных объектов. Будем использовать случай равенства $\Lambda^{(1)}_{pp}=\Lambda^{(2)}_{pp}=\Lambda_{pp}$ [4], случай несовпадения 2-х множеств дисперсий u– и v-переменных [5]: $(1/m)U^TU=\Lambda^{(1)}_{pp}$, $(1/m)V^TV=\Lambda^{(2)}_{pp}$ для применения в цифровой модели не рассматриваем.

В ПМ АИКП [4] решается ПСЗ (однородная спектральная задача) вида $(\Psi_{12}\Psi_{21}-\Lambda^2)A_{qp}=0_{pp}$ для известной симметрической матрицы $\Psi_{12}\Psi_{21}$. решением ПСЗ является пара матриц (Λ^2_{pp},A_{qp}), где Λ^2_{pp}=diag(λ^2_1,…,λ^2_p) – матрица положительных собственных чисел, A_{qp} - матрица собственных векторов $\mathbf{a}_j=(a_{1j},\ldots,a_{qj})^T$ j=1,…,p. Пара матриц (Λ_{pp},A_{qp}) и матрицы Λ_{pp},A_{qp} определяют другую матрицу B_{pp} собственных векторов $\mathbf{b}_j=(b_{1j},\ldots,b_{pj})^T$ j=1,…,p, равную $\mathbf{B}_{pp}=\Lambda^{-1}\Psi_{21}A_{qp}$, при этом для матриц $A_{\mathbf{qp}}$,$\mathbf{B}_{pp}$,Λ_{pp} верны равенства $A_{\mathbf{qp}}\Psi_{12}\mathbf{B}_{pp}=\Lambda_{pp}$, $A^TA=I_{pp}$, $B^TB=I_{pp}$. Заметим: здесь отсутствуют равенства $AA^T=I_{qq}$, $BB^T=I_{pp}$, т.е. матрицы ортогогональны, но не ортонормированы. В нашей обратной задаче мы введем это условие ортонормированности (смотрите ниже).

Образуется 2-ая пара матриц (Λ_{pp},B_{pp}), для которых верны равенства: $B^TB=I_{pp}$, $V_{mp}=Z_{mp}B_{pp}$, $(1/m)V^TV=I_{pp}$ (в обратной задаче: $(1/m)V^TV=\Lambda_{pp}$). Для матрицы A_{qp}, верны равенства: $U_{mp}=Z_{mq}A_{qp}$, $\mathbf{B}_{pp}=\Lambda^{-1}\Psi_{21}A_{qp}$, где $(1/m)U^TU=I_{pp}$ (в обратной задаче: $(1/m)U^TU=\Lambda_{pp}$). Матрица z-переменных {z_1,…,z_q,} Z_{mq} и матрица z-переменных {z_{q+1},…,z_{q+p}} Z_{mp} преобразуются в матрицы би-ортогогальных u- и v-переменных: $U_{mp}=Z_{mq}A^+_{qp}$, $V_{mp}=Z_{mp}B^+_{pp}$, $(1/m)U^TV=\Lambda^2_{pp}$= diag(λ^2_1,…,λ^2_p).

В применяемой нами обратной задаче моделируются A_{qp}, $\mathbf{B}_{pp}$, удовлетворяющие ОСЗ видов $(Q_{qq}-\Lambda^2)A_{qp}=0_{qp}$, $(S_{qp}-\Lambda^2)B_{qp}=0$ для неизвестных симметрических матриц Q_{qq}, S_{qp}. Так как решаются ОСЗ для симметрических матриц Q_{qq}, S_{qp}, то матрицы A_{qp}, $\mathbf{B}_{pp}$ могут быть, в частности, ортонормированными. А при ортонормированном преобразовании стандартизованных матриц Z_{mq} и Z_{mp} получаемые матрицы $U_{mp}=Z_{mq}A_{qp}$ и $V_{mp}=Z_{mp}B_{pp}$ будут удовлетворять соотношениям ПМ ГК. Матрицы U_{mp} и V_{mp} будут матрицами главных компонент, будут иметь неодинаковые дисперсии $\lambda_1,\ldots,\lambda_p$. Но матрицы Z_{mq} и Z_{mp} будем получать из матриц избыточно-канонических , умноженных на диагональную матрицу Λ_{pp}=diag(λ_1,…,λ_p), а при при ортонормированном преобразовании каждая из матриц u- и v-переменных должна быть не ортогональной, а диагональной: $(1/m)U^TU=\Lambda_{pp}$, $(1/m)V^TV=\Lambda_{pp}$, $(1/m)U^TV=\Lambda^2_{pp}$=diag(λ^2_1,…,λ^2_p). Моделирование 2-х матриц U_{mp}, V_{mp} би-ортогональных избыточно-канонических переменных производится при решении отдельной ОЗ с входным объектом Λ_{pp} =diag(λ_1,…,λ_p). Эта Оптимизационная Задача 3 решается после получения модельных пар матриц (A_{qp},Λ^2_{pp}), (B_{pp},Λ^2_{pp}) в результате решений Оптимизационной Задачи 1: (I_{qq},I^2_{pp})=> (A_{qq},Λ^2_{pp}), и Оптимизационной Задачи 2: (I_{pp}, Λ^2_{pp})=>(B_{pp}). В обратной задаче важны 2 матрицы собственных векторов A_{qp}, $\mathbf{B}_{pp}$ – матрицы индикаторов извлекаемых знаний [6]. Элементы диагональной матрицы Λ^2_{pp} моделируются одновременно с элементами матрицы собственных векторов A_{qp}. Диагональная матрица Λ^2_{pp} является входным объетом Оптимизационной Задачи 2: (I_{pp}, Λ^2_{pp})=>(B_{pp}).

Матрица $\mathbf{B}_{pp}$ является матрицей собственных векторов неизвестной симметрической матрицы Q^T_{pp} =Q_{pp} полного ранга. Но они существуют в обратной задаче совместно со своими парами: (Λ^2_{pp}, A_{qp}), (Λ^2_{pp},B_{pp}).

Матрица $\mathbf{B}_{pp}$ моделируется зависимым от спектра Λ^2_{pp}=diag(λ^2_1,…,λ^2_p), а спектр Λ^2_{pp}=diag(λ^2_1,…,λ^2_p) предварительно моделируется совместно с матрицей A_{qp}, содержащей индикаторы присутствия знаний (являются управляющими параметрами цифровой модели) Спектр Λ^2_{pp}=diag(λ^2_1,…,λ^2_p) имеет доминирующие элементы $\lambda^2_1,\ldots,\lambda^2_\ell$, ℓ=3, а наши рассматриваемые ниже матрицы собственных векторов A_{qq}, $\mathbf{B}_{pp}$ преобразуют важные для модели матрицы U_{mp} (в дальнейшем она будет равна $Z_{mq}A_{qp}$) и V_{mp} (в дальнейшем она будет равна $Z_{mp}B_{pp}$) в матрицы Z_{mq} и Z_{mp} значений искомых изменчивостей. При этом матрица U_{mp} би-ортогональных избыточно-канонических переменных умножается справа на диагональную матрицу $\Lambda^{1/2}_{pp}$, этим мы преобразуем одинаковые

дисперсии u–переменных в различные дисперсии (q=5,p=4,λ_5=0), не меняя сумму дисперсий (=p). Матрица U_{mp} би-ортогональных избыточно-канонических переменных не преобразуется в матрицу главных компонент, как может показаться. Наивысшую роль в нашей модели играют матрицы собственных векторов A_{qp} $\mathbf{B}_{pp}$ из соотношений $(\Psi_{12}\Psi_{21})A_{qp}=\Lambda^2A_{qp}$, $Q_{pp}B_{pp}=\Lambda^2B_{pp}$, $Q^T_{pp}Q_{pp}=I_{pp}$, где матрицы $\Psi_{12}\Psi_{21}$, Q_{pp} - неизвестные симметрические матрицы, имеющие нужные нам матрицы (Λ^2_{pp},A_{qp}), (Λ^2_{pp},B_{pp}). Матрицы собственных векторов A_{qp} $\mathbf{B}_{pp}$ содержат индикаторы извлекаемых знаний, они преобразуют матрицы U_{mp} и V_{mp} . А матрицу V_{mp} мы моделируем последней, решая Оптимизационную Задачу 3. В ОЗ 3 входными объектаими являются (Λ_{pp},U_{mp}) выходным объект матрица V_{mp} такая, что удовлетворяет равенству $\Lambda_{pp}=(1/m)V^TV$, $(1/m)U^TV=\Lambda_{pp}=diag\ (\lambda_1,\ldots,\lambda_p)$. При этом матрица V_{mp} будет также матрицей би-ортогональных избыточно-канонических переменных. Так как A_{qp} $\mathbf{B}_{pp}$ являются матрицами индикаторов извлекаемых знаний (смыслов), то лучше матрицы U_{mp} и V_{mp} называть ***смысловыми би-ортогональными избыточно-каноническими переменными.***

Полученные матрицы U_{mp}, A_{qp},V_{mp},B_{pp}, Λ_{pp} удовлетворяют и соотношениям ПМ АИКП. Схематически ПСЗ $(\Psi_{12}\Psi_{21})A_{qp}$ $=\Lambda^2A_{qp}$ обозначается так: $\Psi_{12}\Psi_{21}=>(\Lambda^2,A_{qp})$. Входным объектом ПСЗ является симметрическая q×q-матрица $(\Psi_{12}\Psi_{21})$, а ее выходными объектами являются матрица собственных чисел $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)$ и матрица A_{qp} ортогональных собственных векторов $\mathbf{a}_j=(a_1,\ldots,a_q)^T$, j=1,…,p. Входной объект ПСЗ - матрица $\Psi_{12}\Psi_{21}$, является квадратной симметриической матрицей: $(\Psi_{12}\Psi_{21})^T=\Psi_{12}\Psi_{21}$, а ее решение – пара матриц (Λ^2,A_{qp}) таковы, что выполняются равенства: $(\Psi_{12}\Psi_{21})A_{qp}=\Lambda^2A_{qp}$ $\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $\lambda_1>\ldots>\lambda_p>0$. В нашем примере (смотрите ниже) би-ортогональность пары матриц $(U_{44,4},V_{44,4})$ выражена при 3-х доминирующих дисперсиях $(1/m)U^TV=\Lambda_{44}=diag(1.1391,1.0699,1.0089,0.7348)$. почему 3, а не иное?

Модельная подматрица $V_{mp}=Z_{mp}B_{pp}$ – с избыточно применением матрицы B_{pp}. Матрицы U_{mp} и $V_{mp}=Z_{mp}B_{pp}$ имеют свойства: $(1/m)U^TU=I_{pp}$, $(1/m)V^TV=I_{pp}$, $(1/m)U^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$. Схематически эта последовательность этапов выглядит так: $(A_{qp},\Lambda^2_{pp})\rightarrow A_{qp}$; $(B_{pp},\ \Lambda^2_{pp})\rightarrow(B_{pp})$; $(A_{qp},\ B_{pp})\rightarrow(U_{mp}\ V_{mp})$; $(U_{mp},V_{mp})\rightarrow(Z_{mq},\ Z_{mp})$. Здесь матрицы A_{qp},B_{pp} содержат небольшое число индикаторов $|c_{kj}|\geq c_0$, извлеченных знаний из 5 соответствующих матриц собственных векторов C_{nn} [7-11]. Когнитивные модели извлечения знаний из 5 реальных телекоммуникационным данных описаны в статьях [7-11]. В настоящей работе индикаторы объединены в отдельные 2 матрицы A_{qp}, B_{pp} (они преобразовываются, как увидим ниже, в матрицы индикаторов присутствия знаний). Информативная схема ОЗ АИКП имеет вид: $(I_{qq},\Lambda^2_{pp})\rightarrow A_{qp}$; $(I_{pp},\Lambda^2_{pp})\rightarrow(B_{pp})$; $(V^0_{mp},\Lambda_{pp})\rightarrow U_{mp}$, $(U_{mp},\Lambda_{pp},B_{pp})\rightarrow(V_{mp})$; $(U_{mp},A_{qp},V_{mp},B_{pp})\rightarrow(Z_{mq},Z_{mp})$.

Преобразование пары u- и v-переменных в пару множеств z-переменных на этапе $(U_{mp},V_{mp})\rightarrow(Z_{mq},Z_{mp})$ необходимо для получения модельных числовых данных Z_{mq},Z_{mp}. Эти матрицы данных Z_{mq},Z_{mp} имеют 2 матрицы A_{qp},B_{pp} индикаторов извлеченных знаний, формируемых из информации об именах-смыслах q+p z-переменных, о значениях коэффициентов корреляций $a_{kj}=corr(z_k,u_j)$, $b_{kj}=corr(z_k,v_j)$, $\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$.

Математическая постановка задачи

Задача. Для заданной диагональной матрицы $\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $\lambda_1>\ldots>\lambda_p>0$, $\lambda_1+\ldots+\lambda_p=p$, требуется найти значения элементов 2-х модельных подматриц Z_{mq}, Z_{mp} матрицы $Z_{mn}=[Z_{mq}|Z_{mp}]$, состоящей из m значений n z-переменных. Матрица Z_{mq} состоит из m значений z-переменных $\{z_1,\ldots,z_q,\}$, матрица Z_{mp} состоит из m значений z-переменных $\{z_{q+1},\ldots,z_{q+p}\}$, n=q+p,q≥p.

Получаемые 2 модельные подматрицы Z_{mq}, Z_{mp} должны быть вычислены после *отдельных линейных преобразований*: модельных ортонормированных матриц A_{qp}, $\mathbf{B}_{pp}$. 2 матрицы собственных векторов A_{qp}, $\mathbf{B}_{pp}$ должны содержать индикаторы извлекаемых знаний [1] и должны совместно со своими парами: (Λ^2_{pp},A_{qp}), (Λ^2_{pp},B_{pp}), удовлетворять соотношениям $(\Psi_{12}\Psi_{21})A_{qp}$ $=\Lambda^2A_{qp}$, $Q_{pp}B_{pp}=\Lambda^2B_{pp}$, $Q^T_{pp}Q_{pp}=I_{pp}$, где матрицы $\Psi_{12}\Psi_{21}$, Q_{pp} – неизвестные симметрические матрицы, имеющие нужные нам матрицы (Λ^2_{pp},A_{qp}), (Λ^2_{pp},B_{pp}).

Для моделирования подматриц Z_{mq}, Z_{mp} рекомендуется применить матрицы U_{mp} и V_{mp} значений би-ортогональных избыточно-канонических переменных. При ортонормированных преобразованиях - матрицах A_{qp},B_{pp}, матрицы U_{mp} и V_{mp} будут матрицами главных компонент – y-переменных, имеющих неодинаковые дисперсии $\lambda_1,\ldots,\lambda_p$. Линейным преобразованиям должны подвергнуться 2 матрицы U_{mp},V_{mp} значений би-ортогональных избыточно-канонических переменных (biorthogonal canonical-redundancy) u- и v-переменных таких, что: $(1/m)U^TU=\Lambda_{pp}$, $(1/m)V^TV=\Lambda_{pp}$, $(1/m)U^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $\lambda_1>\ldots>\lambda_p>0$. Модельные матрицы A_{qp} и B_{pp} должны иметь алгебраические свойства ортонормированных матриц: $AA^T=I_{qq}$, $BB^T=I_{pp}$, $A^TA=I_{pp}$, $B^TB=I_{pp}$. Модельная подматрица Z_{mq} должна быть вычислена с применением матрицы

A_{qp}, а модельная подматрица Z_{mp} – с применением матрицы B_{pp}. Ортонормированные матрицы A_{qp}, B_{pp} из ПМ АИКП [4] обеспечивают би-ортогональность пары матриц (U_{mp},V_{mp}): $(1/m)U^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$ и би-ортогональность столбцов в каждой из матриц U_{mp},V_{mp}:$(1/m)U^TU=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $(1/m)V^TV=\Lambda_{pp}=diag\ (\lambda_1,\ldots,\lambda_p)$.

Введенные математически в матрицы A_{qp},B_{pp} индикаторы извлекаемых знаний остаются неизменными в матрицах A_{qp},B_{pp}. Этот факт является существенным преимуществом данной постановки Обратной Задаче (О З) АИКП.

Исходными предпосылками ОЗ являются следующие: множество z-переменных разделены на 2 группы: в 1-ую группу объединены q z-переменные $z_1,\ldots,z_q$, во 2-ую –p переменные $z_{q+1},\ldots,z_{q+p}$, всего q+p=n переменные. Для простоты изложения перенумеруем 2-ую группу: $z_1,\ldots,z_p$. Используемые соотношения из Прямой Модели Анализа Избыточно-Канонических Переменных (ПМ АИКП) приведены в работе [4]. Метод избыточных переменных (МИП, redundancy values analysis, RVA [2]) исследован в [4] в терминах RV-коэффициентов (индексов избыточностей для пар переменных из разных множетв) из статьи [12]. Решение нашей задачи - подматрицы $Z_{mq}|Z_{mp}$ будут моделироваться нами ниже при решении Обратной Задачи АИКП.

Ниже будут изложены алгоритмы реализации ОМ АИКП: $(I_{qq},\Lambda^2_{pp})\rightarrow A_{qp}$; $(I_{pp},\Lambda^2_{pp})\rightarrow(B_{pp})$; $(V^0_{mp},\Lambda_{pp})\rightarrow U_{mp}$, $(U_{mp},\Lambda_{pp},B_{pp})\rightarrow(V_{mp})$; $(U_{mp},A_{qp},V_{mp},B_{pp})\rightarrow(Z_{mq},Z_{mp})$.

Исходные данные - показатели негативных последствий для деятельности человека

Исходные данные показатели негативных последствий для деятельности человека, а не показатели климатических изменений. Показатели негативных последствий достаточно подробно и точно подсчитываются государственными структурами, они касаются юридических и физических лиц, любое пренебрежение при их учете чревато неприятностями для учетчиков возмещающихся потерь от стихийных климатических бедствий. Далеко не все параметры экстремальных изменений климата удается измерить, зафиксировать. Пиковые значения высоты волн, скорости с порывами ветра, объем прибывающей воды и т.п. мало что объясняет из списка последствий.

Исходными словесными данными являются имена-смысли показателей негативных последствий для деятельности человека, общие сведения о которых взяты из материалов Всемирного банка[1] Предполагается существование скрытых неизмеряемых (главных валидных u- скрытых неизмеряемых показателей и главных валидных v-переменных изменений климата) показателей с неизвестными (не только для нас) нам смыслами. Про скрытые факторы имеются много легенд, но нет достоверных научных доказательств. Пример: загадочный Бермудский треугольник в Атлантическом океане. Валидные переменные существуют в модели как для 5 показателей деятельности человека (последствия изменений климата и вредные для экологии действия предприятий), так и для 4-х показателей изменений климата Земли. Их перечень состоит из 4-х показателей. Смысли этих показателей взяты из материалов Всемирного банка[1]. Словесные описания изменений климата и последствий для деятельности человека приведены в статье [1]. Предполагаемая нами независимость скрытых показателей в модели точно соответствует би-ортогональности - свойству множества псевдослучайных векторов, в котором каждый из векторов ортогонален ко всем остальным векторам.

Опираясь на смысли 4-х y-переменных и смысли 5 z-переменных назначили индикаторы [1] в каждой из 4-х собственных векторов. Номер индикатора и их количество определим из исходного списка смыслов 5 z-переменных. Кроме значений индикаторов для решаемых ниже ОЗ для моделирования пар матриц исходными данными для матриц A_{54}, B_{44} являются соответственно матрицы I_{55}, I_{44}. Эти начальные значения позволяют смоделировать 3 матрицы A_{qq},$\mathbf{B}_{pp}$, $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)$. Матрицы собственных векторов A_{qq}, $\mathbf{B}_{pp}$ нужны для преобразования матрицы U_{mp} (в дальнейшем она будет равна $Z_{mq}A_{qp}$ и матрицы V_{mp} (в дальнейшем она будет равна $Z_{mp}B_{pp}$) в центрированные матрицы Z_{mq} и Z_{mp}.

Множество индикаторов присутствия извлекаемых знаний образует мозаику {a11=0,696, a21=0.55, a_{41}=0.4, a_{12}=0.58, a_{22}=0.36, a_{32}=0.710704, a_{52}=0.17, a_{13}=0.3, a_{23}=0,6719, a_{14}=0.3, a_{24}=0.35, a_{44}=0.86}. Множество из 12 пар индексов элементов матрицы C_{55} индикаторов присутствия знаний образует свою мозаику {(1,1), (1,2), (4,1), (1,2), (2,2), (3,2), (5,2), (1,3), (2,3), (1,4), (2,4), (4,4)}.

Словесные описания изменений климата и последствий для деятельности человека приведены в статье [1]. Словесные описания изменений климата и негативных последствий для хозяйственной деятельности человека нужны для формулирования кратких фраз, передающих смыслы вводимых (для когнитивной модели) валидных (вычисляемых) и измеряемых (моделируемых) переменных математической модели. Словесные описания изменяющихся

показателей следующие: колебания температуры, колебания уровня осадков, годовой уровень осадков, происходящих с большими интервалами, в виде гораздо более сильных и кратковременных ливней, вызывающих усиление засух и наводнений, рост интенсивности сильных штормов и ураганов.

Краткие фразы смыслов 5 z-переменных модели должны соответствовать приведенным выше показателям изменений климата. Краткие фразы смыслов 5 z-переменных, характеризующих негативные последствия для хозяйственной деятельности человека, присвоим именам-смыслам 5 z-изменчвостей 5 z-переменных:

z_1 – увеличение степени негативного воздействия на сельское хозяйство в тропиках и субтропиках (угроза продовольственной безопасности);

z_2 - дальнейшее уменьшение количества воды и ухудшение ее качества в регионах, где бедные общины зависят от дождевой воды, используемой для полива зерновых и для питья;

z_3 -увеличение степени распространения малярии, лихорадки денге и других болезней в тропических и субтропических регионах (там, где здравоохранение и без того плохо развито, произойдет повышение уровня смертности);

z_4 -увеличение степени ущерба экологическим системам и биологическому разнообразию в них (что повлечет за собой сокращение возможностей отношении обслуживания, обеспечения средств к существованию и сокращение доходов).

z_5 -увеличение относительного уровння (подъема уровня моря), вызванным ожидаемым повышением температуры.

Краткие фразы смыслов 4 z-переменных изменений климата назначим в 2-ое множество моделируемых (как бы измеряемых) z-переменных модели: **z_6** - колебания температуры (z_6), z_7- колебания уровня осадков, z_8 - годовой уровень осадков (происходящих с большими интервалами, в виде гораздо более сильных и кратковременных ливней, вызывающих усиление засух и наводнений), **z_9** - степень роста интенсивности сильных штормов и ураганов. Эти z-переменных изменений климата характеризуют процессы во времени, не являются одномоментными свойствами климата. Являются проявлениями изменчивости обобщенных свойств климата. Поэтому и моделировать нужно изменчивость обобщенного свойства. Количество таких свойств равно 4 – в соответствии с словесным описанием изменений климата. Мы моделируем z - изменчивость, а не значение z - переменной. Впредь под термином «переменная» надо понимать слово «изменчивость». В описании многомерной модели (прямой или обратной) уместно использовать слово «переменная», а для описаний когнитивных моделей изменчивости, применяющих многомерную модель применим термин «изменчивость». Это замечание относится к z-,u-,y-, v-переменным.

Модельная мтрица A_{qp} значений индикаторов знаний о последствиях изменений климата

Ранее была сформирована матрица **A_{54}**, с назначенными элеметами – 7 индикаторами $a_{41}=corr(z_4,u_1)=0.40$, $a_{12}=corr(z_1,u_2)=0.5800$, $a_{22}=corr(z_2,u_2)=0.5600$, $a_{52}=corr(z_5,u_2)=0.1700$, $a_{13}=corr(z_1,u_3)=0.3000$, $a_{14}=corr(z_1,u_4)=0.2500$, $c_{44}=corr(z_4,u_4)=0.86$. С применением надстройки в ЭТ Excel «Поиск решения» с задачи $(I_{pp},I_p)=>(\Lambda^2_p,A_{pp})$. Далее для найденной матрицы собственных векторов $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)=diag(1.2975,1.14463,1.0179,0.53997)$ последовательно решаем задачи: $\Lambda^2_{pp}=>(\Lambda^2_{pp}, B_{qp})$, $B^TB=I_{pp}$, $BB^T=I_{pp}$. Мы смоделировали матрицу B_{44} как матрицу собственных векторов для матрицы собственных чисел $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)=diag$ (1.2975, 1.14463, 1.0179, 0.53997). Модельные матрицы A_{54} и B_{44} имеют одинаковые алгебраические свойства ортонормированных матриц: $AA^T=I_{55}$, $BB^T=I_{44}$, $A^TA=I_{44}$, $B^TB=I_{44}$, случай разных алгебраических свойств не рассматриваем.

Моделирование 2-х матриц B_{pp}, A_{qp} собственных векторов проводили в ЭТ Excel обратную задачу: подобрать исходные данные для получения желаемого результата. Средство поиска решения Microsoft Excel использует алгоритм нелинейной оптимизации Generalized Reduced Gradient (GRG2), разработанный Леоном Ласдоном (Leon Lasdon, University of Texas at Austin) и Аланом Уореном(Allan Waren,Cleveland State Univer sity Схема ОМ Анализа ИКП, отражающая последовательность этапов независимого моделирования ортонормированных квадратных (q=p) матриц собственных векторов A_{qp}, B_{pp}, q=p, была приведена выше.

Моделирование матриц U_{mp}, V_{mp} значений избыточно-канонических переменных

Моделирование матриц Ump, Vmp значений матриц собственных векторов A_{qq}, **B_{pp}** и матриц значений избыточно-канонических переменных **U_{mp}, V_{mp}** проводятся по-разному.

Нам известны 3 матрицы A_{qq}, **B_{pp}**, $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)$. Матрицы A_{qq}, **B_{pp}** собственных векторов A_{qq}, **B_{pp}** нужны для преобразований матрицы U_{mp} (в дальнейшем она будет равна $Z_{mq}A_{qp}$) и матрицы V_{mp} (в дальнейшем она будет равна $Z_{mp}B_{pp}$) в центрированные

матрицы Z_{mq} и Z_{mp}. Матрицы U_{mp},V_{mp} должны быть матрицами из m значений би-ортогональных избыточно-канонических переменных (biorthogonal canonical-redundancy variables), удовлетворяющих равенствам $(1/m)U^TU=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $(1/m)V^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $(1/m)U^TV=\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)=diag(1.2975,1.14463,1.0179,0.53997)$.

Этап $(A_{qp}, B_{pp}) \rightarrow (U_{mp}\ V_{mp})$ решения нашей задачи начинается моделирования матрицы U_{mp} такой, что $(1/24)U_{24,4}{}^TU_{24,4}=I_{44}$ [1,5]. преобразуется с применением диагональной матрицы $\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, где не всегда выполняется свойсво димирования 1-ых членов: $\lambda_1>\ldots>\lambda_p>0$. Пеобразуется другая матрица, полученная из другой имеющейся матрицы U_{mp} такой что $(1/m)U^TU=I_{pp}$. Далее она преобразуется с применением матрицы A_{qp} (моделируется при решении ОЗ 1 одновременно с Λ^2_{pp}) так, что удовлетворяется равенство $\Lambda_{44}=(1/24)U^TU=diag(\lambda_1,\ldots,\lambda_p)=$ $diag(1.1391,1.0699,1.0089,0.7348)$. Матрица (Таблица 4) $U_{24,4}$ ортогональных избыточно-канонических переменных получена умножением справа на диагональную матрицу $\Lambda^{1/2}{}_{pp}$, этим мы преобразовали одинаковые дисперсии u–переменных в различные дисперсии 1.1391,1.0699,1.0089,0.7348, не меняя сумму дисперсий (=4). Матрица U_{mp} ортогональных избыточно-канонических переменных в данном примере преобразовалась в матрицу главных компонент, так как дисперсии u–переменных различны: 1.1391>1.0699>1.0089>0.7348, а последняя дисперсия не подчиняется критерию Каттела ($\lambda_\ell>1$), пренебрежимо мала, дает допустимую погрешность модели. Но матрицы собственных векторов A_{66} B_{pp} вычисляются с высокой точностью - они нужные нам пары матриц: (Λ^2_{pp},A_{qp}),(Λ^2_{pp},B_{pp}). Матрица собственных векторов A_{54} содержит индикаторы извлекаемых знаний, а матрица $\mathbf{B}_{44}$ не содержит индикаторы, они преобразуют полученные модельные матрицы U_{mp} и V_{mp} в модельные матрицы значений изменчивостей коррелированных z-переменных $\{z_1,\ldots,z_q\}$, $\{z_{q+1},\ldots,z_{q+p}\}$, n=q+p, 5=q≥p=4, Z_{mq},Z_{mp} ($Z_{mn}=[Z_{mq}, Z_{mp}]$).

Матрицу V_{m4} (Таблица 4) мы моделируем, решая Оптимизационную Задачу 3 (О33). В О33 входными объектаими являются пары матриц $(\Lambda_{44},U_{24,4})$, где Λ_{44} –ранее смоделированная матрица из пары матриц $(1/24)U^TU=\Lambda_{44}=$ $diag(1.1391, 1.0699, 1.0089, 0.7348)$, выходной объект: матрица V_{m4} такая, что удовлетворяется равенство $\Lambda_{pp}=(1/m)V^TV$, $(1/m)U^TV=\Lambda_{pp}=$ $diag(\lambda_1,\ldots,\lambda_p)=(1.1391,1.0699,1.0089, 0.7348)$. При этом матрица V_{mp} моделируется как матрица ортогональных избыточно-канонических переменных: $\Lambda_{pp}=(1/m)V^TV$, она зависит из-за формулы $(1/m)U^TV=\Lambda_{pp}=diag(1.1391,1.0699,1.0089,0.7348)$ от матрицы $U_{24,4}$, тоже являющейся матрицей ортогональных избыточно-канонических переменных: $(1/24)U^TU=\Lambda_{44}=(diag(1.1391,1.0699,$ $1.0089,0.7348)$. Пара матриц из (Λ^2_{pp},A_{qp}) и (Λ^2_{pp},B_{pp}) называется матрицами собственных векторов и собственных чисел для би-ортогональных избыточно-канонических переменных $U_{24,4}$, $V_{24,4}$, преобразуемых в матрицы $Z_{24,5}=U_{24,4}A^T_{54}$ и $Z_{24,4}=V_{24,4}B^T_{44}$ ($Z_{mn}=[Z_{mq},Z_{mp}]$) коррелированных z-переменных $\{z_1,\ldots,z_q,\}$, $\{z_{q+1},\ldots,z_{q+p}\}$, n=q+p, 5=q≥p=4. Если бы для наших матриц удовлетворялись только 2 равенства $(1/24)U^TU=\Lambda_{44}$, $(1/m)V^TV=\Lambda_{44}=diag(\lambda_1,\ldots,\lambda_p)$, то матрицы $U_{24,4}$, $V_{24,4}$ (Таблицы 2, 3) назывались бы «матрица ортогональных главных компонент». Постановка О3 аналогична постановке О34 [5]. Решение О3 проводилось программой-таблицей в процедуре Dolver в ЭТ Excel. Изменяемыми ячейками программы-таблицы в окне процедуры Dolver являются элементы матрицы $V_{24,4}$.. При ограничениях $(1/m)U^TV=\Lambda_{pp}=diag(1.1391,1.0699,$ $1.0089,0.7348)$, $(1/m)V^TV=\Lambda_{pp}=diag(1.1391,1.0699,$ $1.0089,0.7348)$, окно параметров процедуры Dolver приведены на рисунке 2.

В нашем примере матрица A_{54} (q=5,p=4) отличается от других матриц индикаторов тем, что содержит много индикаторов, в [13-23] матрицы индикаторов, причем частично удовлетворяется критерий $|a_{kj}|\geq c_0$, для индикатора a_{kj} извлекаемых знаний. Матрицы A_{54} $\mathbf{B}_{44}$ полезны: в них внедрены индикаторы когнитивных знаний из другого исследования [1], теперь количество индикаторов стало большим: 16=7+9 – в A_{54} (из 20), 11 индикаторов появились в матрице $\mathbf{B}_{44}$ (из 4*4=16). Плотным выделением элементов a_{ij}, b_{kj} мы вводим как можно больше извлекаемых знаний в систему показателей «последствий» и от «изменений климата».

Напомним, что функцией ОМ АИКП является моделирование матриц A_{qp},B_{pp} индикаторов извлекаемых знаний из соответствующих им матриц некоррелированных u-, v-переменных U_{mp},V_{mp}, коррелированных z-переменных $\{z_1,\ldots,z_q,\}$, $\{z_{q+1},\ldots,z_{q+p}\}$, n=q+p,q≥p, Z_{mq},Z_{mp} ($Z_{mn}=[Z_{mq},Z_{mp}]$). Дисперсии u-переменных равны дисперсиям v-переменных (1.1391,1.0699,1.0089,0.7348), а дисперсии коррелированных z-переменных $\{z_1,\ldots,z_q,\}$, $\{z_{q+1},\ldots,z_{q+p}\}$ не равны 1: {1.0695, 0.9642, 1.0254, 0.8382, 0.0643}, {1.0873, 0.9880, 1.0169, 0.8686}. Количество доминирующих дисперсий z-переменных (>1) равно 4. Количество доминирующих дисперсий u-переменных (>1) 2, v-переменных – 3. Доля извлекаемой информации об изменениях климата (при ℓ=3) превышает долю информации о послетствиях изменений климата

(при ℓ=2). Мы выделяли индикаторы в матрице B_{pp}, элементы которой равны линейной комбинации произведений «веса» на значение изменчивости z-переменной z_{ij} со смыслом «последствие изменений климата». Такое выделение – правильное, меньше работы эксперту, больше – ОЗ.

Поэтому нами допущены мало вычислительных погрешностей в значениях недоминирующих собственных чисел из матрицы Λ^2_{pp}=diag(1.2975,1.14463,1.0179,0.53997). Далее мы будем допускать погрешности в дисперсиях u-, v-переменных: $(1/24)U^TU=\Lambda_{pp}$=diag(1.1391, 1.0699,1.0089,0.7348); $\Lambda_{pp}=(1/24)V^TV$=diag(1.1391, 1.0699,1.0089,0.7348).

Преимуществом применямой в данной статье Обратной модели является би-ортогональность переменных из 2-х множеств избыточно-канонических переменных, возможность моделировать отдельно и независимо друг о друга матрицы A_{qp}, B_{pp}. Конструирование новой собственной структуры (Λ^2_{pp}, A_{qp},B_{pp}) перенос индикаторов присутствия знаний в другую систему валидных показателей (смысловых избыточно-канонических переменных) является новой методикой конструирования системы валидных u- и v-переменных и коррелированных z-переменных $z_1,\ldots,z_6,z_7,\ldots,z_{12}$. При преобразовании матриц U_{mp}, V_{mp} в матрицы коррелированных z-переменных $z_1,\ldots,z_6,z_7,\ldots,z_{12}$ применяем ортонормированные матрицы B_{66} и A_{66}, а не матрицы B_{66} и A_{66}.

Моделирование матриц Z_{mq}, Z_{mp} значений n=q+p коррелированных z-переменных

Описание схемы $(U_{mp},V_{mp})\rightarrow(Z_{mq},Z_{mp})$. Преобразование пары u- и v-переменных в пару множеств z-переменных на этапе $(U_{mp},V_{mp})\rightarrow(Z_{mq},Z_{mp})$ необходимо для получения модельных числовых данных Z_{mq},Z_{mp}. Эти матрицы данных Z_{mq},Z_{mp} имеют 2 матрицы A_{qp},B_{pp} индикаторов извлеченных знаний. И найти для пары (U_{mp},A_{qp}), (V_{mp},B_{pp}) соответствующую пару матриц Z_{mq} и Z_{mp}: $Z_{mn}=[Z_{mq},Z_{mp}]$. Модельные матрицы A_{qp},B_{pp} являются ортонормированными матрицами. Матрица A_{54} (B_{44}) после решения оптимизационной задачи () получается ортонормированной, матрица A_{54} (B_{44}) является матрицей собственных векторов, но не корреляционной матрицы множества z-переменных, $z_1,\ldots,z_5$ (множества z-переменных $z_6,\ldots,z_9$). Корреляционная матрица имеет спектр Λ^2_{pp}=diag($\lambda^2_1,\ldots,\lambda^2_p$). Для моделирования подматриц Z_{mq}, Z_{mp} преобразуем матрицы U_{mp} и V_{mp} (Таблица 5) значений би-ортогональных избыточно-канонических переменных $Z_{mq}=U_{mp}A^T_{qp}$, $Z_{mp}=V_{mp}B^T_{pp}$. Получим матрицы коррелированных z -переменных, соответствующих 2 множествам -ортогональных избыточно-канонических переменных. таких что: $(1/m)U^TU=\Lambda_{pp}$, $(1/m)V^TV=\Lambda_{pp}$, $(1/m)U^TV=\Lambda_{pp}$= diag($\lambda_1,\ldots,\lambda_p$). Модельные матрицы A_{54} и B_{44} имеют алгебраические свойства ортонормированных матриц: $AA^T=I_{55}$, $BB^T=I_{44}$, $A^TA=I_{44}$, $B^TB=I_{44}$. Модельная подматрица $Z_{24,5}$ вычислена с применением матрицы A_{56}, а модельная подматрица $Z_{24,5}$ – с применением матрицы B_{44} (Таблица 6).

Решив 4 Оптимизационные Задачи ОЗ1, ОЗ2, ОЗ3 мы для нашей модели реализовали схему ОМ АИКП: $(I_{qq},\Lambda^2_{pp})\rightarrow A_{qp}$; $(I_{pp},\Lambda^2_{pp})\rightarrow(B_{pp})$; $(V^0_{mp},\Lambda_{pp})\rightarrow U_{mp}$, $(U_{mp},\Lambda_{pp},B_{pp})\rightarrow(V_{mp})$; $(U_{mp},A_{qp},V_{mp},B_{pp})\rightarrow(Z_{mq},Z_{mp})$. Введенные математически в матрицу A^+_{qp},B^+_{44} индикаторы извлекаемых знаний преобразуются в динамики значений u- и v–переменных (Рисунки 3,4), z-переменных (Рисунки 8,4).

Цифровая модель изменчивостей климата

Цифровая модель 4 показателей изменчивости климата и показателей изменчивости последствий для деятельности человека использует когнитивную модель изменчивости климата и изменчивости негативных последствий для хозяйственной деятельности человека [1]. Введенные обозначения переменных и имена-смыслы всех 4+5=9 словесных z-переменных приведены в статье [1], а смысл u- v-переменных оставлены без привязки к фразам. Исходя из 7 индикаторов, единичных матриц новой модели мы собираемся оцифровывать (5+4)+(4+4)=17 показателей из 2-х множеств, характеризующих изменения климата и их последствия для жизни людей. Применялась ОМ АИКП: $(A_{54},\Lambda^2_{44})\rightarrow A_{54}$; $(B_{44},\Lambda^2_{44})\rightarrow(B_{44})$; $(A_{54},B_{44})\rightarrow(U_{24,4}V_{24,4})$; $(U_{24,4},V_{24,4})\rightarrow(Z_{24,4},Z_{24,4})$. Ортонормированные матрицы A_{54}, B_{44} моделируются отдельно, но паре с матрицей Λ^2_{44}=diag ($\lambda^2_1,\ldots,\lambda^2_p$). Они обладают свойствами: $AA^T=I_{55}$, $BB^T=I_{44}$, $A^TA=I_{44}$, $B^TB=I_{44}$.

Ортонормированные матрицы A_{54}, B_{44} из ПМ АИКП [4] линейно преобразовывают отдельно 2 матрицы U_{mp},V_{mp} значений би-ортогональных смысловых избыточно-канонических переменных. Би-ортогональность пары матриц $(U_{44,4},V_{44,4})$ выражена при помощи формул: $(1/m)U^TV=\Lambda_{44}$=diag($\lambda_1,\ldots,\lambda_p$), а ортогональность стобцов в каждой из матриц $U_{24,6}$, $V_{24,6}$: $(1/m)U^TU=\Lambda_{24}$=diag($\lambda_1,\ldots,\lambda_p$), $(1/24)V^TV=\Lambda_{24}$=diag($\lambda_1,\ldots,\lambda_p$). Ортогональность присуща каждой из пары матриц $(U_{24,6},V_{24,4})$, а би-ортогональность - паре матриц $(U_{24,6},V_{24,4})$: $(1/m)U^TV=\Lambda_{44}$=diag($\lambda_1,\ldots,\lambda_p$). Введенные математически в матрицу A_{qp} индикаторы извлекаемых знаний преобразуются в динамики

значений u- и v–переменных (Рисунки 3,4), z-переменных (Рисунки 8,4).

В итоге получим систему климатических изменчивостей и их последствий для деятельности человека. Получим систему из 4-х смысловых многомерных уравнений смыслов (изменчивости z-переменных и изменчивости y –переменных), передающих смыслы вводимых (для когнитивной модели) валидных (вычисляемых) и измеряемых (моделируемых) переменных, образующих когнитивную модель, соответствующую своей математической модели.

При ниже использованной мозаике индикаторов, при допустимых значениях наших индикаторов найдена матрица C_{55} собственных векторов и матрица собственных чисел Δ_{55}=diag(0.9784,0.7080,1.3301,1.9602,0.0233). Это позволило провести расчеты при отсутствии теоремы существования решений Оптимизационной Задачи.

Пример моделирования значений изменчивостей показателей климата и негативных показателей деятельности человека

Алгоритм вычисления матрицы A_{54}: (I_{55},I_{55})=>(Λ^2_{55},A_{55}), где Λ^2_{55}=diag($\lambda^2_1,\lambda^2_2,\ldots,\lambda^2_5$)= Δ_{55}=Δ_{55}=diag(1.2975,1.14463,1.0179,0.53997,0.0000), значения $\lambda^2_1,\lambda^2_2,\ldots,\lambda^2_5$ равны длинам полуосей гиперэллипсоида. Длины 5 полуосей, направленных вдоль 5 собственных векторов равны значениям 5 собственных чисел. Полученные в результате решения Оптимизационной Задачи длины новых полуосей в сумме равны 5. Гиперэллипсоид с длинами полуосей $\lambda^2_1,\lambda^2_2,\ldots,\lambda^2_5$ получен преобразованием гипершара с единичными длинами радиуса: (1,1,1,1,1) с помощью матрицы A_{55}. Для каждой матрицы I_{nn}, n>2, существует свой n–мерный гиперэллипсоид. Элементы матрицы A_{55} зависят от формы мозаики индикаторов, от размерности n. Значения длин (1,1,1,1,1) начальных векторов мы интерпретировали как собственные числа, соответствующие нейтральной системе собственных векторов I_{55}=A_{55}. Цель состоит в поиске матрицы A_{55} из решаемой Оптимизационной задачи. Значения индикаторов влияют на выбор длин полуосей будущего гиперэллипсоида, длины полуосей которых в сумме равны 5.

Моделирование 2-х матриц A_{qp}, B_{pp} собственных векторов проводили в ЭТ Excel. Так как имеем достаточно подробные данные о «последствиях» (о свойствах климата имеются неполные данные), то индикаторы выделяем в матрице A_{qp} (не в матрице B_{pp}). подобрать исходные данные для получения желаемого результата. Средство поиска решения Microsoft Excel использует алгоритм нелинейной оптимизации Generalized Reduced Gradient (GRG2), разработанный Леоном Ласдоном (Leon Lasdon, University of Texas at Austin) и Аланом Уорреном (Allan Waren,Cleveland State Univer sity Схема ОМ Анализа ИКП, отражающая последовательность этапов независимого моделирования ортонормированных квадратных (q=p) матриц собственных векторов A_{qp}, B_{pp}, q=p, была приведена выше.

В модели [1] были выделены только 7 индикаторов. Их мозаичное распредение в матрице $\mathbf{A_{54}}$ перенесено мз матрицы C_{54} [1]). Старые индикаторы теперь равны значениям коэффициентов корреляции между k-ой z–переменной и j-ой u-переменной a_{kj}=corr(z_k,u_j). Интерпретировать и обосновать значения 7 индикаторов мы не можем. Перенос их из матрицы C_{54} [1] в матрицу $\mathbf{A_{54}}$ проведен формально для того, чтобы далее продолжить добавление наиболее большего количества новых индикаторов другим методом. Ниже мы достигли количества индикаторов 16. Разделенные на 2 множества n=q+p=5+4=9 переменные таковы, что 1-ое содержит показателей деятельности человека, 2-ое – показатели изменений климата,

Теоретически все 20 элементов матрицы A_{54} должны быть индикаторами. Только четырем ее элементам не можем придать статус «индикатор». Визуальное сравнение совместных динамик переменных (Рисунки 4-9) иллюстрирует пренебрежимость значений этих 4-х компонент собственных векторов все 7+9=16 индикаторов распределены плотно по всей матрице $\mathbf{A_{54}}$ по 4 индикатора на 5 компонентов 4-х собственных векторов.

Мозаика фигуры индикаторов зависит от пар номеров индексов (i,j) параметров (индикаторов) a_{ij} уравнений из системы уравнений вида:

$a_{.1}$ => $u_{i1}=z_{i1}*\mathbf{a_{11}}+z_{i2}\mathbf{a_{21}}+z_{i3}\mathbf{a_{31}}+z_{i4}\mathbf{a_{41}}+z_{i5}a_{51}$,

$a_{.2}$=> $u_{i2}=z_{i1}*\mathbf{a_{12}}+z_{i2}\mathbf{a_{22}}+z_{i3}\mathbf{a_{32}}+z_{i4}a_{42}+z_{i5}\mathbf{a_{52}}$,

$a_{.3}$=> $u_{i3}=z_{i1}*\mathbf{a_{13}}+z_{i2}\mathbf{a_{23}}+z_{i3}\mathbf{a_{33}}+z_{i4}\mathbf{a_{43}}+z_{i5}a_{53}$,

$a_{.4}$=> $u_{i4}=z_{i1}*\mathbf{a_{14}}+z_{i2}\mathbf{a^{24}}+z_{i3}\mathbf{a_{34}}+z_{i4}\mathbf{a_{44}}+z_{i5}\mathbf{a_{54}}$,

Каждая линейная комбинация - 4 формулы для 4-х валидных u-переменных содержат 16 выделенных «весов» при z-переменных В 4-х из 5 z-переменных в каждой линейной комбинации (в 4-х формулах 4-х валидных u-переменных) нами выделены «веса» z-переменных. Этим плотным выделением элементов a_{ij} мы вводим как можно больше извлекаемых знаний в систему показателей «последствий» от изменений климата. Ранее мы ввели только 7 индикаторов. Но 2 модели добавили еще 9 индикаторов. В той модели оцифровывались 5+4=9 показателей.

Здесь в новой модели мы собираемся оцифровывались (5+4)+(4+4)=17 показателей из

2-х множеств, характеризующих изменения климата и их последствия для жизни людей.

В переменных z_6,z_7,z_8,z_9, характеризующих изменения климата мы не предсказываем силы проявлений природных катаклизмов климата, значения компонент b_{kj} матрицы B_{44} моделируются отдельно при решении О3, начальной матрицей для процедуры Solver является единичной матрицей I_{44}. Считаем невозможным предсказание их проявлений через значения коэффициентов корреляции в . Но последствия от прошедших ранее ураганов, тайфунов считаем известными. Допускаем знание величин коэффициентов корреляций, приведенных ниже.

Каждая линейная комбинация - 4 формулы для 4-х валидных v-переменных не содержат выделенных «весов» b_{kj} z- переменных:

b.1=> $v_{i1}= z_{i6}*b_{11}+z_{i7}b_{21}+z_{i8}b_{31}+z_{i9}b_{41}$

b.2=> $v_{i2}= z_{i6}*\mathbf{b_{12}}+z_{i7}b_{22}+z_{i8}b_{32}+z_{i9}b_{42}$

b.3=> $v_{i3}= z_{i6}*b_{13}+z_{i7}b_{23}+z_{i8}b_{33}+z_{i9}b_{43}$

b.4=> $v_{i4}= z_{i6}*b_{14}+z_{i7}b_{24}+z_{i8}b_{34}+z_{i9}b_{44}$

Одна компонента b_{12} присутствует формально - как ограничение, чтобы решать О32. О32 необходимо нам для моделирования матрицы $\mathbf{B_{44}}$. ниже величина компоненты a_{kj} равна коэффициента корреляции между k-ой z–переменной и j-ой u-переменной $a_{kj}=corr(z_k,u_j)$. Достигнувшие статуса «индикатор» 16 значений, равны компонентам 4-х собственных векторов из матрицы $\mathbf{A_{54}}$: a_{11}=0,696, a_{21}=0.55, a_{41}=0.4, a_{12}=0.58, a_{22}=0.36, a_{32}=0.710704, a_{52}=0.17, a_{13}=0.3, a_{43}=0.3, a_{14}=0.3, a_{24}=0.35, a_{44}=0.86, a_{54}=0.2, a_{13}=0.3, a_{33}=0.6657.

Применение модели из [1] увеличило количество индикаторов до 7+5=12. Применение излагаемой модели добавило еще 4 индикатора. Таким образом, к 7 выбранным нами индикаторам после решения О31 и О32 добавились еще 9 (Таблица 1, выделены зеленым цветом), стало 7+9=16 индикаторов, значения которым мы не могли сами назначить такими, чтобы удовлетворялось условие ортонормированности матрицы индикаторов.

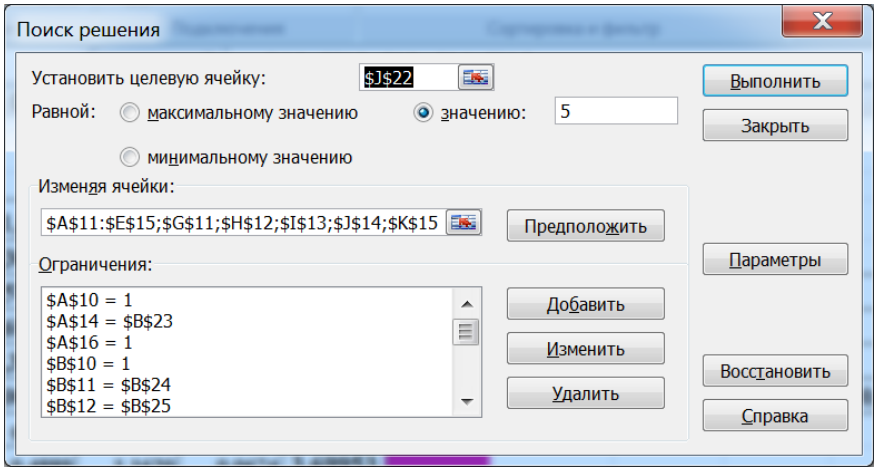

Рисунок 1. Таблица-программа решения Оптимизационной Задачи моделирования матрицы A_{54}

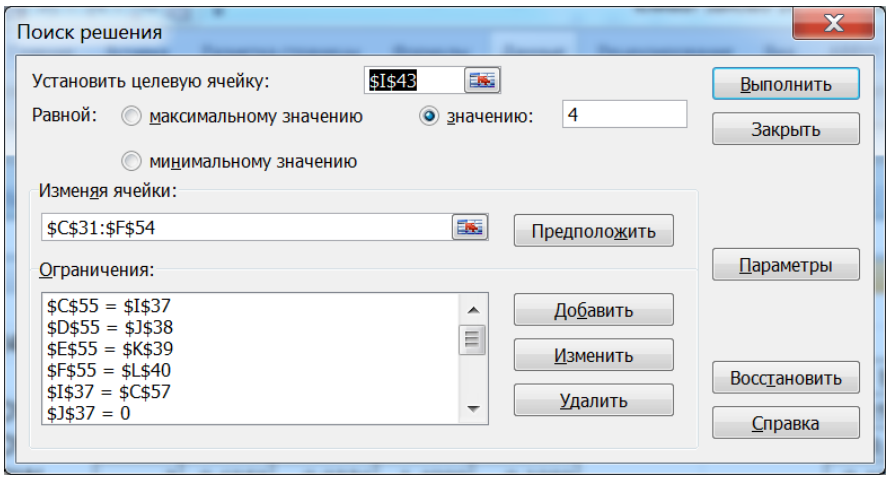

Рисунок 2. Таблица-программа решения Оптимизационной Задачи моделирования матрицы $V_{24,4}$

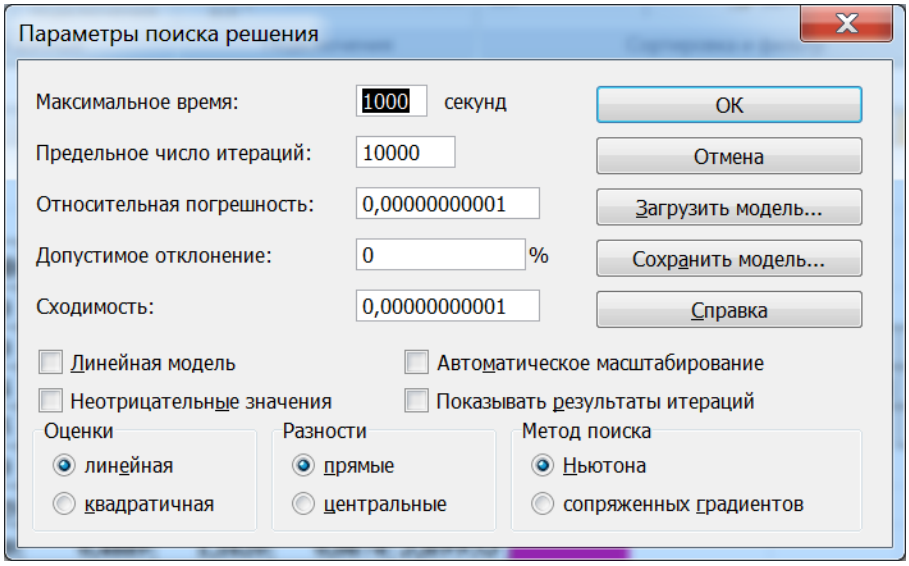

Рисунок 3. Параметры программы – таблицы

Таблица 1.

№	1	2	3	4	5	6
1	**0.7159**	0.5800	0.3000	0.2500	-0.0575	1.0000
2	**0.5587**	0.3600	0.5729	**0.4595**	0.1920	1.0000
3	0.0901	**0.7094**	0.6957	-0.0688	0.0002	1.0000
4	0.4000	0.0455	**-0.5128**	0.8600	0.0256	1.0000
5	0.1000	0.1700	0.0041	0.0000	0.9805	1.0000
	1.0000	1.0000	1.0000	1.0000	1.0000	

Таблица 2.

0,6950	**0,5800**	**0,3000**	**0,3000**	0,0066
0,5500	**0,3600**	**0,6719**	**0,3500**	0,0709
0,2520	**0,7022**	0,6657	0,0137	-0,0015
0,4000	0,1095	0,0003	**0,8600**	0,2974
0,2218	**0,1700**	0,1240	0,0000	**0,9521**

Таблица 3. Матрица собственных векторов A_{54}

\aigen №\vec.	**a_1**	**a_2**	**a_3**	**a_4**	a_5	**|a|**
	1,0000	**1,0008**	**1,0000**	**1,0000**	1,0000	5,0016
1	**0,6960**	**0,5800**	**0,3000**	**0,3000**	0,0000	1,0008
2	**0,5500**	**0,3600**	**0,5925**	**0,3500**	0,3072	1,0000
3	**0,2089**	**0,7107**	**0,6657**	**-0,0889**	-0,0136	1,0000
4	**0,4000**	**0,0286**	**0,3000**	**0,8600**	0,0979	1,0000
5	**0,0971**	**0,1700**	**-0,1607**	**0,2000**	0,9465	**1,0000**

Таблица 4. Матрица собственных векторов B_{44}

1,0000	**1,0000**	**1,0000**	**1,0000**	
0,5590	**0,8021**	**0,1898**	**0,0903**	**1,0000**
0,4989	**0,4665**	**0,5482**	**0,4827**	**1,0000**
0,4546	**0,3553**	**0,8000**	**0,1645**	**1,0000**
0,4817	**0,1131**	**0,1530**	**0,8554**	**1,0000**

Таблица 5.

	u 1	u 2	u 3	u 4	v 1	v 2	v 3	v 4
№	1	2	3	4	5	6	7	8
1	-0,7488	-0,9664	2,0096	0,3754	-0,8529	-1,0340	2,0276	-0,1086
2	0,3819	-0,2382	0,6769	-1,4127	0,4350	-0,2549	0,6829	-0,7508
3	-0,6021	0,0305	-1,4866	0,0534	-0,6858	0,0326	-1,4999	-0,1989
4	0,4410	0,6432	-1,4106	1,2793	0,5023	0,6882	-1,4232	1,2598
5	2,6972	0,1170	-1,3335	-0,8435	3,0724	0,1252	-1,3454	-1,0701
6	-0,0867	1,0180	0,6425	-1,6804	-0,0988	1,0892	0,6482	-1,3468
7	-0,3396	0,8512	-1,5772	0,6104	-0,3869	0,9107	-1,5913	0,9894
8	0,3161	0,3745	-0,1782	0,7633	0,3601	0,4007	-0,1797	0,0688
9	1,6975	-0,7059	-0,0668	1,4660	1,9336	-0,7552	-0,0674	1,1391
10	0,6452	0,2051	-0,0154	-0,4082	0,7350	0,2194	-0,0155	-0,1980
11	-0,4948	-1,2426	-1,5257	-0,7112	-0,5636	-1,3295	-1,5393	-0,4105
12	-0,8949	2,0300	0,2574	-0,3713	-1,0194	2,1719	0,2597	-0,1042
13	-1,3269	2,4150	-0,1423	0,1599	-1,5115	2,5838	-0,1436	0,3609
14	-0,7577	0,2085	0,7648	0,9732	-0,8631	0,2231	0,7716	-0,0007
15	-0,6414	-0,7223	1,1233	1,4450	-0,7306	-0,7728	1,1333	1,3585
16	-0,5066	-1,6820	0,7781	-0,3539	-0,5771	-1,7996	0,7851	0,0320
17	-1,3697	-1,4665	-0,1673	0,0988	-1,5602	-1,5690	-0,1688	0,0257
18	-0,5802	1,1508	1,1383	-0,7939	-0,6609	1,2312	1,1485	-0,3915
19	0,5716	-1,0294	0,0590	-0,8583	0,6511	-1,1014	0,0595	-0,0832
20	1,6331	0,6303	1,5926	0,8639	1,8603	0,6743	1,6068	1,4721
21	-1,8170	-0,7834	-0,9858	-0,4910	-2,0697	-0,8382	-0,9946	-0,3001
22	-0,4510	-0,5951	-0,9011	0,5538	-0,5137	-0,6367	-0,9092	0,7722
23	1,2280	0,5846	0,4398	0,0252	1,3988	0,6254	0,4437	-0,4795
24	1,0055	-0,8268	0,3081	-0,7432	1,1454	-0,8845	0,3109	-0,2777
	1,1391	1,0698	1,0089	0,73483	1,1391	1,0699	1,0089	0,7348
	1,2975	1,14463	1,0179	0,53997	1,2975	1,1447	1,0179	0,5400

Таблица 6.

	z 1	z 2	z 3	z 4	z 5	Z 6	Z 7	Z 8	Z 9
№	1	2	3	4	5	6	7	8	9
1	- 0,3662	0,5623	0,4611	0,5986	- 0,4848	- 0,9310	0,1513	0,8490	- 0,3105
2	- 0,0931	0,0308	0,4866	- 0,8659	- 0,3947	0,1005	0,1101	0,5300	- 0,3571
3	- 0,8313	- 1,1823	- 1,0985	- 0,6400	0,1963	- 0,6599	- 1,2452	- 1,5328	- 0,7263
4	0,6406	0,0861	- 0,5035	0,8718	0,6347	0,6764	0,3994	- 0,4584	1,1798
5	1,2920	0,4403	- 0,1660	- 0,0432	0,3273	1,4657	0,3369	0,1889	0,3729
6	0,2187	0,1113	1,2825	- 1,2580	- 0,2747	0,8198	0,1641	0,6391	- 0,9774

7	- 0,0327	- 0,6012	- 0,5702	- 0,0598	0,4872	0,3015	- 0,1630	- 0,9626	0,5196
8	0,6128	0,4703	0,1458	0,7402	0,2756	0,4948	0,3012	0,1736	0,2501
9	1,1918	1,1531	- 0,3217	1,8996	0,3487	0,5652	1,1252	0,7443	1,8101
10	0,4410	0,2767	0,3066	- 0,0917	0,0183	0,5660	0,3650	0,3671	0,2071
11	- 1,7361	- 1,8723	- 1,9389	- 1,3027	- 0,1564	- 1,7107	- 1,9434	- 2,0276	- 1,0085
12	0,5203	0,2611	1,4601	- 0,5421	0,1426	1,2122	0,5967	0,4988	- 0,2949
13	0,4824	0,1112	1,3302	- 0,3670	0,3366	1,2330	0,5468	0,1754	- 0,1491
14	0,1150	0,4521	0,4125	0,7693	0,0336	- 0,1571	0,0962	0,3041	- 0,2731
15	- 0,0948	0,5585	- 0,0280	1,3025	- 0,0765	- 0,6903	0,5521	0,5235	0,8962
16	- 1,2009	- 0,5470	- 0,7518	- 0,3216	- 0,5309	- 1,6141	- 0,6815	- 0,2684	- 0,3340
17	- 1,8244	- 1,3458	- 1,4486	- 0,5550	- 0,3356	- 2,1603	- 1,5904	- 1,3976	- 0,9328
18	0,3669	0,4917	1,5250	- 0,5405	- 0,2024	0,8008	0,6853	0,9913	- 0,3384
19	- 0,4390	- 0,3217	- 0,4966	- 0,5212	- 0,3006	- 0,5157	- 0,1965	- 0,0614	0,1270
20	2,2391	2,3710	1,7726	1,8920	0,1826	2,0187	2,8340	2,6130	2,4774
21	- 2,1621	- 2,0373	- 1,5490	- 1,4672	- 0,2494	- 2,0451	- 2,1136	- 2,0838	- 1,5006
22	- 0,7632	- 0,8023	- 1,1663	0,0086	0,1106	- 0,9007	- 0,6790	- 1,0600	0,2021
23	1,3332	1,1552	0,9626	0,6615	0,1530	1,3244	1,0013	1,1342	0,4022
24	0,0898	0,1778	- 0,1063	- 0,1681	- 0,2411	- 0,0353	0,1952	0,4095	0,2617
	- 0,0000	- 0,0000	0,0000	- 0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	1,0695	0,9642	1,0254	0,8382	0,0643	1,0873	0,9880	1,0169	0,8686

Визуализация взаимосвязанных динамик изменчивостей показателей климата и негативных показателей деятельности человека

При использованной ранее [2] мозаике индикаторов, при допустимых значениях наших индикаторов найдена матрица C_{55} собственных векторов и матрица собственных чисел Δ_{55}=diag (0.9784; 0.7080, 1.5501, 0.509697478, 1.9602, 0.520504656, 0.0255). При начальных значениях 7 индикаторов: c_{41}=corr(z_4,y1)=0.40, c_{12}=corr(z_1,y_2)=0.5800, c_{22}=corr(z_2,y_2)=0.5600, c_{52}=corr(z_5,y_2)=0.1700, c_{13}=corr(z_1,y_3)=0.3000, c_{14}=corr(z_1,y_4)=0.2500, c_{44}=corr(z_4,y_4)=0.86 совместные динамики изменчивости разных переменных приведены на рисунках в статье [1].

Ниже приведены динамики взаимных связей собственных изменчивостей неизмеряемых, но моделируемых, показателей изменений климата и негативных показателей последствий для деятельности человека. Наглядные графические иллюстрации динамик значений изменчивостей показателей показывают адекватность реальным связям в системе «изменение климата - природные и хозяйственные последствия». Описание взаимных динамик, для наглядности сгруппированных по 2,3, 4, 5 штук, показателей. Все динамики значений изменчивостей пар (троек), четверок) переменных визуально адекватны по значениям своих заданных индикаторов из пары матриц (A_{54}, B_{44}) индикаторов.

Совместная динамика значений изменчивостей (y_{i1},z_{i4}) пары переменных (y1,z4) графически визуально адекватны с совместной динамике значений изменчивостей (u_{i1},z_{i4}) пары переменных (u1,z4). Аналогичная адекватность наблюдается и в паре переменных (u3,z1), в тройке переменных (u2,z1,z2,z5), (u4,z1,z4). Динамика значений изменчивости новой переменной u1 совпадает с динамикой значений изменчивости старой переменной y3, а динамика значений изменчивости новой переменной u2 совпадает с динамикой значений изменчивости старой переменной y4. поэтому аналогичная прежней адекватность наблюдается и в новой паре переменных (u3,z1), в новых тройках переменных (u_2,z_1,z_2,z_5), (u_4,z_1,z_4). Рисунки совместных динамик старых переменных (y_1,z_4),(y_3,z_1), (y_2,z_1,z_2,z_5), (y_4,z_1,z_4) приведены в статье [1], они такие же что и у новых переменных (u_1,z_4),(u_3,z_1), (u_2,z_1,z_2,z_5), (u_4,z_1,z_4). Поэтому рисунки совместных динамик новых переменных (u_1,z_4),(u_3,z_1), (u_2,z_1,z_2,z_5), (u_4,z_1,z_4) не приводим. А приведем рисунки для новых u-переменных.

В новой модели z-переменные отличаются более тесной корреляцией между собой, имеется 5 значений (из 24), находящихся в окрестности пиковых точек +2 и -2.

В той модели [1] первые 5 z-переменные чуть менее коррелированны между собой (Рисунок 8), по сравнению с z-переменными из новой модели (Рисунок 7). Количество пиковых точек в их динамиках одинаково равно 5. Более тесные корреляции присущи модельным

показателям «последствий», использовано большое количество переменных (5+4+4+4=17) параметров (5*5+4*4+4=45) в модели, и не только поэтому новая модель более адекватно моделирует реальные взаимосвязи между 5 показателями изменений «последствий» и 4 би-ортогональных смысловых избыточно-канонических переменных (показателей изменений климата с неизвестными смыслами. Независимость би-ортогональных избыточно-канонических u-, v-переменных визуально показана на Рисунках 4 и 6. На Рисунке 5 приведена независимость y- переменных y3, y4, такая же независимость показана на Рисунке 4 для пары новых би-ортогональных u- переменных (u1,u2, u3). Высокая коррелированность 4-х z-переменных (z_6,…,z_9) дала тесную взаимную динамику их кривых их изменчивостей (Рисунок 9).

Эти тесные динамики обусловлены наиболее информативными 2 парами валидных би-ортогональных показателей (u1,u2, u3) (Рисунок 4) и 3 валидных би-ортогональных показателей (v1,v2,v3). Они имеют доминирующие значения дисперсий, по величине превышающих 1. Их дисперсии превышают дисперсию (=1) z-переменной, ибо значения u_1,u_2 (v1,v2,v3) равны линейным комбинациям значений z-переменных z_1,…,z_5 (z_6,…,z_9).

Эти адекватности обусловлены большим количеством переменных (5+4+4+4=17) параметров (5*5+4*4+4=45) в ОМ АИКП [5]. В модели [1] количество переменных было равно 5+4=9, количество параметров – 5*4=20. Количество управляющих параметров в модели [1] равно 7+4=11, в новой модели количество управляющих параметров модели равно 4+27=31, где 4- количество дисперсий скрытых переменных, 16 - количество индикаторов, на которое увеличилось до 11+16=27 все 20+16=5*4+4*4 должны стать индикаторами, но разными по величине.

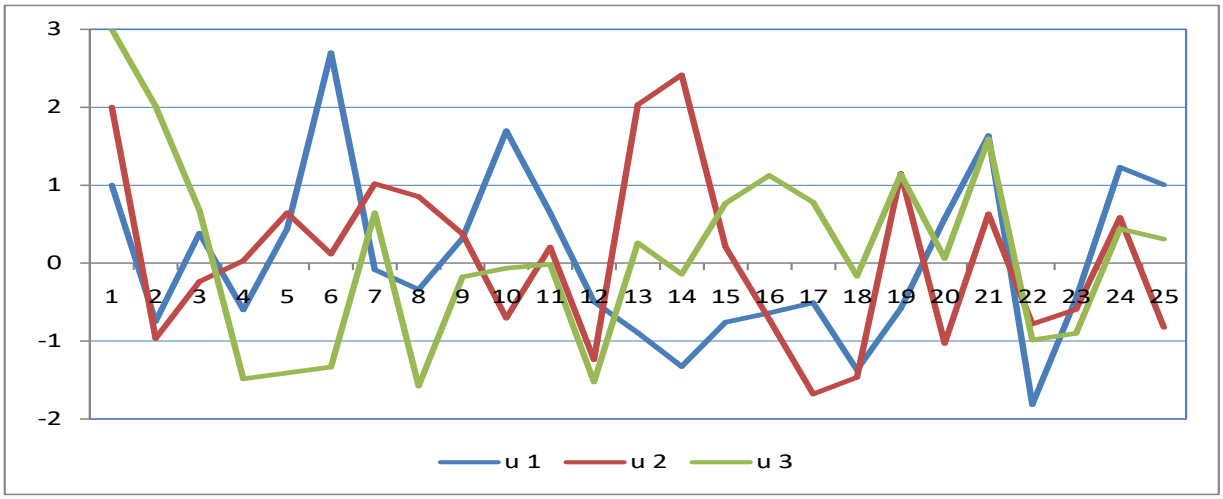

Рисунок 4.

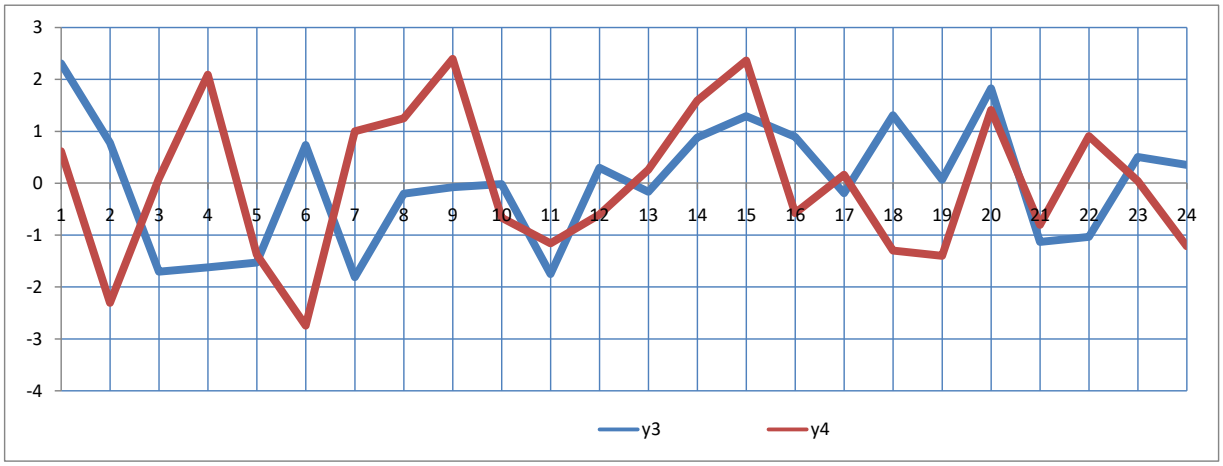

Рисунок 5.

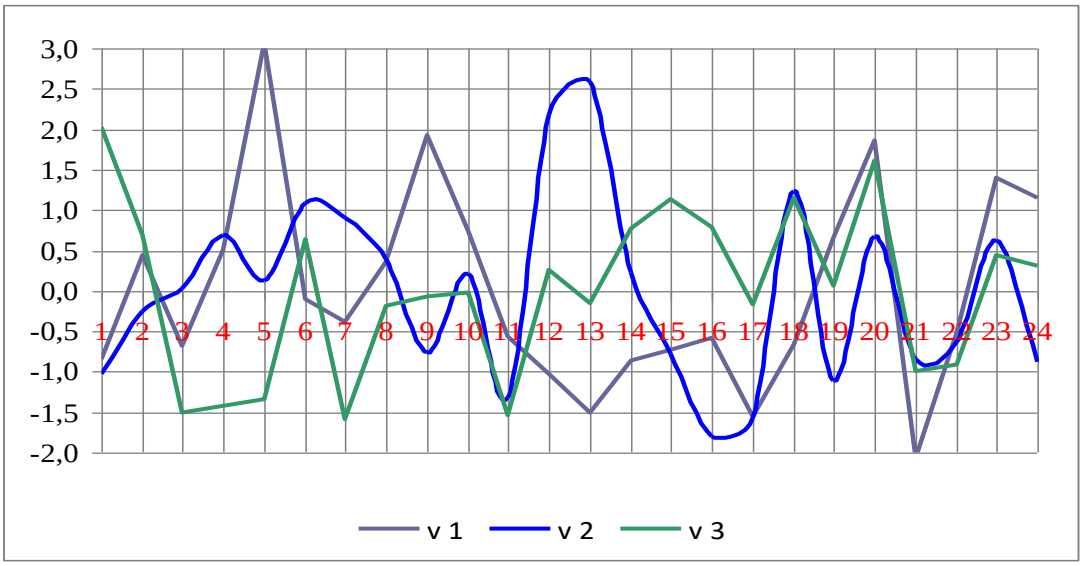

Рисунок 6.

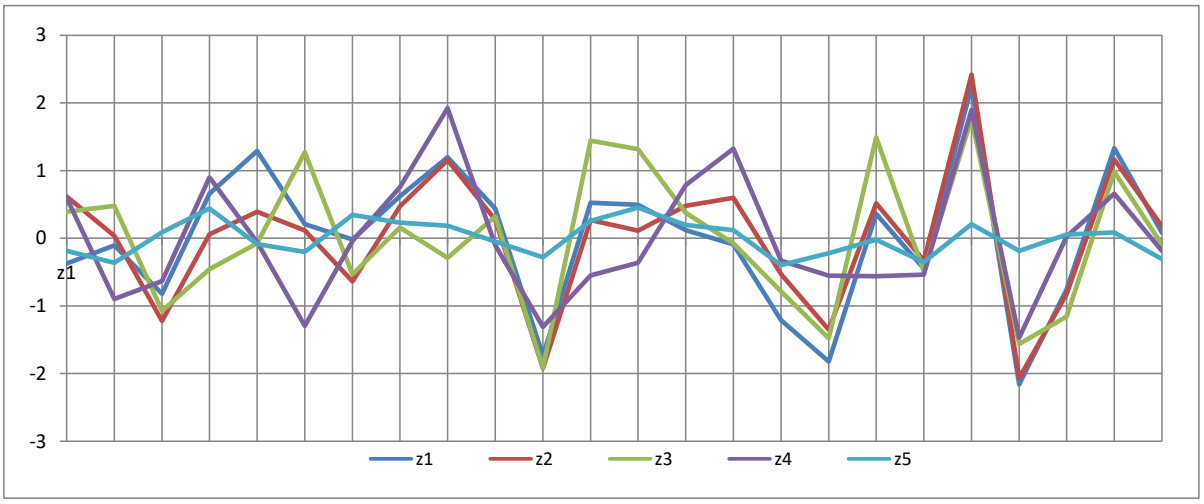

Рисунок 7.

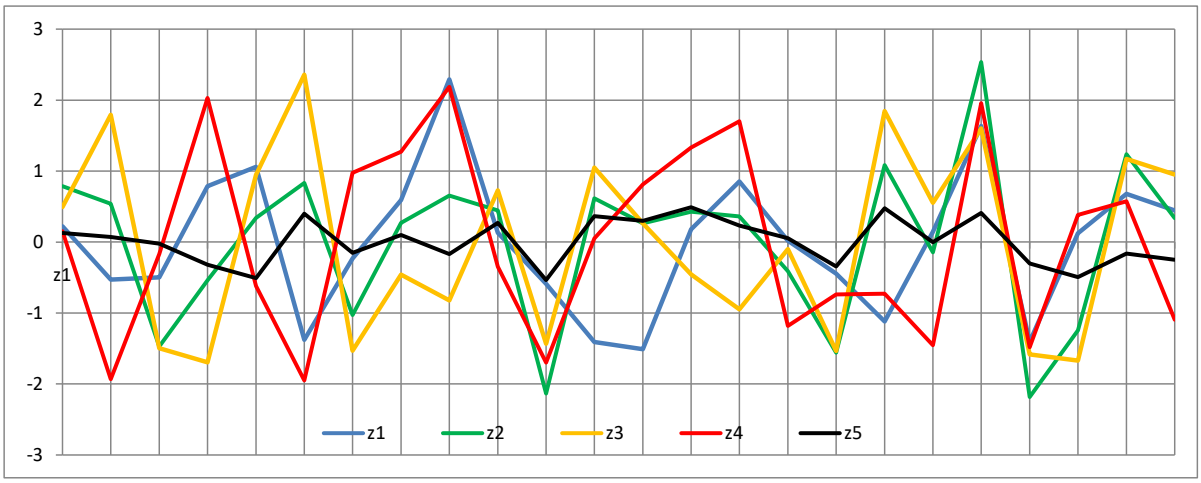

Рисунок 8.

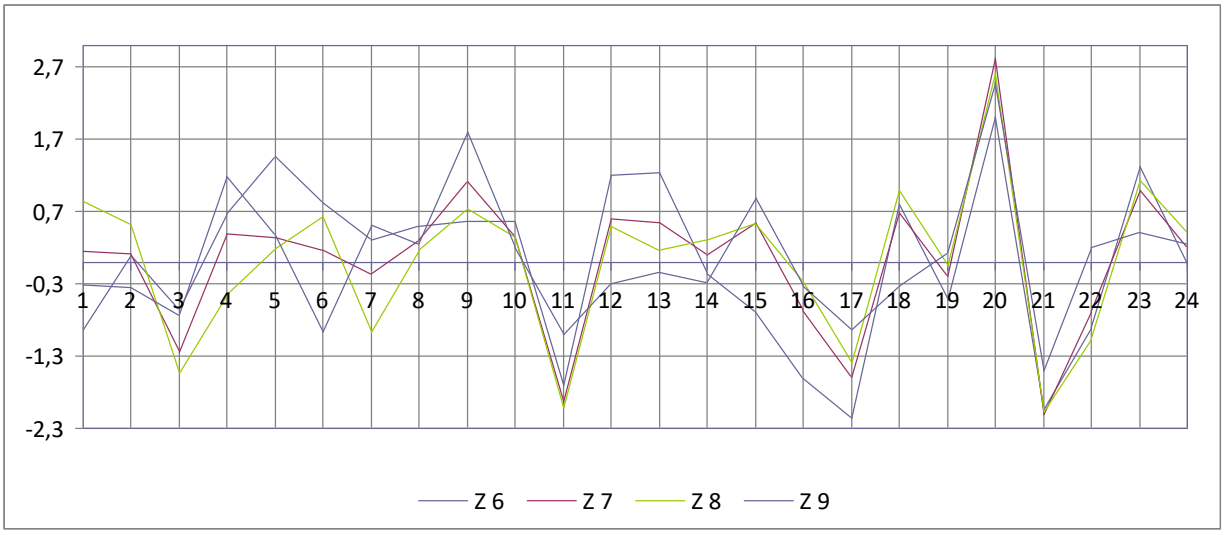

Рисунок 9.

Заключение

Извлечение цифровых знаний из числовых модельных данных по математически введенным индикаторов присутствия знаний только в матрицу A_{54} позволило нам существенно увеличить с 7 до 27. Использовалась исходная мозаика индикаторов, при допустимых значениях 7 индикаторов, далее были алгоритмически найдены еще 9+11 индикаторов при моделировании двух матриц (A_{qq},$\mathbf{B}_{pp}$) собственных векторов с общей матрицей собственных чисел $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)=$ diag(1.2975,1.14463,1.0179,0.53997).

Матрица Λ_{pp} вычислена из матрицы собственных чисел $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)$. Диагональные элементы $\lambda_1,\ldots,\lambda_p$ матрицы Λ_{pp} равны значениям дисперсий как u-переменных, так и v–переменных: $(1/m)U^TU=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, $(1/m)V^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$. При этом пары (u_j,v_j) u-переменной и v–переменной, j=1,…,p, би-ортогональны: $(1/m)U^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$, значение $\lambda_1,\ldots,\lambda_p$ дисперсий равны квадратному корню из значения собственного числа: sqrt(1.2975), sqrt(1.14463), sqrt(1.0179), sqrt(0.53997), $\Lambda^2_{pp}=diag(\lambda^2_1,\ldots,\lambda^2_p)$ =diag(1.2975, 1.14463, 1.0179, 0.53997)).

Би-ортогональность - свойство множества псевдослучайных векторов, у которых компоненты равны значениям u-изменчивости (или v-изменчивости), в котором каждый из векторов ортогонален ко всем остальным векторам. Смысл каждой u-изменчивости и смысл каждой v-изменчивости независимы, т.е. каждая используемая скрытая изменчивость показателя изменений климата или показателя последствий изменений климата независима от остальных изменчивостей. Такая би-ортогональность точно отражает реальные процессы нашей предметной области, связей свойств процессов в ней.

Матрицу V_{mp} значений v-изменчивости мы моделируем, решая Оптимизационную Задачу 4. В ОЗ4 входными объектаими являются матрицы значений u-изменчивости U_{mp} и их дисперсий Λ_{pp}. При этом матрица V_{mp} моделируется такой, что удовлетворяет равенствам $\Lambda_{pp}=(1/m)V^TV$, $(1/m)U^TV=\Lambda_{pp}=diag(\lambda_1,\ldots,\lambda_p)$.

Цифровая модель изменчивости климата имеет 2 адекватные системы линейных уравнений для 5-и и 4-х z-изменчивостей. Первая - с правой частью, равной u-изменчивости (для 5 z-изменчивостей), вторая - v-изменчивости (для других 4 z-изменчивостей). Математическая многомерная модель корректно преобразуется в систему смысловых уравнений с неизвестными m z-изменчивостями, m u-изменчивостями, m v-изменчивостями, при наличии 16 индикаторов наличия знаний. Некоррелированность m u-изменчивостей с m v-изменчивостями точно соответствует независимости смысла каждой u-изменчивости от смысла каждой v- изменчивости. Трансформация одного многомерного линейного уравнения когнитивных смыслов изменчивостей $z_{i1},\ldots,z_{i5}$ z–переменных $z_1,z_2,\ldots,z_5$ и смысла одной u–переменной в m линейных уравнений 5 переменных, характеризующих изменчивости негативных последствий для хозяйственной деятельности человека, дает m значений 5 z-изменчивостей, m значений u-изменчивости. Трансформация одного многомерного линейного уравнения когнитивных смыслов изменчивостей $z_{i6},\ldots,z_{i9}$ z–переменных $z_6,\ldots,z_9$ и одной v–переменной в m линейных уравнений с 4 переменными, характеризующих изменчивости

климата, дает m значений 4 z-изменчивостям, m значений каждой из 4-х v-изменчивостей.

Проведены расчеты при отсутствии теоремы существования решений применяемой Оптимизационной Задачи. Были найдены значения параметров и переменных (разнообразные по смыслу интрпретации) когнитивной модели изменчивости климата и изменчивости негативных последствий для хозяйственной деятельности человека. Пример моделирования значений изменчивостей показателей климата и негативных показателей деятельности человека численно и визуально отображают разнообразие и обширность видов зависимостей, взаимосвязей 9=4+5 показателей (Рисунки 4-9). Управляющими параметрами являются приемлемые величины 7 индикаторов (компонент собственных векторов) из матрицы собственных векторов A_{54}.

Извлечение цифровых знаний из числовых реальных данных- превращение данных в значимую информацию за счет применения разработанной математической модели и многомерных уравнений когнитивных смыслов изменчивостей переменных, направлена на получение адекватности к требуемой ситуации. Нам удалось применить другой набор множеств переменных, сохранив в матрице собственных векторов A_{54} мозаику фигуры из 7 индикаторов наличия знания, отличающуюся от мозаики из статьи [1].

Разработана когнитивная модель изменчивости климата и изменчивости негативных последствий для хозяйственной деятельности человека. Исходные данные - фразы смыслов 4-х показателей изменений климата (колебания уровня осадков и т.д.) и 5 негативных показателей последствий (степень ущерба экологии и т.д.) для деятельности человека. Последствия выражены в виде негативных природных, экологических проявлений, негативно воздействующих на деятельность людей, объединенных в крупные компании. Получена система из 4-х смысловых многомерных уравнений смыслов (изменчивости z-переменных и изменчивости y–переменных), передающих смыслы вводимых (для когнитивной модели) валидных (вычисляемых) и измеряемых (моделируемых) z-переменных, образующих (при решении Оптимизационной Задачи) когнитивную модель, соответствующую своей математической модели.

Пример численного моделирования значений изменчивостей показателей климата и негативных показателей деятельности человека дал адекватные реальным. Наглядные графические иллюстрации динамик значений 5+4=9 модельных показателей (Рисунки 1-8) показывают их адекватность реальным связям в системе «изменение климата-природные и хозяйственные последствия». Визуализация динамик показала много признаков пригодности когнитивной модели для моделирования изменений климата и последствий для человека.

Наиболее информативным 3 валидным показателям $v1,v_2,v_3$ (Рисунок 3) соответствуют проявления адекватности динамик модельных z–переменных $\{z_6,z_7,z_8,z_9\}$ (Рисунки 4-8) динамикам изменчивости реальных данных. Дисперсии v–переменных в матрице собственных чисел Δ_{44}=diag(1.1391,1.0699,1.0089,0.7348)

Наши выводы по конечной выборке объема m=24 (недель, месяцев, кварталов, летт) пригодны и для совокупности объема k*24, k>1, из которой она была случайно выбрана.

В нашем примере применение модели из [1] увеличило количество индикаторов до 7+5=12. Применение излагаемой ниже модели добавило еще 4 индикатора в матрице A_{54}. Таким образом, к 7 выбранным нами индикаторам после решения О31 и О32 добавились еще 9 (Таблица 1, выделены зеленым цветом), стало 7+9=16 индикаторов, а в матрице B_{44} появились 11 индикаторов, значения которым мы не могли сами назначить такими, чтобы удовлетворялось условие ортонормированности матриц B_{44} индикаторов. Оставшиеся 5*4-16=4 индикатора (b_{42}=corr(z_4,v_2)=0.1131,b_{13}=corr(z_1,v_3)=0.1898, b_{14}=corr(z_1,v_4)=**0.0903**,b_{34}=corr(z_3,v_4)=0.1645) с малыми значениями отражают некоррелированности 4-х пар переменных. Проверить соответствие этих значений реальным парным связям мы не можем, так как смыслы некоррелированных u-переменных нами не названы. Наличие адекватности этих малых значений реальным связям не можем. Если бы мы знали смыслы –переменных и малые значения адекватно соответствовали реальным связям, то b_{42}, b_{13}, b_{14},b_{34} приобрели бы статус индикатора. В итоге применение модели [1] и новой модели позволило найти модельные значения еще 16 (из 20) индикаторов из матрицы A_{54} и 11 (из 16) индикаторов из матрицы B_{44}. Наша модель не связана с современной климатической моделью, предполагающую выбросы аэрозолей и оксида азота.

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SYSTEMS CHECK: A STUDY ON THE PERFORMANCE EVALUATION SYSTEM OF AN ASIAN HIGHER EDUCATION INSTITUTION

Abstract: *For an organization to function at its best, it requires that all of its employees perform based on the standards and requirements set by the management and the industry where the company belongs. To achieve the desired results demands that performance evaluation embraces the bounds of standards set in human resources management. This paper presents an assessment of the current and prevailing performance evaluation system of an Asian school. The aspect of performance evaluation in this study includes the assessment's process flow, the instrument used, the evaluator, and the utilization of evaluation results. Administrators, teaching personnel, non-academic personnel, maintenance personnel were participants of this study. Through a survey using a researcher-made questionnaire, the participants supplied responses on the different aspects of the evaluation process. The results revealed that the current and prevailing performance evaluation system properly uses the various aspects of evaluation from moderate to a great extent in the process flow, instrument, feedbacking, evaluators, and result utilization. The manifestation, to a great extent in several aspects of the evaluation process, leads to the conclusion that the evaluation system of the institution works.*

Key words: *Performance Evaluation, Appraisal System, Human Resource Management.*

Language: *English*

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Introduction

Every organization creates a set of desired goals and objectives, and the main task ahead is to be able to accomplish these desired goals and objectives. This can only be achieved if individuals involved in the organization know their roles and functions and are producing the expected output, i.e., performance.

Many organizations use performance evaluation that appraises the effectiveness of management tools, determines the relevance of performance evaluation in today's work environment, and identifies the kind of performance appraisal needed. A performance appraisal is a process of assessing workers' performance in comparison to specific predetermined organizational standards. Assessments help employees understand how they are doing and help their superiors identify points for improvements to develop the organization as a whole.

Performance appraisal is one way of giving employees feedback about their performance at work. According to ACAS (1997), appraisals regularly record an assessment of an employee's performance, potential and development needs. Performance appraisal is a formal system of measuring, evaluating, and influencing an employee's job-related attributes, behaviors and Outcomes. In some organizations' appraisal, results may be used to determine relative rewards in the firm -- who should get merit in the form of pay increases, bonuses, or promotions. Similarly, appraisal results can be used to identify those who perform poorly may require some form of counseling, demotion, decreases in pay, or even dismissal.

A sound performance appraisal should provide substantial benefits to both the organization and the employees. However, it has been found out that many performance appraisals contain weaknesses, some of which are the resistance of the supervisors to spend sufficient time and attention to it, biases and sometimes favoritism, lack of reliability and validity in giving the ratings and the problems arising between the supervisors and subordinates in discussing and acting upon the results of the appraisal. As a result of these weaknesses, it created an atmosphere of doubts and biases. The performance appraisal result is no longer communicated to the employee concerned despite the general idea that an employee ought to know the result for whatever purpose it may serve them.

Over the years, researchers and practitioners, industrial psychologists and personnel/human resource specialists have tried their best to develop a well-designed and tailor-made performance evaluation that would provide a higher degree of reliability and validity for the program to bring about competitive advantage the organization. However, no one can lay claim to the fact of creating an ideal performance evaluation since an appraisal is governed by specific objectives to be achieved by the organizations. As Henderson would say, "Developing an appraisal system that would accurately reflect employee performance is a difficult task. Performance appraisal systems are not generic or easily passed from one company to another; their design and administration must be tailor-made to match employee and organizational characteristics and qualities" (Henderson, 1984).

Asian College of Technology International Educational Foundation (ACTIEF), like any organization, uses its own performance evaluation for both the academic and non-academic personnel. It uses the traditional type of appraisal system wherein subordinates are evaluated by their superiors and likewise, superiors are also evaluated by their subordinates. As had been practiced by the school, peer and self-evaluation had never been conducted. Weighting of evaluation results had also not been considered. Thus, problems may arise when evaluation procedures seem not to be as objectively carried as possible.

It is, therefore, the desire of the researchers to conduct a study to assess the existing performance evaluation of the school to have bases for some recommendations to improve the existing system.

Methodology

This study utilized the descriptive-survey method making use of the researcher-made questionnaire. The questionnaires were used to gather data needed to assess the existing performance evaluation system of Asian College of Technology-International Educational Foundation (ACTIEF) for its academic and non-academic personnel in terms of process flow, instruments used, the evaluators who conduct the performance evaluation system, the feedback mechanism to inform the result of the evaluation and the utilization of these results for the benefit of the concerned employees. Moreover, this study also utilized unstructured and informal interviews and focused group discussions on ascertaining the accuracy of data.

Results and Discussion

Profile of Performance Evaluation System in the Aspect of Process Flow

A successful organization attains its goals or objectives through the optimum level of performance

of every personnel involved. Human resource practitioners would always say that the employees are the most important assets of any organization (Davis, 1992). Therefore, these assets have to be properly taken care of and maximally developed. In order to arrive at the optimum performance level, they must be properly guided, monitored and evaluated.

Process Flow

As shown in Table 1, the majority of the respondents said that they were informed as to the aims of the evaluation. This accounts to the total of 70 or 88.61 percent of the respondents as compared to 9 or 11.39 percent who said that they were not informed of the aims of the evaluation. Only 9 or 11.39 per cent of the respondent claimed otherwise.

From these findings, it can be gleaned that the academic and non-academic personnel are fully aware of the aims of the evaluation.

The table further reveals that majority of these respondents were likewise informed of the benefits of evaluation as evidenced by 69 or 87.34 percent of the respondents as against 10 or 12.66 per cent who said that they were not informed.

As to whether the school has a process in the conduct of the evaluation, the majority said yes, as manifested by 72 respondents or 91.14 percent of the total. As to the frequency of the evaluation, 53 respondents or 67.09 percent said that they are evaluated every semester while 26 or 32.91 percent said that they are evaluated every year. Those evaluated every semester are the college deans, chairs and faculty members while the non-academic staff are evaluated on a yearly basis.

From these findings, it can be deduced that the school is able to widely inform all employees as to the aims and the benefits that every employee gets from this performance evaluation.

Table 1. Profile of Performance Evaluation System in the Aspect of Process Flow

Items	f	%
1) Does the school inform you of the aims of evaluation?		
Yes	70	88.61
No	9	11.39
2) Does the school inform you of the benefits of evaluation?		
Yes	69	87.34
No	10	12.66
3) Does the school have a process on performance evaluation?		
Yes	72	91.14
No	7	8.86
4) How often does the school evaluate your performance?		
Every year	26	32.91
Every semester	53	67.09

Instrument

Table 2 presents data on the profile of the performance evaluation system in the aspect of the instrument being used.

As shown in Table 2, the respondents believe that the school uses a standard tool for the conduct of the evaluation as manifested by 66 or 83.54 percent. Moreover, they are also aware of the areas wherein they are being evaluated. However, as to the regular revision of the said instrument, majority of the respondents believe that there is none. Although not manifested, many of the respondents have been in the institution for quite a number of years and they noticed that there had been no revisions made as regards to the instruments used.

Table 2. Profile of Performance Evaluation System in the Aspect of Instrument

Items	f	%
5) Does the school use a standard evaluation tool/instrument?		
Yes	66	83.54
No	13	16.46
6) Are you aware of the areas by which you are evaluated?		
Yes	66	83.54

No	13	16.46
7) Does the school regularly revise/update the evaluation instrument?		
Yes	26	32.91
No	53	67.09

Evaluator

Table 3 presents the profile of Performance Evaluation System in the aspect of the evaluator.

As shown in Table 3, the 79 respondents or 100 per cent said that they are all evaluated by their head of office; the teachers by their Chairs, the Chairs by their deans, the deans by the Vice President for Academics, the directors by the Vice President for Administration and the office and maintenance staff by the Vice President for Administration. Moreover, the 36 faculty members also mentioned that they are evaluated by the students. Peer and self-evaluation got zero responses and have been consistent with the questions if the respondents are given the chance to evaluate themselves and their colleagues. The results show that Peer and Self-evaluation are not included in the Performance Evaluation System of the academic and non-academic personnel of the school.

Table 3. Profile of Performance Evaluation System in the Aspect of Evaluator

Items	f	%
8) Who evaluates your performance?		
Head of office/Dean	79	100
Peers	0	0
Self	0	0
Students	36	45.57
9) Are you given the chance to evaluate the performance of your colleagues?		
Yes	0	0
No	79	100
10) Are you given the chance to evaluate your own performance?		
Yes	0	0
No	79	100

Feedback Mechanism

Table 4 presents the profile of Performance Evaluation System in the aspect of the feedback mechanism.

As shown in Table 4, 72 or 91.14 percent of the respondents revealed that they are informed of the results of the evaluation. Since they refer to their immediate head as the ones who evaluated them, they also said that their heads are the ones who informed them of the result of their evaluation. As to the frequency of the conduct of the feedback mechanism, it is consistent with the fact that those who are evaluated every semester also receive their feedback every after the evaluation. Those that are evaluated on a yearly basis also receive their feedback once a year.

The finding reveals that the school has a feedback mechanism wherein employees are given the results of their evaluation.

Table 4. Profile of Performance Evaluation System in the Aspect of Feedback Mechanism

Items	f	%
11) Does the school inform you of the results of your evaluation?		
Yes	72	91.14
No	7	8.86
12) Who informs you of the results of your evaluation?		
Chairman/Department Head	36	45.57
Dean	36	45.57
VP Academics	4	5.06
VP Administration	28	35.44

13) How often does the school give you feedback on your evaluation?		
Every year	28	35.44
Every semester	51	64.56

Utilization of Results

Table 5 presents the profile of Performance Evaluation System in the aspect of utilization of results.

As shown in Table 6, 60 or 75.95 per cent of the respondents did not feel that there were interventions made by the school regarding the outcome of the evaluation of the employees. As to the question whether the school made some policies based on the result of the evaluation, 64 or 81.01 per cent said that there was none.

Generally, the result shows that evaluation results are not utilized to make interventions for the development of the employees and there were no policies made out of the outcome of the evaluation

Table 5. Profile of Performance Evaluation System in the Aspect of Utilization of Results

Items	f	%
14) Does the school provide intervention so you can improve your performance?		
Yes	19	24.05
No	60	75.95
15) Does the school make policies based on the results of evaluation?		
Yes	15	18.99
No	64	81.01

Manifestation of Performance Evaluation System Among the Administrators, Faculty, Non-Teaching and Maintenance Staff

Tables 6 to 10 present data on the extent to which the different dimensions have been manifested among the administrators, faculty, non-teaching and maintenance staff of Asian College of Technology-International Educational Foundation.

Process Flow

Table 6 presents data on the extent of the manifestation of the performance evaluation system among the administrators, teaching and non-teaching personnel as well as the maintenance staff in the aspect of the process flow.

As shown in Table 6, the overall item average of 3.04 derived from the group average of 3.28 (Great Extent) from the school administrators, 3.11 (moderate extent) from the teaching personnel, 2.75 (moderate extent) from the non-academic staff and 2.90 (moderate extent) from the maintenance staff revealed that the steps undertaken in the conduct of the performance evaluation of all employees are done to a moderate extent.

In particular, the item average of 3.03 from the group mean of 3.26 (great extent) from the school administrators, 2.91 (moderate extent) from the teaching personnel, 2.82 (moderate extent) from the non-academic and 3.50 (great extent) from the maintenance staff is indicative of the fact that the dissemination of information on the conduct of the performance evaluation is to a moderate extent.

The item average of 3.35 taken from the group mean of 3.26 (great extent) from the school administrators, 3.57 (great extent) from the teaching personnel, 2.83 (moderate extent) from the non-academic personnel, and 3.70 (great extent) from the maintenance staff reveals that the majority is aware that there is an office or a person that is responsible in the conduct of the performance evaluation.

Moreover, the item average of 3.04 taken from the group mean of 3.20 (moderate extent), 3.08 (moderate extent), 2.78 (moderate extent), and 3.20 (moderate extent) respectively from the school administrators, teaching personnel, non-academic and maintenance staff suggests that they are informed of the goals and objectives of the performance evaluation in a moderately extent manner.

Furthermore, that the school has a clear policy on performance evaluation is manifested in the item average of 2.94 taken from the group mean of 3.20 (moderate extent) from the school administrators, 3.08 (moderate extent) from the teaching personnel, 2.55 (moderate extent) from the non-academic personnel, and 2.80 (moderate extent) from the maintenance staff. The finding reveals that Asian College of Technology-International Educational Foundation has created a clear policy on performance evaluation of all its employees.

As shown by the item average of 3.05, the respondents believe that there is an orderly and

systematic conduct of the performance evaluation. This is derived from the weighted mean of 3.26 (moderate extent) from the school administrators, 3.16 (moderate extent) from the teaching personnel, 2.72 from the non-academic and 3.00 from the maintenance staff.

The respondents are assured that there is confidentiality in the conduct of the evaluation as shown by the item average of 3.17 (moderate extent) which is derived from the weighted mean of 3.60 (great extent) from the school administrators, 3.19 from the teaching personnel, 2.94 from the non-academic staff and 2.90 from the maintenance staff.

The respondents also believe that the feedback system is used to a moderate extent as evidenced by the item average of 2.98 taken from the group mean of 3.40 (great extent) from the school administrators, 3.11 from the teaching personnel, 2.50 from the non-academic personnel and 2.80 from the maintenance staff. The finding reveals that the respondents are able to receive the result of the evaluation or the evaluators are able to give feedback of the results to their subordinates on a regular basis.

The item average of 3.13 (moderate extent) revealed that the conduct of performance evaluation is done in a regular basis. The regularity of the conduct of the evaluation is every semester for the Deans and teaching personnel and once every year for the non-academic and maintenance staff. This item average was derived from the weighted mean of 3.60 (great extent) from the school administrators, 3.28 (great extent) from the teaching personnel, 2.83 (moderate extent) from the non-academic and 2.50 (moderate extent) from the maintenance staff.

Finally, with the item average of 2.94 (moderate extent), the respondents believe that the school sees to it that the evaluation process is as objective as possible. This is based on the weighted mean of 3.20 (moderate extent) from the school administrators, 2.97 (moderate extent) from the faculty, 2.72 (moderate extent) from the non-academic and 2.90 (moderate extent) from the maintenance staff.

Table 6. The Extent to which the Performance Evaluation System is Manifested in the Aspect of Process Flow

Items	Administrator (n=15)		Teaching Personnel (n=36)		Non-Academic Personnel (n=18)		Maintenance Personnel (n=10)		Item Average (N=79)	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
1. The school properly disseminates information on performance evaluation	3.26	GE	2.91	ME	2.82	ME	3.50	GE	3.03	ME
2. There is an office/person tasked to conduct evaluation	3.26	GE	3.57	GE	2.83	ME	3.70	GE	3.35	GE
3. The school informs the goals and objectives of performance evaluation	3.20	ME	3.08	ME	2.78	ME	3.20	ME	3.04	ME
4. The school has a clear policy on performance evaluation	3.20	ME	3.08	ME	2.55	ME	2.80	ME	2.94	ME
5. The conduct of evaluation is orderly and systematic	3.26	GE	3.16	ME	2.72	ME	3.00	ME	3.05	ME
6.Confidentiality of results is maintained	3.60	GE	3.19	ME	2.94	ME	2.90	ME	3.17	ME
7. There is a system of feed backing on evaluation results	3.40	GE	3.11	ME	2.50	ME	2.80	ME	2.98	ME
8. Performance evaluation is conducted regularly	3.60	GE	3.28	ME	2.83	ME	2.50	ME	3.13	ME
9. The school gives premium on the results of evaluation	2.85	ME	2.79	ME	2.83	ME	2.50	ME	2.77	ME
10. The school sees to it that the evaluation process is as objective as possible	3.20	ME	2.97	ME	2.72	ME	2.90	ME	2.94	ME

Group Average	**3.28**	**VGE**	**3.11**	**ME**	**2.75**	**ME**	**2.90**	**ME**	**3.04**	**ME**

Legend:

Mean Range	Scale	Interpretation
3.25 - 4.00	**Always**	**Great Extent (GE)**
2.50 - 3.24	**Often**	**Moderate Extent (ME)**
1.75 - 2.49	**Rarely**	**Less Extent (LE)**
1.00 - 1.74	**Never**	**Not Practiced (NP)**

Instruments

Table 7 presents data regarding the extent of the manifestation of the performance evaluation system among the administrators, teaching and non-teaching personnel as well as the maintenance staff in the aspect of the instrument being used.

As shown in Table 7, the overall item average of 3.06 (moderate extent) derived from the group average of 3.33 (great extent) coming from the school administrators, 3.02 (moderate extent) from the teaching personnel, 2.96 (moderate extent) from the non-academic and 3.06 (moderate extent) from the maintenance staff, indicated that the respondents believe that the instruments used in the conduct of the evaluation are effective for the purpose.

Specifically, as revealed by the item average of 3.01 (moderate extent), the respondents believe that the school uses an appropriate evaluation instruments. This is based on the weighted mean of 3.21 (moderate extent) from the school administrators, 3.14 (moderate extent) from the teaching personnel, 2.70 (moderate extent) from the non-academic and 2.80 (moderate extent) from the maintenance staff. The findings revealed that the respondents are unanimous in saying that the instruments used in the conduct of the evaluation are effective for what they are meant for.

An item average of 3.34 (great extent), which is derived from the weighted mean of 3.57 (great extent) from the school administrators, 3.22 (moderate extent) from the teaching personnel, 3.27 (great extent) from the non-academic and 3.60 (great extent) from the maintenance staff, manifests that the school has included questions regarding the employees' attendance in the evaluation instrument. Punctuality is also solicited in the instrument as manifested in an item average of 3.33 (great extent) which is derived from the weighted mean of 3.64 (great extent) from the school administrators, 3.19 (moderate extent) from the teaching personnel, 3.27 (great extent) from the non-academic staff and 3.50 from the maintenance personnel. The item on job knowledge reveals that the respondents expressed a strong affirmation to the existence of such item as indicated in the item average of 3.21 (moderate extent) which is derived from the weighted mean of 3.42 (great extent) from the school administrators, 3.25 (great extent) from the teaching personnel, 3.11 (moderate extent) from the non-teaching personnel and 3.00 (moderate extent) from the maintenance staff.

As shown by the item average of 3.19 (moderate extent) taken from the weighted mean of 3.57 (great extent) from the school administrators, 3.13 (moderate extent) from the teaching personnel, 3.11 (moderate extent) from the non-academic personnel and 3.00 (moderate extent) from the maintenance staff, the respondents stated that the instrument includes quality of work as one of the items evaluated.

On the other hand, with an item average of 3.20 (moderate extent) taken from the weighted mean of 3.50 (great extent) from the school administrators, 3.08 (moderate extent) from the teaching personnel, 3.27 (great extent) from the non-academic personnel and 3.10 (moderate extent) from the maintenance staff, all respondents noted that that item regarding attitude towards work is solicited from them.

As shown by the item average of 3.11 (moderate extent) taken from the weighted mean of 3.42 (great extent) from the school administrators, 3.00 (moderate extent) from the teaching personnel, 3.16 (moderate extent) from the non-academic personnel and 3.00 (moderate extent) from the maintenance staff, the respondents claimed that the instrument includes personality as among the items evaluated.

As shown by the item average of 3.02 (moderate extent) taken from the weighted mean of 3.21 (moderate extent) from the school administrators, 2.91 (moderate extent) from the teaching personnel, 3.00 (moderate extent) from the non-academic personnel and 3.20 (moderate extent) from the maintenance staff, the respondents noted that the instrument includes industry as among the items included in the evaluation system.

Initiative and resourcefulness are also included as an item in the evaluation as manifested by the average item of 3.07 (moderate extent) derived from the weighted mean of 3.50 (great extent) from the school administrators, 2.85 (moderate extent) from the teaching personnel, 3.11 (moderate extent) from the non-academic staff and 3.00 from the maintenance staff.

Also included in the evaluation tool is the item on loyalty and cooperation. This is confirmed by an item average of 3.11 (moderate extent) which is

derived from the weighted mean of 3.35 (great extent) from the school administrators, 3.08 (moderate extent) from the teaching personnel, 3.05 from the non-academic personnel and 3.00 from the maintenance staff.

An item average of 3.11 (moderate extent) derived from the weighted mean of 3.42 (great extent) from the school administrators, 3.25 (great extent) from the teaching personnel, 3.00 (moderate extent) from both the non-academic and maintenance staff showed that the respondents were aware of the different areas in which they were evaluated.

An item average of 2.72 (moderate extent) based on the weighted mean of 2.85 (moderate extent) from the school administrators, 2.88 (moderate extent) from the teaching personnel, 2.55 (moderate extent) from the non-academic staff and 2.30 (less extent) indicated that the respondents did not see any revision or updates with regard to the instrument used in the conduct of the evaluation. The instrument used is the same all throughout that the respondents could not identify some changes being made.

An item average of 2.13 (less extent) derived from the weighted mean of 2.50 from the school administrators, 2.11 (less extent) from the teaching personnel, 1.77 (less extent) from the non-academic and 2.30 (less extent) from the maintenance staff showed that the respondents are almost unanimous in saying that they have not been given the chance to participate in the crafting/revising of the evaluation instrument.

These findings disclosed that the instrument used in the conduct of the evaluation is to a moderate extent as perceived by the respondents. However, it is very evident that the respondents likewise emphasized that they need to be included in the crafting or revision of the future instrument so that they will feel that they also own the instrument.

Table 7. The Extent to which the Performance Evaluation System is Manifested in the Aspect of Instruments

Items	**Administrator (n=15)**		**Teaching Personnel (n=36)**		**Non-Academic Personnel (n=18)**		**Maintenance Personnel (n=10)**		**Item Average (N=79)**	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
11. The school uses appropriate evaluation tools/instruments	3.21	ME	3.14	ME	2.70	ME	2.80	ME	3.01	ME
12.The evaluation tool/instrument solicits questions on employees': a) attendance	3.57	GE	3.22	ME	3.27	ME	3.60	ME	3.34	ME
b) punctuality	3.64	GE	3.19	ME	3.27	ME	3.50	ME	3.33	ME
c) job knowledge	3.42	GE	3.25	ME	3.11	ME	3.00	ME	3.21	ME
d) quality of work	3.57	GE	3.13	ME	3.11	ME	3.00	ME	3.19	ME
e)attitude towards work	3.50	GE	3.08	ME	3.27	ME	3.10	ME	3.20	ME
f)human relations	3.42	GE	3.00	ME	3.16	ME	3.00	ME	3.11	ME
g) personality	3.42	GE	3.13	ME	3.11	ME	3.00	ME	3.16	ME
h) industry	3.21	ME	2.91	ME	3.00	ME	3.20	ME	3.02	ME
i) initiative and resourcefulness	3.50	GE	2.85	ME	3.11	ME	3.20	ME	3.07	ME
j) loyalty and cooperation	3.35	GE	3.08	ME	3.05	ME	3.00	ME	3.11	ME
13. I am aware of the different areas by which I am evaluated	3.42	GE	3.25	ME	3.00	ME	3.00	ME	3.19	ME
14.The evaluation instrument is revised/updated regularly	2.85	ME	2.88	ME	2.55	ME	2.30	LE	2.72	ME
15. Employees are given the chance to										

participate in crafting/revising the evaluation instrument	2.50	ME	2.11	LE	1.77	LE	2.30	LE	2.13	LE
Group Average	**3.33**	**GE**	**3.02**	**ME**	**2.96**	**ME**	**3.00**	**ME**	**3.06**	**ME**

Legend:

Mean Range	**Scale**	**Interpretation**
3.25 - 4.00	**Always**	**Great Extent (GE)**
2.50 - 3.24	**Often**	**Moderate Extent (ME)**
1.75 - 2.49	**Rarely**	**Less Extent (LE)**
1.00 - 1.74	**Never**	**Not Practiced (NP)**

Evaluators

Table 8 presents data regarding the extent of the manifestation of the performance evaluation system among the administrators, teaching and non-teaching personnel as well as the maintenance staff in the aspect of the evaluators.

As shown in Table 8, the overall item average of 3.32 (great extent) derived from the group average of 3.40 (great extent) coming from the school administrators, 3.44 (great extent) from the teaching personnel, 3.11 (moderate extent) from the non-academic and 3.16 (moderate extent) from the maintenance staff, manifested that the respondents believe in the capability of the evaluators to perform their task.

Specifically, an item average of 3.51 (great extent) derived from the weighted mean of 3.64 (great extent) from the school administrators, 3.58 (great extent) from the teaching personnel, 3.00 (moderate extent) from the non-academic personnel and 4.00 (great extent) from the maintenance staff revealed that all the respondents are being evaluated by their heads or immediate superior.

With an item average of 3.30 (great extent) derived from the weighted mean of 3.42 (great extent) from the school administrator, 3.38 (great extent) from the teaching personnel, 3.22 (moderate extent) from the non-academic personnel and 3.00 (effective) from the maintenance staff also revealed that the one who conducted the evaluation observed professionalism in the conduct of the evaluation.

The respondents were also one in saying that the evaluators observed confidentiality as evidenced by an item average of 3.43 (great extent) derived from the weighted mean of 3.57 (great extent) from the school administrators, 3.50 (great extent) from the teaching personnel, 3.44 (great extent) from the non-academic personnel and 3.00 (moderate extent) from the maintenance staff.

With an item average of 3.08 (moderate extent) derived from the weighted mean of 3.07 (moderate extent) from the school administrators, 3.30 (great extent) from the teaching personnel, 2.77 (moderate extent) from the non-academic staff and 2.90 (moderate extent) from the maintenance staff revealed that at least the conduct of the evaluation is announced by the head ahead of time to prepare the respondents.

Finally, with an item average of 3.26 (great extent) derived from the weighted mean of 3.28 (great extent) from the school administrators, 3.44 (great extent) from the teaching personnel, 3.11 (moderate extent) from the non-academic personnel and 2.90 (moderate extent) from the maintenance staff the respondents believe that their head was objective in the conduct of the performance evaluation.

From these findings, it can be deduced that the school has entrusted to the right persons as evaluators of the employees who are capable of handling their tasks and are effective in the performance of their duties.

Table 8. The Extent to which the Performance Evaluation System is Manifested in the Aspect of Evaluators

Items	**Administrator (n=15)**		**Teaching Personnel (n=36)**		**Non-Academic Personnel (n=18)**		**Maintenance Personnel (n=10)**		**Item Average (N=79)**	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
16.My head conducts my performance evaluation	3.64	GE	3.58	GE	3.00	ME	4.00	GE	3.51	GE

17. My head observes professionalism in conducting my evaluation	3.42	GE	3.38	GE	3.22	ME	3.00	ME	3.30	GE
18. My head observes confidentiality in my evaluation results	3.57	GE	3.50	GE	3.44	GE	3.00	ME	3.43	GE
19. My head announces the conduct of evaluation ahead of time	3.07	ME	3.30	GE	2.77	ME	2.90	ME	3.08	ME
20. My head is objective in evaluating my performance	3.28	GE	3.44	GE	3.11	ME	2.90	ME	3.26	GE
Group Average	**3.40**	**GE**	**3.44**	**GE**	**3.11**	**ME**	**3.16**	**ME**	**3.32**	**GE**

Legend:

Mean Range	**Scale**	**Interpretation**
3.25 - 4.00	**Always**	**Very Effective (VE)**
2.50 - 3.24	**Often**	**Effective (E)**
1.75 - 2.49	**Rarely**	**Not Effective (NE)**
1.00 - 1.74	**Never**	**Not Practiced (NP**

Feedback Mechanism

Table 9 presents data regarding the extent of the manifestation of the performance evaluation system among the administrators, teaching and non-teaching personnel as well as the maintenance staff in the aspect of the feedback mechanism.

As shown in Table 9, the overall item average of 2.86 (moderate extent) derived from the group average of 3.00 (moderate extent) coming from the school administrators, 2.99 (moderate extent) from the teaching personnel, 2.58 (moderate extent) from the non-academic and 2.75 (moderate extent) from the maintenance staff, manifested that the feedback mechanism is used to a moderate extent.

In particular, the item average of 2.93 (moderate extent) derived from the weighted mean of 3.20 (moderate extent) from the school administrators, 3.00 (moderate extent) from the teaching personnel, 2.72 (moderate extent) from the non-academic personnel, and 2.70 from the maintenance staff revealed that the school has a feedback mechanism and that those who evaluated were able to relay to the respondents the results of the evaluation.

Furthermore, the item average of 2.66 (moderate extent) taken from the weighted mean of 3.00 (moderate extent) from the school administrators, 2.80 (moderate extent) from the teaching personnel, 2.22 (less extent) from the non-academic personnel and 2.50 (moderate extent) from the maintenance staff revealed that there is post conference with regard to the results of the evaluation. However, the non-academic personnel believed that the process is not effective.

The item average of 2.80 (moderate extent) taken from the weighted mean of 3.00 (moderate extent) from the school administrators, 2.80 (moderate extent) from the teaching personnel, 2.44 (less extent), and 2.60 (moderate extent) from the maintenance staff indicated that the respondents believed that the feedback mechanism used by the school is objective and proactive.

Moreover, with an average item of 2.89 (moderate extent) taken from the weighted mean of 2.93 (moderate extent) from the school administrators, 3.05 (moderate extent) from the teaching personnel, 2.61 (moderate extent) from the non-academic staff and 2.80 from the maintenance personnel, it can be deduced that the feedback mechanism had its effect in the improvement of the respondents' performance.

Furthermore, an item average of 2.83 (moderate extent) derived from the weighted mean of 3.06 (moderate extent) from the school administrators, 2.94

(moderate extent) from the teaching personnel, 2.41 (less extent) from the non-academic staff and 2.90 from the maintenance personnel revealed that the respondents have been informed of their weak points in the evaluation and have been encouraged to improve in the next performance evaluation.

The item average of 2.90 (moderate extent) taken from the weighted mean of 3.06 (moderate extent) from the school administrators, 2.72 (moderate extent) from the teaching personnel, 2.44 (less extent) from the non-academic personnel, and 2.90 (moderate extent) from the maintenance staff also revealed that the respondents have been informed of their strong points in the evaluation and have been advised to continue doing well.

The item average of 3.14 (moderate extent) taken from the weighted mean of 3.40 (great extent) from the school administrators, 3.22 (moderate extent) from the teaching personnel, 3.05 (moderate extent), and 2.70 (moderate extent) from the maintenance staff implies that the respondents believe that confidentiality is being observed in the feedback mechanism.

The item average of 2.87 (moderate extent) taken from the weighted mean of 2.87 (moderate extent) from the school administrators, 3.00 (moderate extent) from the teaching personnel, 2.67 (less extent) from the non-academic staff, and 2.80 (moderate extent) from the maintenance staff revealed that the respondents believe that the feedback mechanism is able to highlight the areas where they need to improve.

Finally, with an item average of 2.85 (moderate extent) from the weighted mean of 2.73 (moderate extent) from the school administrators, 3.14 (moderate extend) from the teaching personnel, 2.55 (moderate extent) from the non-academic staff and 2.60 (moderate extent) from the maintenance staff further revealed that the school regularly conducts monitoring of the performance of the employees.

These findings revealed that the school possesses an effective feedback mechanism where the respondents are able to receive the result of the evaluation with acknowledgement of the strong points that need to be maintained and the weak points that need to be improved and developed.

Table 9. The Extent to which the Performance Evaluation System is Manifested in the Aspect of Feedback Mechanism

Items	**Administrator (n=15)**		**Teaching Personnel (n=36)**		**Non-Academic Personnel (n=18)**		**Maintenance Personnel (n=10)**		**Item Average (N=79)**	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
21. The school has a feedback system on evaluation results	3.20	ME	3.00	ME	2.72	ME	2.70	ME	2.93	ME
22. There is a post conference where my evaluation results are discussed	3.00	ME	2.80	ME	2.22	ME	2.50	ME	2.66	ME
23. The feed backing system is objective and is pro-active	3.00	ME	2.97	ME	2.44	ME	2.60	ME	2.80	ME
24. The feed backing system ensures improvement of my future performance	2.93	ME	3.05	ME	2.61	ME	2.80	ME	2.89	ME
25. The weak points in my evaluation are given emphasis for improvement	3.06	ME	2.94	ME	2.41	ME	2.90	ME	2.83	ME
26. The strong points in my										

evaluation are considered for future enhancement	3.06	ME	2.94	ME	2.72	ME	2.90	ME	2.90	ME
27.Confidentiality is maintained in every feed backing session	3.40	GE	3.22	ME	3.05	ME	2.70	ME	3.14	ME
28. Points for improvement are highlighted and given immediate resolution	2.87	ME	3.00	ME	2.67	ME	2.80	ME	2.87	ME
29. My head conducts monitoring of my performance after the feed backing session	2.80	ME	2.86	ME	2.38	ME	3.00	ME	2.75	ME
30. Monitoring of performance is regularly conducted	2.73	ME	3.14	ME	2.55	ME	2.60	ME	2.85	ME
Group Average	**3.00**	**ME**	**2.99**	**ME**	**2.58**	**ME**	**2.75**	**ME**	**2.86**	**ME**

Legend:

Mean Range	**Scale**	**Interpretation**
3.25 -4.00	**Always**	**Great Extent (GE)**
2.50 - 3.24	**Often**	**Moderate Extent (ME)**
1.75 - 2.49	**Rarely**	**Less Extent (LE)**
1.00 - 1.74	**Never**	**Not Practiced (NP)**

Utilization of Results

Table 10 presents data regarding the extent of the manifestation of the performance evaluation system among the administrators, teaching and non-teaching personnel as well as the maintenance staff in the aspect of the utilization of the evaluation results.

As shown in Table 10, the overall item average of 2.61 (moderate extent) derived from the group average of 2.69 (moderate extent) coming from the school administrators, 2.56 (moderate extent) from the teaching personnel, 2.75 (moderate extent) from the non-academic and 2.60 (moderate extent) from the maintenance staff, showed that the results of the evaluation are being used by the school in its desire to improve the incentives of the employees.

An item average of 2.98 (moderate extent) based on the weighted mean of 3.20 (moderate extent) from the school administrators, 3.08 (moderate extent) from the teaching personnel, 2.94 (moderate extent) from the non-academic staff and 2.98 (moderate extent) from the maintenance personnel revealed that the evaluation result is utilized for merit increase.

However, the respondents were almost unanimous in affirming that the results of the evaluation have not been effectively used by the school for job counseling as manifested in the item average of 2.46 (less extent) derived from the weighted mean of 2.40 (less extent) from the school administrators, 2.38 (less extent) from the teaching staff, 2.55 (moderate extent) from the non-academic personnel and 2.40 (less extent) from the maintenance staff.

Furthermore, an item average of 2.56 (moderate extent) derived from the weighted mean of 2.80 (moderate extent) from the school administrators, 2.50 (moderate extent) from the teaching personnel, 2.66 (moderate extent) from the non-academic staff, and 2.70 from the maintenance personnel revealed that the school takes into consideration the results of the evaluation in the promotion of its employees.

An item average of 2.68 (moderate extent) derived from the weighted mean of 2.85 (moderate extent) from the school administrators, 2.52 (moderate extent) from the teaching personnel, 2.83 (moderate extent) from the non-academic staff revealed that majority of the respondents believe that the results of the evaluations have been made basis for termination or layoff. However, the maintenance staff, with a weighted mean of 2.30 (less extent), believe otherwise.

Whether the results of the evaluation are being utilized for development and evaluation of training program, or not, the answer can be manifested by the following presentation. With an item average of 2.55

(moderate extent) derived from the weighted mean of 2.66 (moderate extent) from both the school administrators and the teaching personnel, 2.50 (moderate extent) from the non-academic staff and 2.80 (moderate extent) from the maintenance personnel, the respondents said that the results of the evaluation have been utilized for the development of the personnel and the evaluation of the training programs of the institution.

An item average of 2.54 (moderate extent) from the weighted mean of 2.50 (moderate extent) from the teaching personnel and 2.72 (moderate extent) from the non-academic staff revealed that the respondent perceive that the results of the evaluation have been considered in the transfer of employees. However, the school administrators with a weighted mean of 2.35 (less extent) and 2.10 (less extent) from the maintenance personnel said otherwise.

An item average of 2.56 (moderate extent) derived from the weighted mean of 2.71 (moderate extent) from the school administrators, 2.55 (moderate extent) from the teaching personnel, 2.61 (moderate extent) from the non-academic staff and 2.70 from the maintenance staff shows that the school uses the results as a basis for its human resource planning.

Furthermore, the respondents were divided in terms of their perception whether the results have been used for giving incentives and bonuses to the employees. The school administrators netted a weighted mean of 2.73 (moderate extent) while the non-academic personnel had a weighted mean of 3.11 (moderate extent) believe so. However, the teaching personnel, with a weighted mean of 2.34 (less extent) and the maintenance staff with a weighted mean of 2.30 (less extent) indicated otherwise. Overall, the item average of 2.58 (moderate extent) manifested that the respondents still believe that the results are used for this purpose.

An item average of 2.61 (moderate extent) derived from the weighted mean of 2.66 (moderate extent) from the school administrators, 2.57 (moderate extent) from the teaching personnel, 2.77 (moderate extent) from the non-academic staff, and 2.30 (less extent) from the maintenance personnel revealed that the school uses the results of the evaluation for internal communication.

And finally, with an item average of 2.59 (moderate extent) deduced from the weighted mean of 2.57 (moderate extent) from the school administrators, 2.52 (moderate extent) from the teaching personnel, 2.77 (moderate extent) from the non-academic staff and 2.40 (less extent) from the maintenance personnel suggested that the results are utilized for policy formulation.

From this finding, it can be deduced that generally, the school utilizes the results of the evaluations from merit increase to policy formulation but there are some areas where other respondents did not perceive like job counseling, giving of incentives and bonuses and transferring of employees.

Table 10. The Extent to which the Performance Evaluation System is Manifested in the Aspect of Utilization of Results

Items	Administrator (n=15)		Teaching Personnel (n=36)		Non-Academic Personnel (n=18)		Maintenance Personnel (n=10)		Item Average (N=79)	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
31.Evaluation results are used for: a) merit increase	3.20	ME	3.08	ME	2.94	ME	2.75	ME	2.98	ME
b) job counseling	2.40	ME	2.38	ME	2.55	ME	2.40	LE	2.46	LE
c) promotion	2.80	ME	2.50	ME	2.66	ME	2.70	ME	2.56	ME
d)termination/layoff	2.85	ME	2.52	ME	2.83	ME	2.30	LE	2.68	ME
e) development and evaluation of training program	2.66	ME	2.66	ME	2.50	ME	2.80	ME	2.55	ME
f) transfer	2.35	ME	2.50	ME	2.72	ME	2.10	LE	2.54	ME
g) human resource planning	2.71	ME	2.55	ME	2.61	ME	2.70	ME	2.56	ME
h) giving of incentives and bonuses	2.73	ME	2.34	LE	3.11	ME	2.30	LE	2.58	ME
i)internal communication	2.66	ME	2.57	ME	2.77	ME	2.30	LE	2.61	ME
j) policy formulation	2.57	ME	2.52	ME	2.77	ME	2.40	LE	2.59	ME
Group Average	**2.69**	**ME**	**2.56**	**ME**	**2.75**	**ME**	**2.60**	**ME**	**2.61**	**ME**

Legend:

Mean Range			Scale	Interpretation
3.25	**-**	**4.00**	**Always**	**Great Extent (GE)**
2.50	**-**	**3.24**	**Often**	**Moderate Extent (ME)**
1.75	**-**	**2.49**	**Rarely**	**Less Extent (LE)**
1.00	**-**	**1.74**	**Never**	**Not Practiced (NP)**

Summary of Data on the Extent to which Performance Evaluation System is Manifested

Table 11 contains a summary of the data pertaining to the extent to which the performance evaluation system is manifested as perceived by the school administrators, teaching personnel, non-academic staff and the maintenance personnel.

As shown in Table 11, the overall item average of 2.97 (moderate extent) derived from the group mean of 3.14 (moderate extent) from the school administrators, 3.02 (moderate extent) from the teaching personnel, 2.83 (moderate extent) from the non-academic personnel and 2.87 (moderate extent) from the maintenance staff showed that the school's performance evaluation system is effective as perceived by the respondents.

Specifically, the item average of 3.04 (moderate extent) derived from the weighted mean of 3.28 (great extent) from the school administrators, 3.11 (moderate extent) from the teaching personnel, 2.75 (moderate extent) from the non-academic staff and 2.98 (moderate extent) from the maintenance personnel showed that the process flow of the evaluation system is effective.

The item average of 3.06 (moderate extent) derived from the weighted mean of 3.33 (great extent) from the school administrators, 3.02 (moderate extent) from the teaching personnel, 2.96 (moderate extent) from the non-academic staff and 3.00 (moderate extent) from the maintenance staff revealed that the instrument used in the conduct of the evaluation is still useful and effective.

Furthermore, the item average of 3.32 (great extent) taken from the weighted mean of 3.40 (great extent) from the administrators, 3.44 (great extent) from the teaching personnel, 3.11 (moderate extent) from the non-academic personnel and 3.16 (moderate extent) from the maintenance personnel showed that those who are tasked to evaluate are very much capable and acceptable to those who were evaluated. This is the only aspect where the respondents gave a very high rating.

The respondents also believe that the feedback mechanism is effective as manifested in the item average of 2.86 (moderate extent) derived from the weighted mean of 3.00 (moderate extent) from the administrators, 2.99 (moderate extent) from the teaching personnel, 2.58 (moderate extent) from the non-academic staff, and 2.75 (moderate extent) from the maintenance personnel.

Finally, the item average of 2.61 (moderate extent) taken from the weighted mean of 2.69 (moderate extent) from the school administrators, 2.56 (moderate extent) from the teaching personnel, 2.75 (moderate extent) from the non-academic staff showed that for the majority of the respondents, the results of the evaluations are used to improve the employees' welfare while the maintenance personnel, with a weighted mean of 2.46 (less extent) perceive otherwise.

These findings imply that, generally, the school's performance evaluation is still effective and serves it purpose. From the standpoint of the respondents, there are some areas which need to be reviewed and given attention.

Table 11. Summary on the Extent to which the Performance Evaluation System Is Manifested as Perceived by the Administrators, Teaching Personnel, Non-Academic Personnel and Maintenance Personnel

Aspects of Performance Evaluation System	**Administrator (n=15)**		**Teaching Personnel (n=36)**		**Non-Academic Personnel (n=18)**		**Maintenance Personnel (n=10)**		**Item Average (N=79)**	
	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.	Mean	Int.
1. Process Flow	3.28	GE	3.11	ME	2.75	ME	2.98	ME	3.04	ME
2. Instruments	3.33	GE	3.02	ME	2.96	ME	3.00	ME	3.06	ME
3. Evaluators	3.40	GE	3.44	GE	3.11	ME	3.16	ME	3.32	GE
4.Feedback Mechanism	3.00	ME	2.99	ME	2.58	ME	2.75	ME	2.86	ME

5.Utilization of Results	2.69	ME	2.56	ME	2.75	ME	2.46	LE	2.61	ME
Group Average	**3.14**	**ME**	**3.02**	**ME**	**2.83**	**ME**	**2.87**	**ME**	**2.97**	**ME**

Legend:

Mean Range	**Scale**	**Interpretation**
3.25 - 4.00	**Always**	**Great Extent (GE)**
2.50 - 3.24	**Often**	**Moderate Extent (ME)**
1.75 - 2.49	**Rarely**	**Less Extent (LE)**
1.00 - 1.74	**Never**	**Not Practiced (NP)**

Test of Hypothesis

The data are presented in Table 12 showing the degree of freedom, the computed F-value, the critical F-value, the p-value, the decision and the conclusion to the hypothesis.

The null hypothesis of the study was stated as: there is no significant difference on the extent to which the performance evaluation system is manifested by the school administrators, teaching personnel, non-academic staff and maintenance personnel in the aspect of process flow, instruments, evaluators, feedback mechanism and the utilization of results.

As presented in Table 12, there is a significant difference between the perceptions of the respondents in the aspect of the process flow as shown by the p-value of 0.0054 which is less than the 0.05 level of significance. This finding could be traced back to Table 6 which revealed that although the item average is considered effective, however there are some items under this aspect where the administrators and teachers, non-academic staff and maintenance personnel differed in their perceptions. Thus, the null hypothesis was rejected.

On the other hand, the perceptions of the different groups of respondents on the aspects of instruments, evaluators, feedback mechanism and utilizations of results showed no significant difference. Specifically, the p-value of 0.2564 for instruments, 0.1178 for the evaluators, 0.2227 for feedback mechanism and 0.6461 for the utilizations of results all are higher than the 0.05 level of significance, thus accepting the null hypothesis.

Table 13. Results of the Test of Hypothesis at α = 0.05 Level of Significance

Null Hypothesis	Degrees of Freedom (df)	Computed F-value	Critical F-value	p-value	Decision	Conclusion
Ho: There is no significant difference on the extent to which the performance evaluation system is manifested by the respondents in the aspects of:						
a) Process Flow	78	4.5641	2.72	0.0054	Reject Ho	Significant Difference
b) Instruments	78	1.3765	2.72	0.2564	Accept Ho	No Significant Difference
c) Evaluators	78	2.0238	2.72	0.1178	Accept Ho	No Significant Difference
d)Feedback Mechanism	78	1.4952	2.72	0.2227	Accept Ho	No Significant Difference
e) Utilization of Results	78	0.5553	2.72	0.6461	Accept Ho	No Significant Difference

Conclusion

Based on the results of the study, it is concluded that the academic and non-academic personnel consider the performance evaluation system as effective in the aspect of process flow, instruments, evaluators, feedback mechanism and the utilizations of results.

The study supports the theory of Henderson that in order for an organization to be able to survive, prosper and achieve competitive advantage with the rest of similar organizations, it must develop a well-designed, tailor-made and systematic performance evaluation system to match employee and organizational characteristics and qualities (Henderson, 1984).

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INNOVATIONS IN BANKING: DIGITAL BANKING

Abstract: *The article discusses the development of a digital bank in Uzbekistan. According to the Payments Industry Intelligence portal, there were 60 non-banks in the world in 2018 year. At the beginning of 2021, the number of digital institutions has grown to 319 active. In 2019-2020 years alone, 144 new neobanks were opened. Currently, there are 24 digital banks operating in the USA, about 100 in the EU, 10 in China, 3 in Russia, and 1 in Kazakhstan. There are 2 digital banks in Uzbekistan: the first domestic commercial digital bank Anorbank, as well as a branch of the Georgian digital bank.*

Key words: *digital bank, software, Central Bank, IT infrastructure, banking services, digital innovations.*

Language: *English*

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Introduction

Favorable conditions have been laid down in Uzbekistan for the opening of digital banks back in 2018, thanks to the Decree of the President of Uzbekistan "On measures to radically improve the activities of the Central Bank". It is obvious that the number of digital banks, compared to the "traditional" ones, is much smaller at the moment. However, it is already possible to assess the advantages of digital banks over "traditional" ones and predict a significant increase in their number in the near future. Due to savings on the maintenance of offices, staff, equipment, a reduction in the cost of transactions is achieved (according to various estimates, from 2 to 16 times), the opening and closing of accounts occur quickly, more attractive interest rates on loans and deposits appear, and due to online opportunities, the customer base expands and the issue of queues is practically solved. The profitability of this type of banks increases dramatically due to a significant reduction in the cost of services provided while increasing

After the signing of the Presidential Decree "On measures to radically improve the activities of the Central Bank of the Republic of Uzbekistan", the banking system was tasked with organizing "digital" banks and banking units specializing in retail banking and customer service using innovative banking technologies to further improve the quality of service. Based on this, Anorbank and TBC Bank were registered as digital banks in Uzbekistan in 2020 year.

Research of methodology.

When writing the article, we used the synthesis and analysis of the materials under study.

Discussion of the results.

The concept of "digital banking" developed rapidly in European countries during 2015-2020. Digital banks widely use modern digital innovations to provide their customers with more convenient and useful services. Today, Anorbank and TVS Bank are both digital banks, also offering their customers a full range of digital services through mobile applications or personal computers. This means that a digital bank customer can use banking services 24/7. In other words, a mobile application is provided to the customer in the digital bank system, and on the basis

of a mobile application, high flexibility of banking operations with a high-tech IT infrastructure is provided [1].

It is known that digital banks are divided into 2 types: some have a license and initially operate independently under their own brand, others directly cooperate with existing traditional banks and become a kind of online subsidiaries of these banks, but they can also have their own name and brand. For example, in Uzbekistan in 2020, the Georgian digital bank TBC Bank opened, which in Georgia has a head office and full-fledged branches, as well as a digital division with its own name Space, which is positioned as a digital bank with a license from TBC Bank. It is typical for digital banks not to expand the network of bank branches; 100% online communication system between the bank and the client; high-quality and convenient mobile application; the most favorable conditions for deposits and loans that meet market requirements (i.e. based on customer demand); availability of fast, high-quality, convenient and round-the-clock response centers [2,3,4].

The digital transformation of financial services will help expand the economic opportunities of customers, while creating a wide range of opportunities for the bank's customers, which is an important step towards increasing financial activity. In other words, one of the prospects for digital banks is to reduce the cost of services by 40-60% due to the digitalization of these financial sectors. The transformation of commercial banks and the transition to a digital banking system is a response to the development and active dissemination of new information technologies around the world, and digital technologies not only improve the quality of products and services, but also reduce unnecessary costs. In other words, the development of digital financial services is an important aspect of the development of the country's banking and financial system. The first digital bank in Uzbekistan will be a foreign company - TBC Bank Group PLC, which at the end of April received a license from the Central Bank of the Uzbekistan for the right to operate in the country.

The branches of the bank, the number of which will be three, will differ from traditional bank offices. The first steps towards digitalization of the banking sector in the Uzbekistan began in early 2018. Then, at the legislative level, they approved a course for the introduction and development of digital banks. A few months later, online deposits became available to users (they were the first to be implemented in “Hamkorbank”), then it became possible to convert currency through a mobile application. Now the functionality of applications is much broader: remotely you can not only open a deposit and change currency, but also apply for a loan, order a card, transfer funds to a card, receive a money transfer, manage accounts, pay for goods and services. Market experts note that the level of digitalization of the sector is still low. Despite the fact that almost all banks in the country have got mobile applications, and some even two (for individuals and legal entities). The banking system of Uzbekistan is characterized by a high concentration: more than 80% of banking assets are in the hands of the state. Now both private and public have undergone some changes. Uzbekistan's policy is pushing state-owned banks to be more competitive in the market and maximize profits.

Over the past few years, the banking sector in Uzbekistan has made a breakthrough in development. Most banks began to offer their products and services through digital channels, mobile applications have become more convenient, their functionality has expanded significantly. Banks have paid attention to the retail sector and to our citizens as consumers of banking services. It can be noted the successful implementation of digital solutions in Uzbekistan, including mobile applications, for example, Kapitalbank's Apelsin, NBU's Milliy, Promstroybank's Joyda, InfinBANK, Ipak Yo'li Mobile, Hamkor Mobile and others. Increasingly, banks are making applications available not only to their customers. So the banking sector will win back the market share that was captured by payment organizations like Payme, CLICK, Upay and others. Digitalization of the banking sector is a complex and complex process. But its ultimate goal is to save the resources of both customers and the banks themselves, since the bank is available at any time through any channel convenient for the client: bank office, call center, video communication, ATM, mobile and Internet banking, chat bots, social networks and messengers; the client forgets the way to the bank's office, because he can get any service remotely: open a card with its delivery to his home, issue a loan, open a deposit, and so on; service becomes more personalized, up to individual tariffs [5,6].

All thanks to big data, using which banks know so much about customers that they themselves offer services without waiting for a request. A classic example of a digital bank is the Russian “Tinkoff Bank”, which does not have a single office. Its main channels of interaction are a website and a mobile application through which you can order a card (it will be delivered to your home for free), apply for a loan (including cash, which will also be delivered to the client) or a deposit. Customers can top up the card or withdraw cash through ATMs, and all communication takes place through digital channels. For the bank, digitalization is primarily an opportunity to optimize costs: more than 5,000 people have opened deposits online. This means that the bank saved 5,000 deposit books, did not print out the contract in duplicate and the cash receipt order, the employee did not spend 15 minutes of time opening each deposit and does not spend 5 minutes monthly to pay interest on them, the accountant and cashier did not participate in this

operation and also saved 2-3 minutes of their time. A simple calculation shows how many man-days the bank has saved. Internal optimization of the bank also includes digitization of all business processes. For example, the introduction of a credit pipeline that allows you to make a decision on the approval or rejection of a loan application in a few minutes without the participation of a bank employee. Here, too, two technologies that are leading the digital transformation of the banking sector come into play: big data and artificial intelligence. Having information about the client's income, the number of overdue loan payments and other data, the system analyzes in a few minutes and gives a positive or negative answer, or calculates the optimal interest rate for a certain applicant. When scoring (automatic assessment of a client's creditworthiness based on data about him), there are elements of big-data.

Really big data is used by mobile operators who have information about the movement of subscribers: where he lives, which restaurants he visits, how often he goes on business trips, and so on. In Ukraine, for example, scoring takes into account even the contacts of a potential borrower. If he often communicates with people from the bank's blacklist, then the level of risk for this client increases. The bank receives and stores a huge amount of information about the customer, from his income and the average check in the store to the time of card transactions and their location. If you manage these data correctly, you can use them to offer a loan to the client at the right time for him. Forced isolation of people on the one hand, and increased public interest in e-commerce (shopping in online stores, ordering groceries from supermarkets and food from stores), and, on the other hand, led to a sharp development of digital banking services [7].

In particular, it became possible to remotely open a card of national and international payment systems, which the bank's employees delivered to the client at home. Banks began to sell their products online and transfer the identification process from the stage of creating an application to the stage of delivering products to the consumer. Internet acquiring, courier delivery, remote scoring, unidentified mobile wallet began to develop. During the quarantine period, “Kapitalbank” launched remote money transfer and card delivery in just a week. According to the Central Bank of Uzbekistan, the number of bank cards in circulation exceeds more than 21 million. At the same time, as of January 1, 2020 year, over 10 million people are users of remote banking services. Most of them (93% or 9.4 million) are individuals. On the one hand, this indicates the success of the efforts of Uzbekistan's banks on the way to a fully digital bank, on the other hand, it demonstrates a huge potential for growth [8].

Banks that have not started the process of digital transformation now risk being left out in a few years. On the other hand, there are infrastructure problems in the country that do not allow banks to digitalize at a rapid pace. In particular, this is a low level of Internet and smart phone penetration. Penetration, as well as the cost of mobile and fixed Internet is the main factors in the development of e-commerce. The penetration of smart phones at the level of 40-45% is also a strong limitation. The key feature of digital banking is the ability to open a bank account without the physical presence of the client. Currently, banks in Uzbekistan do not have such an opportunity, but we expect changes in regulatory documents that will allow customers to open accounts remotely in the near future. Experts predict that in the coming year, the banking sector of Uzbekistan will undergo major changes, in a year such professions as managers selling card and credit products will remain only in textbooks, because the entire retail business will go online. Digitalization helps to save time and resources of the bank's employees and customers, thanks to digitalization, the cost of all operations has fallen sharply, customers are satisfied with the quality and speed of services.

According to KPMG experts, in the next 10 years, the banking sector will change in a way that has not changed in the last century. It is important that the market is expanding at the expense of players who have become involved in payments and other banking operations, although this is not a core activity for them. For example, global technology corporations like Apple, Google, Samsung already have their own payment services. This forces such large and non-revolving structures as banks to become more flexible, customer-oriented [9]. The financial sector is one of the most active segments of innovative solutions consumption. At the same time, bank employees spend millions of dollars on high technologies, and constantly raise the bar of requirements for IT systems. Innovative trends characterizing technological breakthroughs in the banking sector are the improvement of the way of organizing processes, which allows to reduce the cost of banking services and products, as well as the expansion of integration services and the emergence of new payment systems.

Conclusion.

In 2017, credit institutions began using Apple Pay and Samsung Pay payment systems, Android Pay and Xiaomi Pay, because of their convenience as a means of payment. It is possible to note the prospect of support by Mir cards for making payments using Apple Pay and Samsung Pay technologies. Currently, in the call centers of banks, bots-robot consultants using speech technologies and simple forms of artificial intelligence are already used to help solve simple banking issues, and robotovizers are used for automatic investment management in the bank [10]. At the same time, artificial intelligence systems capable of self-learning and helping to make complex

decisions based on processing large arrays of banking data are extremely promising technologies [8].

The introduction of a Unified Identification and Authentication System (USIA) for bank customers, the transition to the use of XBRL for reporting under IFRS, the use of biometric data (fingerprints, voice, iris, etc.) for multi-factor authorization increases the efficiency of the bank. The use of blockchain in a bank that stores information about all transactions of system participants in the form of a "block chain" is the main advantage of this technology over traditional banking transactions, where there are no intermediaries, because the blockchain does not have a central authority, and transactions are verified by the participants themselves [9]. According to the TAdviser survey on the prospects of blockchain technology in the Russian banking sector, it showed that blockchain has a great future and when using it, a deep rethinking of the technological principles of providing banking services is necessary.

Mobile applications of banks and online banks are constantly expanding their capabilities, becoming more convenient and advanced. However, along with this, the number of threats faced by customers is also growing. This, in turn, changes the paradigm of development of these financial products. Currently, the market of software products for credit institutions is represented by a wide range of systems that differ both in functional part and technical implementation. However, any banking information system must necessarily meet the following requirements: the possibility of network work of many users; the implementation of the entire complex of banking operations for settlement and cash services, credit and deposit activities, currency transactions; flexible configuration for end-user access; support for several hardware platforms; automated generation of most of the reporting forms, the possibility of their reconfiguration, etc.

These requirements are met today by most systems for financial organizations represented on the market of IT products. The use of a Russian-made information system ensures the accounting and operational activities of a credit institution, but the functionality of such systems in such business areas as strategic management, customer relationship management, and risk management lags significantly and is narrower than that of Western systems, although they are cheaper [10]. This is increased competition for the clientele, especially for a quality client. It is necessary for the bank to have sufficient information about markets and customers, to be able to respond flexibly and promptly to customer requests, to predict the changing needs of the clientele and to develop new products taking into account such forecasts. This situation primarily concerns those banks that have begun to develop retail business, private banking, etc. Now there is an increased interest in systems that provide comprehensive risk management, primarily credit. In addition, it is necessary to introduce a modern corporate information system into the bank, which would cover all aspects of the bank's activities. The problem of strategic management and planning is urgent. The latest regulatory documents and recommendations of the Bank of Russia on the business plans of credit institutions encourage banks to use modern information systems in the field of strategic business development [11].

In order to avoid technological lag, banks should identify their niche and focus on automating selected business lines. The more high-tech a bank is, the higher its competitiveness. The processes of mergers and acquisitions taking place in the banking system require the adequacy of the development of information systems in banks to minimize risk and loss of their manageability.

The first and most important task of information technology (IT), among others, is to achieve business goals. Any activity in the field of IT only makes sense when it is aimed at obtaining the final result and is connected with the development strategy of the bank. If the management of a credit institution is properly organized, the IT manager should be directly involved in defining goals and developing a strategy to achieve them. In the field of IT, the means of achievement are resources, their balance.

The main IT resources are technologies, information, personnel, software and hardware. The common resource is money, time. In the field of IT resource provision, the use of third-party resources, i.e. outsourcing, is more preferable for some tasks and is increasingly expanding [12]. For example, if a bank has acquired banking programs and technologies for banking automation systems from a developer company, then after a while it will be necessary to add a function for working with new stock instruments (for example, bills of exchange) to expand the activity of the tank. And in this case, the outsourcing service involves the bank contacting the developer company for the design and purchase of information technology that provides the bank with work with bills. A new function in the activity of a particular bank is implemented by an external contractor and its resources, which is a more economical way to implement it.

Outsourcing services may be associated with the transfer of the bank's information technologies to new software and hardware (platform), with the replacement and updating of the network operating system, etc. When solving specific tasks, it is necessary to determine which type of resource use is more effective - internal or external. Outsourcing is also associated with new specific risks, the management of which is part of the operational activities of IT services [13]. In the international practice of banks, not only the experience and knowledge of managers and other personnel are used

to solve the problems of optimal organization of information technologies, but they also use some kind of IT management methodology developed on the side or their own.

Such methodologies contain the definition of the main goals and objectives of the information technology management structure, the composition of functions, technologies, and the organization of work on their implementation. The advantages of well-known methodologies include offering proven approaches and solutions that comply with international legal standards and technical standards, achieving goals and results, etc. [14].

The bank's performance is assessed on the basis of a number of key indicators reflecting how successfully managers manage their own and borrowed funds, what is the profitability of interest and non-interest operations, the degree of profitability of assets, capital, the share of expenses on the management apparatus [14]. However, financial indicators are reliable for assessing the work already done and are not fully adequate when it comes to the future development of the bank. The owners of the bank mainly have a strategic view of its development. They decide in which areas of business to identify priorities and give them the status of strategic. Paying attention to the long-term perspective, it is necessary to provide resources for the bank's development program. This prepares the ground for implementation.

Experience shows that banks that have a clear strategy and clear plans are more likely to succeed. The process of translating the bank's strategy and plans into action is inextricably linked with the development of information technology. Therefore, it is necessary to expand the system of indicators, to give it a balance to reflect not only the past period, but also the future, forming goals and stages of their achievement.

Reducing the bank's strategic objective for monitoring individual indicators, many of which need to be monitored in the course of operational activities, and represents the translation of the strategy into action in the future. The degree of achievement of individual goals is determined by feedback, which is so necessary to adjust the bank's development for the implementation of a long-term program. To access, analyze and forecast the state of information technology, it is necessary, as well as for the bank as a whole, to have an objective system of indicators on the main aspects of ABS activities.

Such indicators provide control, management and achievement of the final results of IT activities. In foreign practice, such indicators are called key performance indicators. Examples include user satisfaction with the work of IT services, the number of supported users per ABS employee, the percentage of ABS employees' workload, the growth of the ABS budget compared to the growth of operations, the time to resolve problems with users, the percentage of IT projects that do not meet deadlines or budget, the availability of critical resources (100% means that certain resources are available 24 hours), etc. It is important to determine which of the indicators should be taken into account when evaluating the activities of the IT bank.

One of the main aspects of the implementation of the bank's development strategy is the organization of information technologies in the direction of complex automation of banking activities based on the integration of the bank's management functions as a whole. Therefore, the automated banking system of the ABS of a credit institution should function as an integrated complex, in which, in addition to traditional solutions, modern tools, there is a system for visualizing key indicators, including about the future activities of the bank. The process of informatization of banking activities will continue in the future. In the banking sector, in the near future, trends will prevail towards improving the quality and reliability of the products and services offered, increasing the speed of settlement operations, and organizing electronic access of customers to banking products.

This is due to the desire of banks to achieve competitive advantages in the financial markets. The use of modern information technologies dramatically affects and changes business processes in banks, bringing them to a fundamentally different level. Banking technologies are inextricably linked with information technologies that provide comprehensive business automation. The formation of the national banking sector continues to this day. The future of banking remains for information technology. The Uzbek banking system should join the global one, and the fight against Western competitors is unthinkable without relying on modern high-level information technologies. New electronic technologies help banks to change customer relationships and find new means to make a profit. Banking computer systems are currently one of the fastest growing areas of applied network software. The advantages of non-banks over traditional ones are: free connection of new customers without queues and bureaucracy; personalized customer support works in a 24/7/365 time format; the vast majority of banking operations are via an online application, all processes work using blockchain technology, and credit rates and deposits are often offered with greater benefit for the client.

Digital banks focus on modern technologies and the target audience, which is used to online banking services. The main sources of income of such banks are transaction fees, paid subscription to VIP or premium services and commissions from third-party services. Certain disadvantages of digital banks include their narrow, in comparison with the broad masses of citizens, target audience. For example, the vast majority of pensioners and elderly people who are

unfamiliar with modern technologies will not be able to fully use the services of neobanks.

Moreover, digital banks are mostly "sharpened" for monetary transactions taking place inside the network and in the absence of their terminals (or a small number of them), and sometimes even plastic cards (for the sake of virtual cards and electronic wallets). Also, factors slowing down the spread of digital banks in Uzbekistan are an adapted regulatory framework and insufficient technological capacities (data centers, experienced IT specialists, Internet coverage and speed, etc.). However, it must be said that it is a matter of time, education and resources when digital banks will be able to translate these shortcomings in their favor.

It is known that money is the equivalent of the cost of goods and services. Their forms are diverse: from ordinary coins and banknotes to digital and information sources of their issue. There are 157 currencies on the territory of 193 states today. According to the information portal FinFocus, there are $80.9 trillion in turnover, taking into account long-term deposits, of which $5 trillion. - in coins and banknotes, the rest - in electronic form. The most popular among them are 5 national monetary units (US dollar, British pound sterling, Japanese yen, Swiss franc and Australian dollar) and 1 interstate - euro. There are also gold and foreign exchange reserves, no state can do without them. They are estimated at $7.8 trillion. The IMF and the central banks of the participating countries account for about 17% of all gold reserves. It is also worth mentioning about crypto-currencies - virtual money. According to the international magazine Global Finance, the total value of crypto-currencies in the world is estimated at $196.5 billion. The top three by capitalization for 2020 year include bitcoin ($156.5 billion), ethereum ($17.5 billion) and ripple ($9.8 billion). But this is only a part of the entire money supply. Everything else, and this is a much more significant share– is non-cash money. Wondering how much electronic money is in the accounts of various electronic wallets, no study provides accurate data. According to various experts, the global volume of electronic money and securities can vary and reach $1,280 trillion, i.e. it can be said with some confidence that almost all money in the world today is non-cash. Thus, in developed countries, the volume of cash is no more than 10%, i.e. about 90% of all money in developed countries is electronic. For example, in the Russian Federation, the turnover of electronic money, according to the National Association of E-Commerce Participants, annually amounts to 1.7 trillion rubles, and electronic wallets are used by more than 10 million Russians. Today, Web Money and Yandex are the leaders in the Russian electronic money market, Money, and the total share of which is about 46%. According to the estimates of the British specialized resource Learn Bonds, the global digital payments market in 2020 amounted to a record $4.7 trillion, which is 15.3% more than a year earlier.

Analysts predict that the market will continue to grow in the coming years and will reach $6.7 trillion by 2023 year. According to a “Statista” study on the financial and technology industry, the global digital payments market will grow by an average of 14% per year in 2017-2023 years. In many ways, the market is growing thanks to online trading. In the next three years, digital payments in this segment will account for 67% of the total number of digital payments. However, mobile payments will show the most significant growth: if in 2019 their volume worldwide amounted to $745 billion, then in 2023 year it will reach $2.1 trillion. At the moment, the world leader in the volume of digital payments is China, which by 2023 will account for 49% of the total global volume ($3.1 trillion). In February 2020 year, the Law of the Republic of Uzbekistan "On Payments and Payment Systems" came into force, regulating, among other things, the use of electronic money and payment systems.

In the Republic of Uzbekistan, electronic money is the same Uzbek soums, only their circulation is carried out in an electronic system. They can be used to purchase goods and services from individual entrepreneurs and legal entities - subjects of the system. Special electronic wallets are formed for them, to which electronic currency is accepted for the goods sold or the service rendered in order to further transfer the equivalent amount to the bank's settlement accounts.

There are three such systems in Uzbekistan today, they are created by Click, Pay me and Ozon payment organizations. The first company was Avrio Group, which registered the first Ozon electronic money system. The issuer of the electronic money system was the private joint-stock private bank «Turkiston». In August 2020 year, Inspired (E-Card) LLC and Click (Click) LLC registered their electronic money systems. The issuers were Universal battery and Agrobank battery, respectively. Currently, about 500 thousand wallets have been created in the Click system, more than 140 thousand in Ozon, and more than 100 thousand in Payme. It is important for consumers in Uzbekistan to know that virtual wallets in which electronic money is stored are mainly intended for those who do not have a bank card, but at the same time want to use electronic payments. However, the capabilities of such wallets are limited compared to classic plastic cards, and electronic wallets are not yet able to completely replace cards. You can use them not in all stores, gas stations, pharmacies or other trade and service enterprises, but only in those where contactless payment is accepted (for example, using a QR code). Also, it is not yet possible to withdraw cash from an ATM from an electronic wallet. In general, electronic money is a good alternative to conventional cards, the issuance of

which takes several days and requires a visit to the bank.

Perhaps, with the development of contactless technologies, phones will completely replace plastic cards. Which tool the consumer will use with an electronic wallet, a mobile application of a bank or a payment organization to which the card is attached will depend on the amenities and bonuses (in the form of cashback, special promotions and others) provided by market players. Nevertheless, the expansion of electronic circulation causes special attention to cybersecurity issues. According to the results of a survey of the international developer of antivirus software ESET, conducted in 2019 among IT directors of companies in Uzbekistan, it became known that 55% of companies in the country faced internal cyber threats and 72% with external ones.

Thus, spam and malicious software have become the most common cyber threats. Also, 18% of respondents reported that their companies suffered from accidental information leaks, and 10% from intentional ones. Entrepreneurs of Uzbekistan consider financial information to be the most significant: 75% of companies noted that it needs special protection from cyber threats, 48% allocate information about operational activities, 45% information about partners and customers, 25% personal data of employees. It should be noted that the most advanced technologies of the digital economy and electronic money will continue to appear and find their development in Uzbekistan. There are practically all conditions for this, both at the legislative and communication levels. Of course, with the chosen vector of development towards digitalization, the main emphasis should be placed on ensuring cybersecurity, creating capacities for data centers to store "big data" (Big Data) and ensure the smooth operation of computing equipment, and there is also a lot of work to be done to increase the education of the population to use IT-technology services.

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MECHANISM OF «VOLUNTARY» APPROACH TO THE REGULATION OF INTELLECTUAL PROPERTY

Abstract: *In the article, we argue that it is expedient to use not only administrative but also voluntary approach to the management of intellectual property, using the administrative approach, which is one of the scientific approaches of management in affirming the relationship between copyright and patent law subjects and the results of intellectual activity.*

Key words: *intellectual property, intellectual capital, intangible asset, patent, income, expense, property value, copyright, related rights, administrative, voluntary.*

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Introduction

Within the framework of the theory of property rights, the concept of "property" is usually interpreted as a set of rights that are distributed in different shares between different persons. Studying the organizational and legal basis of property, it is determined that it should be economically managed as an asset (both tangible and intangible), and also that it is an economic category that determines the indicator of socio-economic efficiency as a factor of production. In our republic, there are certain stages in the creation of organizational and economic mechanisms for regulating the intellectual property market in the republic, and in each period the issues of organizational, legal and economic protection of the use of intellectual property wealth are being improved.

As a result of the study, the author studied the features of the management of intellectual property in scientific, technical and industrial spheres in relation to the bundle of property rights, developed the subjective side of intellectual property relations, that is, the scheme for the distribution of powers between the participants in these relations.

The legal framework for intellectual property (IPO) objects is not always the same. The system of absolute rights sometimes does not cover the OIP, it includes creative results, for example, trade secrets (know-how). In the opinion of some scientists, a special system of absolute rights is applied to know-how. The expediency of approving the application of the administrative scientific approach to managing intellectual property in the regulation of intellectual property on the basis of an "arbitrary" approach in protecting the corresponding rights and distribution of powers between the subjects of copyright and patent rights has been substantiated (Table 1).

A trade secret (know-how) is an unprotected object. Information recognized as know-how is usually a trade secret and is not disclosed to third parties, in other words, the know-how has only a legal monopoly. If the author wants, he can open it "arbitrarily". In this case, depending on the method of transferring property rights, powers are distributed among the subjects.

The personal non-property rights of the author to an invention created in the course of fulfilling official duties or a job assignment shall remain with the author of the invention, and the exclusive rights to use the work of a service belong to the employer, unless otherwise provided by the agreement between the author and the employer. It is administratively established in the national legislation that, regardless of the contract with the employer, the author assigns

the right to use and receive remuneration in full after ten years from the date of disclosure of the work, and even earlier with the consent of the employer.

Although service inventions, utility models, and industrial designs belong to the employer, the "arbitrary" representation of the authorization for use will help to improve the system of interaction in the future of the enterprise / organization.

It is proposed to finance advanced innovations in the intellectual property market through the "collective contribution of people" to attract foreign investment, international organizations and entrepreneurs in the commercialization of information technology projects with a high sales flow.

The implementation of this scientific novelty in practice leads to the development of healthy competition, ensuring the formation of an intellectual property market and the development of a startup ecosystem, and, in turn, will create a Central Asian startup hub. The role of digital infrastructure is important in determining the growth of the national economy and the country's influence on the global world.

In the rapidly developing and modern world, raising funds via the Internet is becoming an alternative and promising scheme for financing projects. In particular, the mechanism for placing and financing projects in the field of information technology through a crowdfunding platform has an important place. This scheme provides young entrepreneurs and start-ups with the opportunity to attract investment and find sources of funding.

In recent years, the global crowdfunding market has been actively developing. In 2018, the total number of such platforms in the world reached 2948. Most of them have 1231 platforms in the European Union, 900 in the USA and 431 in Asia. In the CIS, crowdfunding projects are relatively active in Russia, Belarus and Kazakhstan.

Table 1. Administrative and arbitrary approach to the regulation of intellectual property objects*

Intellectual Property (IP)	Protected object	Registration (administrative and arbitrary)	Security document	Duration of absolute rights
Copyright	Works of literature, science and art	Not required	x	Throughout life and for 50 years after the date of death of the author (Based on Law No. 709 of August 20, 2021 Marked 70 years)
	Derivative and composite works		x	
	Computer programs	Mandatory	Certificate	
	Database			
Related rights	Performance, phonogram, broadcast	Not required	x	Production, broadcast for 50 years after the date of performance
	Production database		x	15 years after the date of development
	Publications		x	Within 25 years after publication
Patent Law	Inventions	Mandatory	Patent	20 years
	Utility models			10 years (extension up to 3 years)
	Industrial designs			15 years (extension up to 10 years)
The Right to Breeding Achievements	Plant varieties	Mandatory	Patent	30 years (35 years for selected species)
	Breeds of animals			30 years
IC Layout Rights	x	По желанию	Certificate	10 years
Trade secrets law (know-how).	x	Not required	x	Until the mystery is revealed
Personalization rights	Company name	Not required	x	Until the exclusion of legal entities from the unified state register

	Brand name and place of origin of goods	Mandatory	Certificate	10 years with the right to renew each innovation for 10 years
	trade secret	Not required		Unlimited
Developed by the author				

The market for advanced technologies, including artificial intelligence, blockchain, fifth generation mobile communications (5G), robotics, drones, genetic engineering, nanotechnology and solar photovoltaic systems, is ushering in a new era of digital economy and collaboration. 90% of these technologies belong to intellectual property. As you know, all over the world a new network in the field of production and services is being formed and is developing, which is called the "Information of an intellectual product" network.

Among such terms as “smart car”, “smart home”, “smart city”, the phrase “smart people” is also often found in the achievements of science. Consequently, the improvement of mechanisms for supporting projects initiated by smart people and organizations, the introduction of the results of scientific and technical developments into production is accelerated, and the creation and development of a sustainable chain of systems for the release of innovative products to the international market is ensured.

To date, not enough attention is paid to the role and importance of the use of intellectual property (OIP) in commercial organizations of Uzbekistan, in particular, its institutional foundations. In addition, existing sources are trying to understand using various approaches and methods, such as "intangible objects", "intellectual property", "intellectual capital". This creates additional complexities both economically and institutionally. On the basis of the study, a diagram of the relationship between the concepts of "intellectual property", "intangible assets" and "intellectual capital" has been developed. Comparison of intellectual property and fixed assets allowed us to determine the similarities and differences between IP and fixed assets (PF). The use of IP in the above areas allows you to increase the production capacity and production efficiency of the enterprise. The correct use of the IPO increases the income and profitability of the enterprise, as a result of which its value increases. In this chapter, the main criteria for the similarities and differences between intellectual property and fixed assets are developed.

There are a number of basic principles for assessing intellectual property: the principle of profitability, the principle of substitution (change), the principle of expectation, the principle of conformity, the principle of supply and demand, the principle of competition, principles that depend on the macroeconomic situation or the economic development of the region. Since the intellectual property object is presented as a commodity, it must have its own market value. At the same time, it is required to effectively use the institutional structures of the market for IP valuation services.

A methodology has been developed for the advantages of approaches to the assessment of intellectual property (IP) and intangible assets (IA) (Table 2).

Table 2. Preferred Approaches to Valuing Intellectual Property and Intangible Assets*

Types of intangible assets and intellectual property	**Selected approaches**		
	First	**Second**	**Third**
Patents and technologies	Profitable	Comparative (market)	Costly
Trade marks	Profitable	Comparative (market)	Costly
Objects of copyright	Profitable	Comparative (market)	Costly
Skilled workforce	Costly	Profitable	Comparative (market)
Providing information program management	Costly	Comparative (market)	Profitable
Software products	Profitable	Comparative (market)	Costly
Distribution (distribution) networks	Costly	Profitable	Comparative (market)
Basic deposits	Profitable	Comparative (market)	Profitable
Franchising rights	Profitable	Comparative (market)	Profitable

Corporate practices and procedures	Costly	Profitable	Comparative (market)
Copy rights	Profitable	Comparative (market)	Profitable
Developed by the author			

An assessment of intellectual property is necessary when an enterprise / organization is liquidated, when conducting a merger and acquisition, when submitting an official report to the court, when assessing damage caused as a result of a violation of property rights, when determining the right paid to authors, and if it is necessary when issuing and licensing rights intellectual property, and the valuation of intangible assets - when making contributions to the authorized capital of an enterprise / organization, making decisions on investing in an intangible asset, acquiring and selling property rights, valuing and acquiring a business, as well as for International Financial Reporting Standards.

The Commonwealth of Independent States (CIS), including Uzbekistan and a number of developed, developing and undeveloped countries are also members of the World Intellectual Property Organization (WIPO). WIPO acts as an international arbitration tribunal in the resolution of commercial disputes related to the protection of intellectual property.

Copyright and related rights, as well as international patent conventions, are fundamental to equal and fair relations between countries. Based on the analysis, it was determined that the intellectual property market of the Republic of Uzbekistan needs to be managed in total in accordance with 14 international agreements that are members of the World Intellectual Property Organization (WIPO), as well as treaties administered by WIPO, the International Organization for the Protection of New Varieties of Plants UPOV (International Union for the Protection of New Varieties of Plants, UPOV), the World Trade Organization (WTO) and the United Nations (UN).

Research on improving the institutional management of the intellectual property market has shown that in practice there is no state that would regulate or manage intellectual property on the basis of a single state body. In practice, 6.8% of the state resolves this issue through a specific ministry or organization. Improving the mechanism for regulating the intellectual property market in the economy is, first of all, state policy, and today the state is taking measures to improve the system for protecting intellectual property objects.

As you know, a common goal in developing a strategy in the field of intellectual property is in itself not enough; it is necessary to initially determine for what and for whom it is being developed. In this case, not only responsible employees will have to take part, but also other interested parties. Improving the legislation in this area, the issues of protecting personal intellectual property, bringing scientific achievements to each department and industry are raised.

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«ISJ Theoretical & Applied Science, USA» - Международный научный журнал зарегистрированный во Франции, и выходящий в электронном и печатном формате. **Препринт** журнала публикуется на сайте по мере поступления статей.

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1. Curriculum vitae (photo, passport details, education, career, scientific activities, achievements)
2. List of publications
3. The list of articles published in the scientific journal ISJ Theoretical & Applied Science
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Detailed information on the website http://www.t-science.org/Academ.html

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Presidium of the Academy

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3. Список статей опубликованных в научном журнале ISJ Theoretical & Applied Science
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Presidium of the Academy

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