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Section 1. Mathematic

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QUADRATURE A CIRCLE– A COSMOLOGICAL TASK AND A WAY TO SOLVE IT

Abstract. A method is given for solving the quadrature of a circle – a task of ancient Greek mathematics for constructing using a compass and a ruler without divisions. It is based on the principles of building a cosmological model of the Universe of Light. It has been established that the construction of a square, equal in area to a given circle, is a two-dimensional display of the metaphysical connection between the sphere of the Universe and hypercube, in volume, generated by it. Alternative formulas $S = \left(\dfrac{5}{4} R 2 \sin 45° \right)^2$ and $V = \left(\dfrac{5}{4} R 2 \sin 45° \right)^3$ are given to determine the area of a circle and the volume of a sphere by calculating their equal square and hypercube, respectively. These formulas are based on an analogy that can be traced between the quadrature of a circle and the trigonometric circle, in which trigonometric functions determine the relationship between the sides and the angle of a right triangle. It is this triangle, emanating from the center of the circle, which underlies the construction of the square.

Keywords: quadrature the circle, hypercube, pyramid of Cheops, cosmological model of the Universe of Light.

Introduction

As you known, in ancient Greece, along with philosophy, much attention was paid to mathematics. The main requirement in solving geometric tasks was the condition to use only compass and a ruler without divisions for constructions. However, over time, a number of tasks appeared, the solution of which was impossible under this condition. Among them, the most famous are the three classical tasks of ancient Greece mathematics: squaring a circle, doubling a cube, and dividing an angle into three equal parts. Since ancient times, many famous mathematicians have tried to solve them. Further, it was concluded that it is impossible to obtain a positive result without to use of additional devices.

Naturally, the desire to solve these tasks played a positive role. Many discoveries have been made. Nevertheless, it is unlikely that the main purpose the appearance of these tasks was to attract the human mind to improve the mathematical methods of condition and the emergence of new ideas in geometry and algebra. The need to comply with a given construction for solving these tasks indicates that their authors pursued a certain goal. It will become clear further, when we realize the metaphysical essence hidden in them,

indicating their cosmological significance. In this article the subject of consideration is the quadrature of a circle. This is the first step in solving the above three tasks of ancient Greek mathematics.

Material and methods

To solve this task, a cosmological model of the Universe was used, which is conceptually different from existing models. The principles of its construction are outlined by me in the 1st volume "The Universe of Light: two keys to the secrets of the Universe" [1]. Its modeling is based on a series of constructions using compass and ruler without divisions. A clear illustration of this method of construction is Figure 1. This became the basis for solving the task of quadrature a circle using the following principles applied in modeling the stress structure of the three-dimensional sphere of the Universe of Light:

1. Geometric constructions must be carried out with the help of a circle, which is a two-dimensional display of the sphere of the outflow energy of the primordial Light from a point charge of creation.

2. The formation of the structure of the tension of the Universe became possible due to the interaction of the sphere of the outflowing Light with the twelve spheres of its reflection. At the two-dimensional level of display, we are talking about the interaction on the circumference of a circle with the circumferences of six circles of its reflection. Therefore, when solving the task under consideration, it is necessary to use the principle of building on the relationship of a give circle with the circles of its mirror reflection.

If we follow the listed cosmological principles of creation, then it becomes clear why, to solve the quadrature of the circle, as well the other two tasks mentioned above, attention was focused on the use of a compass and ruler. Using the first tool, you can embody the idea of circle, and use a ruler to connect the intersection points of mirror-symmetrical circumferences, and thereby, with the help of straight-line elements, carry out the necessary constructions.

Modeling the process of emergence and formation of the structure of the static tension of the three-dimensional sphere of the Universe showed that the construction of geometric figures is based on number from 1 to 10. Those in the metaphysics of the construction of the Universe are 28 conventional units of the potential of creation, the esoteric sum of which is 10. It should also be noted the significance of the center of the sphere of the Universe as a point of creation, relative to which the formation of the structure of its tension took place. This is an important circumstance, which, when solving the task under consideration, requires construction relative to the center of the circle.

Two-dimensional constructions have sown that the interpenetration of the circumferences of the circle of the outflowing Light and six circles of its reflection leads to the appearance of the contours of the sections of six lenses located in circular symmetry relative to the center of creation. They are sources of formation in their focal planes of one-dimensional elements of tension (strings), and of them – two-dimensional figures that do not violate the symmetry and balance of the bipolar circular system of opposing forces of Light.

In terms of the sequence of formation of the structure of tension of the three-dimensional sphere of the Universe, the first figure on the two-dimensional display level is an equilateral triangle, which geometrically embodies the number 3. Two such tringles, having a common side, form a rhombus in the ray of opposing forces of Light (Fig. 1). Six equilateral triangles inside the circle of outflowing Light form a hexagon of tension.

During the transition to the three-dimensional level of perception, we are dealing with twelve rays emanating in spherical symmetry from the center of the Universe. This is a consequence of the synthesis of the sphere of the outflow of Light and the twelve spheres of its reflection. Double circles of the counter movement of the energy of Light in their lenses form a closed circular-spherical dynamic system of formation of the structure of tension of the sphere of the Universe, which is represented by the icosahedron, dodecahedron, hypercube, tetrahedron and octahedron.

It this sequence, these 3D solids optimize the tension space. A fragment this structure is shown in Figure 2.

Thus, taking into account the understanding of what two-dimensional figures these polyhedral are formed from, it can be argued that in the considered cosmological model of the Universe, as a whole, there are a circle, the number 3, a triangle, a square and cube. As you can see, these mathematical concepts are key words in defining the essence of the three ancient Greek tasks.

Quadrature the circle

This task is reduced to finding a way to construct a square, equal in area to a give circle, using a compass and a ruler without divisions. The key to its solution lies in recognizing, in addition to the above two principles of manifestation of the dual power of the primordial Light that created the Universe, the role of the number 10, which encompasses all arithmetic and harmonic proportions. With this in mind, let´s look at Figure. 3.a, which shows the circumferences of a given circle, increasing in size, and the lines of its two diameters, perpendicular to each other. Two circles of reflection are displayed on one of the semi-axes. Their centers are located at even levels, which correspond to principle of the completeness of the formation of a particular structure. The circumferences of these circles, passing through the center of manifestation intersect with the circumferences of the given circle.

The next step is connected with the construction of straight lines perpendicular to the considered semi axis. This is achieved by connecting the points of intersection of the circumferences of reflection circles with the circumferences of the given circle. As a result, we see that the circumferences of the last circle pass through the centers of the reflection circles. The construction of these lines obeys the principle of multiplicity 2. For example, for the first circle of reflection, the center of which is at the second level, the vertical line will run tangentially to the given circle of the first level of manifestation. In the second case, this ratio will be represented by a proportion of 4:2.

Now, following the third of the indicated principles of creation, we will construct 10 circles, which will reflect the consistent increase a given circle (Fig. 3.b). Next, we extend the horizontal and vertical axes of symmetry. Using the construction method described above, we will position the reflection circles relative to the given circle, placing their centers on four semi-axes. To do this, from each even level, we will carry out circular movements of the compass away from center of creation, limiting them to that circumference of a given circle that passes through the corresponding center of reflection. This allows you to build five perpendicular lines.
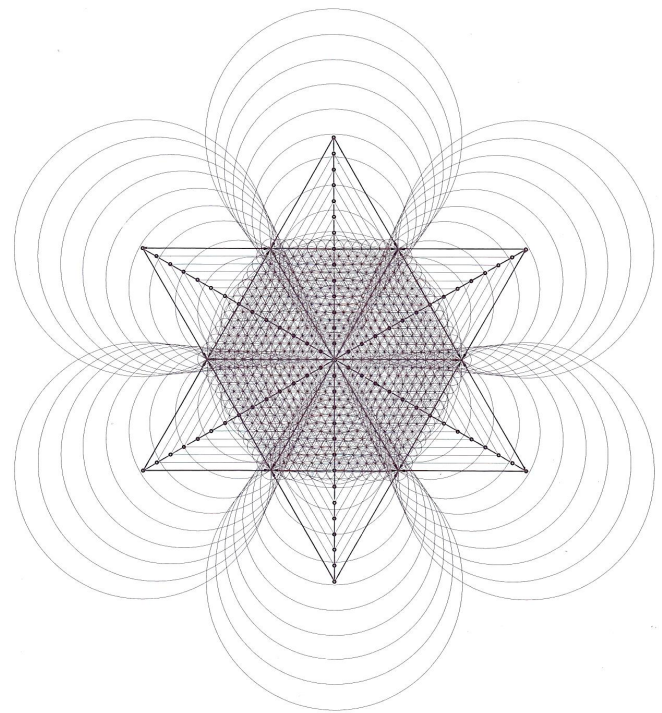
Figure 1. An example of building a structure of a three-dimensional sphere of the Universe of Light with a compass and ruler without (2D display) [1]

This matrix, built only with a compass and a ruler without divisions, is the embodiment of the three principles of creation mentioned above. It allows you to build a square equal in size to one of the areas bounded by the circumferences of a circle, increasing in size. As you can see, there are five of them, and they form scales from the corresponding

number of divisions relative to the center of the matrix construction on each semi-axis. Additionally, we will draw radius-vectors along the diagonals, which will denote four directions of movement in the rectangular coordinate system of the vertices of counter of the desired square until it reaches the required size that satisfies the condition of the task under consideration.

Figure 2. Circles of the counter motion of the energy of Light in the rays as a dynamic torsion force in the formation of the dodecahedron and hypercube of stress structure of the three-dimensional sphere of the Universe [1]

For each semi-axis. They, intersecting, form a square matrix, the area of which will consist of $100\,(10^2)$ cells.

This matrix, built only with a compass and a ruler without divisions, is the embodiment of the three principles of creation mentioned above. It allows you to build a square equal in size to one of the areas bounded by the circumferences of a circle, increasing in size. As you can see, there are five of them, and they form scales from the corresponding number of divisions relative to the center of the matrix construction on each semi-axis. Additionally, we will draw radius-

vectors along the diagonals, which will denote four directions of movement in the rectangular coordinate system of the vertices of counter of the desired square until it reaches the required size that satisfies the condition of the task under consideration.

To establish this moment, it is necessary to pay attention on the peculiarity of the passage of the circumferences of the circle through the cells of the matrix located on the radius-vectors. With the exception of the first A1B1C1D1 square, which consistent of 4 cells, here we are talking about the corner cells of the $A_2B_2C_2D_2 - A_5B_5C_5D_5$ squares. All squares tangentially surround the corresponding circumferences. Upon careful study, it becomes obvious that the circumference of a circle with a radius equal to 5 cells of the matrix, unlike other circumferences, diagonally crosses the vertices of the corner cells of the $A_4B_4C_4D_4$ square, belonging to a circle with a radius of 4 cells. As a result, the fifth circumference of the circle of the circle cuts of 8 parts from perimeter of the square of the fourth level, each of which is equal to the side of the matrix cell. This violates the integrity of this square.

Let's restore its shape by connecting the intersection points of the fifth circumference of the given circle and the radius-vectors. As a result we will get required square *EFGH*, the area of which will be equal to the area of a circle with a radius equal to 4 cells. This can be see if, to find the length of its side, apply the formula

$$x^2 = \pi R^2. \tag{1}$$

For a more accurate calculation, let's move on to a linear measurement taking into account that in the matrix under consideration, the cell side length is 8 mm. This corresponds to the initial radius of the circle, which will be 32 mm $(8 \cdot 4)$ when the quadrature of the circle is embodied. Thus, converting the formula in question to

$$x = \sqrt{\pi R} \approx 1.772R \tag{2}$$

and entering the specified radius value. We get the number 56.704, which corresponds to the length of the side of the *EFGH* square.

It is established that the side of the desired square is 56.704:64 = 0.886 of the length of the diameter of a circle of equal size. The resulting number practically coincides with the number 0.888 in the formula

$$S = \left(\frac{8}{9}d\right)^2 = (0.888d)^2, \qquad (3)$$

which was used in ancient Egypt when calculating the area of a circle. The Egyptians knew that it was equal to the area of a square with a side of $\frac{8}{9}d$. The legitimacy of using the considered method of constructing with a compass and a ruler in solving the task of quadrature a circle also become obvious if we take the radius of a circle as a unit of measurement. Then you need to use the equation

$$x^2 = \pi, \qquad (4)$$

which can be converted to

$$x = \sqrt{\pi}. \qquad (5)$$

In this case finding the length of the side of the square is reduced to finding the middle member of the proportion 32:1 = x: 1.772, where x = =32·1.772:1 = 56.704.

Thus, the side of the constructed square, equal in area to a circle represents the length π. Based on the foregoing, it follows that area of the considered square and circle, respectively, will be equal to 56.704^2 = 3215.34 and 3.14·32^2 = 3215.36. The obtained values testify to this.

Now it is necessary to remember that the construction of the matrix was carried out using reflection circles, the centers of which were located on the semi-axes of a given circle. If these semi-axes considered as the axes of a rectangular coordinate system, then the solution of the quadrature of the circle can be implemented using trigonometric functions. They define the relationship between the sides and angle of a right triangle. For this, let us turn to Figure 4, where the circle with radius-vector of 5 is a trigonometric circle. In the structure of the square matrix, in which this circle is inscribed, with respect to four radius-vectors, we have eight right-angled triangles with an angle equal 45°, in the center of the formation of an equal area square *EFGH*. Using the ex-

ample of a right-angled triangle *OGI*, it can be seen that sine function is determined by ratio of the opposite leg of the *GI*, equal to ½ of the side of the *GH* of the square under consideration, to the hypotenuse of the *OG*. For a given angle, the sine will be equal $\frac{\sqrt{2}}{2}$, which is equal to 0.707. It follows that when determining the length of the side of the square in the values of the trigonometric function under consideration, it is necessary to additionally use the fourth quarter, where it has a negative value.

The polarity of the sines corresponds to the metaphysics of the increase in the considered side of the square when two of its vertices move along the radius-vectors from the *OX* axis. Therefore, when determining its length, it is necessary to take into account the sum of the absolute values of two sines with opposite sines with opposite signs. This pattern extends to other sides of the square. If we consider the sides together, then their synchronous stretching with an increase in the square corresponds to the transverse distribution of the polar values of the sine.

This is observed when considering eight right triangles around the center of trigonometric circle, where in each of them the opposite leg and hypotenuse is connected by a sine function. As applied to the cosmological model of the Universe under consideration, the sine determines the ratio of spatial strings to radius-vectors of the dual force of Light during the formation of the crystal lattice of the hypercube. The construction of a square matrix by arranging reflection circles relative to a given circle, there is information about the method for constructing a hypercube of a three-dimensional sphere of the Universe.

As you known, in 1882 *F.* Lindeman proved that the number π is transcendental, that is, it does not satisfy any algebraic equation with integers. This becomes the basis for concluding that is impossible to solve the quadrature of a circle using a compass and a rule without divisions. However, the considered method of construction indicates the opposite.

Moreover, it becomes possible to substantiate a formula that makes it possible to determine the area of a circle by determining the area of a square equal of it, without involving the number π.
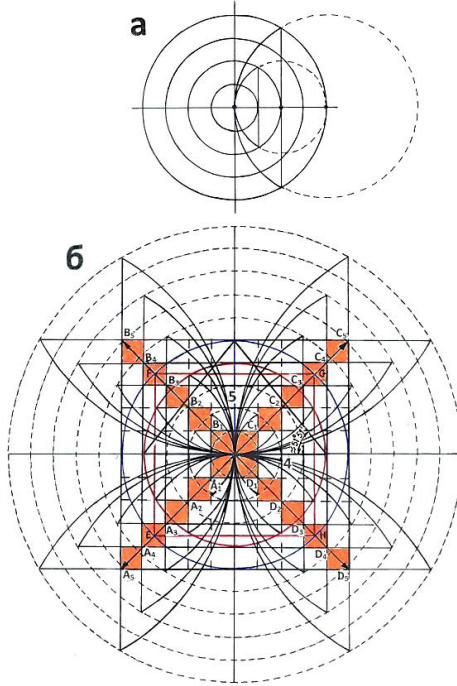

Figure 3. Construction of a square equal in area to a given circle

Recall that the main element of the construction in the matrix of the *EFGH* square, equal in size to a given circle was the circumference of a circle with a radius equal to 5 cells. The sought square, in contrast to the $A_4B_4C_4D_4$ square, intersect a circle with a radius equal to 4 cells. This indicates that the numbers 5 and 4 in the natural series of the Pythagorean decade are those steps that, in relation to each other, determine the moment of manifestation of the equal of the areas of a circle and a square in their joint increase from the center of creation. The ratio of these numbers can be expressed as a fraction $\frac{5}{4}$, where the numerator reflects the value of the unit radius-vector of the trigonometric circle, and the denominator is that part of it that determines the size of the circle, equal in size to the square, whose sides in relation to the hypotenuses of right triangles are lines connecting the polar values of the sines.

Thus, it can be stated that the indicated that indicated fraction conversion factor of a circle with any radius into a functional connection with a trigonometric circle to find its area through the line $2\sin 45° = \sqrt{2}$. In general, the formula for finding the area of a circle will look like

$$S = \left(\frac{5}{4}R2\sin 45°\right)^2 = \left(\frac{5}{4}R\sqrt{2}\right)^2. \qquad (6)$$

Let´s compare the calculation of the area of a circle with a radius 32 using this formula with its calculation using the formula

$$S = \pi R^2. \qquad (7)$$

In this first case $S = \left(\frac{5}{4}32 \cdot 1.414\right)^2 = 3199.03$, and in the second case – $S = 3.14 \cdot 32^2 = 3215.36$. In percentage terms, both values coincide by 99.5%, which indicates their practical equality.

It should be especially noted that the alternative formula for finding the area of a circle is a mathematical representation of the hidden geometry of the transition from the transcendental number π, which reflect the ratio of the circumference to the diameter, to the number expressing the length of the side of the square, which is equal in area to the given circle. This becomes apparent when multiplying the numbers $\left(\frac{5}{4}32 \cdot 1.414\right)$ in brackets of the consideration formula. As a result, we get the number 56.56, which practically corresponds of the length π (56.704) established above by the formula (2) when finding the side of the square, equal in size to this circle.

It should be recalled that the proposed formula for finding the area of a circle is directly related to the quadrature of the circle as one of the aspects of constructing the structure of the Universe by the sphere of the outflow of Light in conjunction with the twelve spheres of its reflection. At the two-dimensional level of displaying this process, the square and the circle are inextricably linked with each other, where the last figure in conjugation with the circles of reflection in relation to the first figure is the figure that generates it. This fundamentally distinguishes

the calculation of the area according to the formula under consideration from the calculation according to the formula (7). Nevertheless, the obtained values are close and those 0.5% by which they differ from each other lose their on the scale of the Universe.
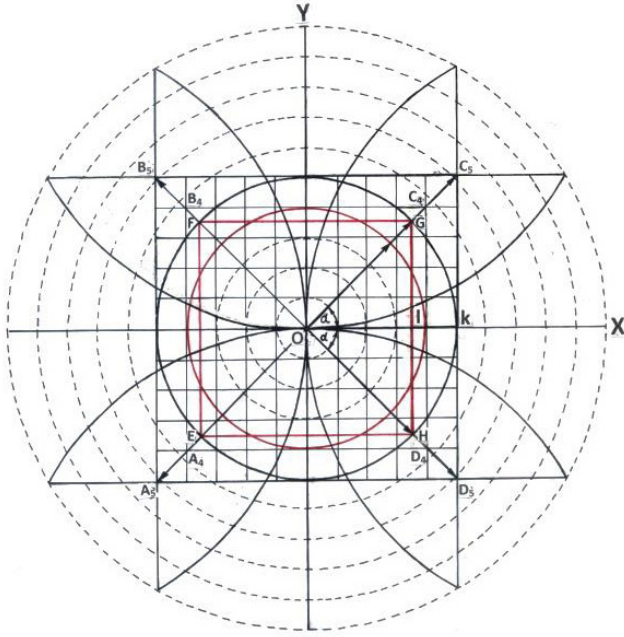
Figure 4. Quadrature the circle and its connection with the trigonometric circle

The reason for this coincidence is the presence in both formulas for calculating the area of a circle of its connection with the center. In one case, it is carried out through the number π, which establishes the ratio of the circumference to the diameter. In the second case, as already noted, we are dealing with the possibility of transferring any circle into a functional connection with a trigonometric circle, which allows us to find its area by the value of $2\sin 45°$ by calculating the area of a square equal to it.

The noted connection of a circle and a square with their common center of origin corresponds to one of the metaphysical model of the universe of Light. When modeling, it was found that inside the three-dimensional sphere of the Universe there are five regular polyhedral, among which the cubic form is represented by an octal hypercube (Fig. 2). This polyhedron is the main volumetric body of the

structure of tension, which ensures the stability and strength of the luminous frame of the Universe.

The geometric method applied above made it possible not only to construct a square matrix as the main tool in solving the task of quadrature a circle, but also to come to the understanding that it identifies one of the three planes perpendicular to each other. It, passing through the center of the Universe, divides the hypercube in half. The emergence of f square matrix is similar to the formation of a hypercube, which, like other polyhedral, arises as a result of the interaction of the sphere of outflow Light with the twelve spheres of its reflection.

In this regard, the question arises of the possibility of converting the formula (6) in the formula

$$V = \left(\frac{5}{4} R 2 \sin 45°\right)^3 \qquad (8)$$

to find the volume of a sphere by establishing the volume of an equal-sized hypercube with an edge equal in length to the side of an equal-sized square $EFRGH$. According to this formula we obtain the volume of the sphere equal to $\left(\frac{5}{4} \cdot 32 \cdot 1.414\right)^3 = 180937.34$, and for the hypercube it will be equal to $56.704^3 = 182322.84$. The coincidence of the obtained is 99.2%, which indicates their practical equality.

Now let´s find out which of the matrix circumference in figure 4 is a one-dimensional mapping of a sphere equal in value to a hypercube. This is the circumference of trigonometric circle, since its radius-vector OG, which is the hypotenuse of a right triangle OGI, is equal to 5 cells of the matrix, which is equal 40 mm in a linear measure. It is this number $\frac{5}{4} \cdot 32 = 40$ that is obtained by applying the coefficient $\frac{5}{4}$ to the radius of the circle when translating in into a functional connection with the trigonometric circle in the formula (6).

A different situation arises when using a radius 32 mm in the case of calculating the volume of a sphere using the traditional formula

$$V = \frac{4}{3} \pi R^3. \qquad (9)$$

Then we get a volume equal $\frac{4}{3} \cdot 3.14 \cdot 32^3 = 137188.69$, which is $\approx 25\%$ less than the volume of the sphere calculated by the formula (8). The reason for this difference lies in different nature of the formation of the compared spheres hidden in the formulas for calculating their volumes. In the formula where the trigonometric function $2sin45°$ is present, the sphere does not exist on its reflection. A two-dimensional analogue of its manifestation in the form of a three-dimensional sphere that generates the bodies of polyhedral is the method of constructing a square matrix. In it, the trigonometric circle acquires a metaphysical aspect, reflecting at the two-dimensional level of perception the connection between the sphere of the Universe and the structure of the octal hypercube generated by it.

If we argue from position of three-dimensional bodies, then the formula (9) for calculating the volume of a ball, in contrast to the formula (7) for finding the area of a circle, does not reflect its connection with the center, in this case it exist by itself as a material body, which does not generate bodies of polyhedral. The essence of the discrepancy lies in the justification of this formula by Archimedes. This thinker, in his reasoning regarding the method of finding the volume of a ball, proceeded from the fact that half of the ball can be reflected using a cylinder and a cone. He came to the conclusion that if the volume of the cone is subtracted from the volume of the cylinder, you can get the volume of half the ball

$$\left(\frac{1}{2}V = \pi R^3 - \frac{1}{3}\pi R^3 \right). \qquad (10)$$

Then the above formula will be for calculating its total volume. Thus, this formula reflects the determination of the volume of a ball by establishing the difference between the volumes of a cylinder and a cone, the formulas of which like fore a ball, are applicable to materialized three-dimensional bodies.

Concluding this article, it is necessary to pay attention to one important circumstance that concerns the numbers 5 and 4. They played a key role in constructing square equal in area to a given circle, using a compass and a ruler. As is known, these numbers determine the length of legs of a right-angled triangle, which underlies the contour of the vertical section of the Great Pyramid of Cheops. They, respectively, reflect the ratio between the height and $\frac{1}{2}$ of the base of the pyramid. This is shown in (Fig. 3b), where the location of its contour ideally matches the purpose of the construction. This confirms the existing opinion about this pyramid as an example of a true quadrature of a circle.

Conclusions:

1. Solving the task of quadrature a circle using the principles of constructing the structure of a three-dimensional sphere of the Universe made it possible not only to obtain a positive result, but also to come to an understanding of its cosmological significance.

2. The construction of a square equal in area to a given circle is a two-dimensional representation of the formation of an octal hypercube – one of the polyhedral of the structure of tension of the sphere of the Universe.

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Section 2. Medical science

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MODERN METHODS OF TREATMENT OF ANEMIC SYNDROME IN CHRONIC PYELONEPHRITIS IN CHILDREN

Abstract. Regardless of the etiology, any chronic kidney disease comes to the final histological point – the "last stage kidney" – non-functioning, sclerosed glomeruli, atrophied tubules, interstitial fibrosis. Purpose of the work: to assess the effect of anemia on the course of chronic pyelonephritis in children and the effectiveness of the drug "Askozhel". All children are divided into two groups: group 1 – chronic primary pyelonephritis, group 2 – chronic secondary non-obstructive pyelonephritis. To assess the effect of anemia on the pathological process in the kidneys, both groups were divided into subgroups: subgroup 1 – children with mild anemia (hemoglobin level <90 g/l), subgroup 2 – children with moderate anemia (hemoglobin level 89–70 g/l). Results and discussion. The effectiveness of the inclusion of the drug "Askozhel" in patients with various forms of CP, was expressed not only in the positive dynamics of clinical symptoms, but also in the improvement of the studied parameters of the body's blood, had significant advantages over the traditional method of treatment in the most significant parameters. Conclusions. The use of the drug "Askozhel" in CP is the most acceptable method of therapy.

Keywords: nephrogenic anemia, endogenous creatinine clearance, chronic pyelonephritis, "Askozhel".

Regardless of the etiology, any chronic kidney disease comes to the final histological point – the "last stage kidney" – non-functioning, sclerosed glomeruli, atrophied tubules, fibrosis of the interstitium [1; 2; 3]. In this case, the steady progression of the pathological process is the result of the emergence of a self-sustaining vicious circle of fibrosis, which was triggered by the action of the first damaging factor [4].

Interstitial damage leads to increased pressure in the capillaries of the glomeruli and / or to an increase in blood volume in the capillaries, which leads to hypertrophy of the glomeruli, damage to podocytes and overproduction of the extracellular matrix. Interstitial fibrosis induces tubular ruptures, which lead to tubular destruction and the formation of non-functioning "atubular" glomeruli [5].

In addition, interstitial fibrosis leads to a decrease in the number of peritubular capillaries, which also contributes to the destruction of the tubules. It has been proven that even after primary sclerosis, the pathological process in damaged glomeruli does not stop – pathological cell transformation continues in them [6; 7].

Even more important, the issues of therapy of early stages of chronic renal failure acquire in the light of the possibility of regression of the process.

Although the terminal stage of chronic renal failure is irreversible, there is a possibility of regression of the pathological process in the kidneys. This theory is supported by the data of studies of experimental models of kidney damage in animals [8; 9].

Purpose of the work: to assess the effect of anemia on the course of chronic pyelonephritis in children and the effectiveness of the drug "Askozhel".

Materials and methods of research. Among the patients observed in the Samarkand region in the regional multidisciplinary scientific center (chief physician – M. K. Azizov), for the period from 2019 to 2020, 57 children with an established diagnosis of CP were selected. the drug in the complex treatment of CP, the patients were divided into 2 groups. The first group consisted of 27 patients with CP (10 of them with ChPP and 17 with ChSNObP) receiving traditional therapy. The second group consisted of 30 children (including 10 children with ChPP and 20 patients with ChSNObP) who received the drug "Askozhel" against the background of traditional treatment.

An objective examination in all patients revealed the well-known general and renal symptoms of the disease, characteristic of each form of the disease, the dynamics of which, depending on the methods of treatment, is presented in table 1.

Table 1. – The dynamics of the elimination of clinical symptoms in children with ChPP and ChSNObP on the background of the use of the drug "Askozhel" (in days, M + m)

Symptoms	Conventional therapy		Patients who received «Askozhel»	
	with ChPP (n=10)	with ChSNObP (n=17)	with ChPP (n=10)	ChSNObP (n=20)
1	*2*	*3*	*4*	*5*
1. Common symptoms				
General state	8.1±0.2	9.1±0.23	5.2±0.28 P<0.001	6.1±0.15 P<0.001
Body temperature	4.2±0.24	5.2±0.14	2.3±0.31 P<0.001	3.4± 0.42 P<0.001
Pallor of the skin and mucous membranes	9.18±0.34	10.1±0.52	6.2±0.33 P<0.001	7.1±0.46 P<0.001

1	2	3	4	5
Nausea and vomiting	7.0±0.21	8.2±0.42	5.2±0.45 P<0.02	6.2±0.55 P<0.05
Weakness	9.1±0.58	10.3±0.64	6.3±0.62 P<0.05	7.2±0.35 P<0.001
Improved appetite	8.15±0.41	9.2±0.48	5.3±0.46 P<0.001	6.3±0.62 P<0.001
2. Renal symptoms				
Pain and discomfort in the lumbar region	8.2±0.71	9.2±0.41	5.13±0.42 P<0.001	6.2±0.57 P<0.001
Dysuric phenomena	8.1±0.33	9.3±0.48	5.2±0.74 P<0.02	6.3±0.36 P<0.001
Sanitation of urine	9.3±0.33	10.1±0.43	6.3±0.31 P<0.001	7.2±0.44 P<0.001
«+» Symptom of Pasternatsky's tingling	8.2±0.73	9.2±0.45	5.1±0.62 P<0.05	6.3±0.41 P<0.001
Average hospital stay	15.1±0.58	16.2±0.55	12.2±0.6 P<0.001	13.2±0.7 P<0.05

Note: P-certainty versus conventional therapy

As can be seen from the table, under the influence of the drug "Askozhel" in patients with ChPP, along with an improvement in the general condition by 5.2 ± 0.28 (P <0.001) day, a decrease in the pallor of the skin by 6.2 ± 0.33 (P < 0.001) day after the start of treatment, which is 2 times faster in comparison with the traditional group: by 8.1 ± 0.2, by 4.2 ± 0.24, by 9.18 ± 0.34 days, respectively. In case of chronic renal failure, ferrotherapy with the drug "Askozhel" for 5–6 days contributed to a significant acceleration of the normalization of some renal signs of the disease: pain and discomfort in the lumbar region by 5.13 ± 0.42 (P <0.001), dysuric phenomena by 5, 2 ± 0.74 (P <0.02) days from the start of treatment in comparison with the control group: by 8.2 ± 0.71, 8.1 ± 0.33 days, respectively.

Consequently, "Askozhel" in the treatment of chronic renal failure in children, along with an improvement in the dynamics of general symptoms, also effectively affects the renal signs of the disease, which in general leads to a reduction in the treatment time of patients to 12.2 ± 0.6 (P <0.001) days.

It should be noted that in ChSNObP, as in the case of a comparative analysis conducted in patients with chronic renal failure, the drug "Askozhel" was more effective in all symptoms of the disease.

A comparative analysis of the dynamics of the clinical picture (table 1) testifies to the undoubted advantage of this drug, in terms of the elimination of both general and renal symptoms of the disease, and at the same time having advantages in some analyzed clinical parameters.

Comparative evaluation of laboratory studies carried out after treatment in children with CP, depending on the method of treatment, revealed various changes in iron parameters (tables 2, 3). Iron is an essential trace element, the main component of the synthesis of hemoglobin and myoglobin, maintains the prooxidant-antioxidant balance, catalyzes the processes of electron transport, is part of more than 100 enzymes, ensuring the vital activity of all cells in the body. In this regard, it is quite obvious that Fe deficiency can play an important role in the high susceptibility of children to inflammatory diseases.

Serum ferritin is the main Fe depot in the body, therefore it is considered the main marker of the Fe reserve fund. Most of the ferritin is concentrated in cells in the liver, spleen, and bone marrow, from where Fe can be mobilized and distributed through plasma transferrin depending on the body's needs. The small amount of ferritin found in circulation is in direct correlation with total body Fe stores and can be detected in serum. A serum ferritin level <12 µg/L reflects the depletion of the tissue depot of Fe and indicates iron deficiency, and in combination with hematological criteria for anemia, confirms the presence of IDA.

Table 2. – Dynamics of iron indices in patients with chronic renal failure, depending on the method of treatment (M ± m)

Indicators	Healthy	Patients with chronic primary pyelonephritis		
		before treatment (n=57)	after treatment	
			I group (n=10)	II group (n=17)
Hemoglobin, g/l	115.14±2.94	98.4 ± 7.1 г/л	99.7±1.70 P_1>0.1	108.9±2.79 P_1<0.01. P_2<0.05
Serum iron, µmol/l	14.6 ± 7.3	10.8 ± 6.3	12.37±0.02 P_1>0.1	13.9±0.1 P_1<0.02
Ferritin, mcg/l	238.2 ± 206.5	202.5 ± 199.2	210.4±1.13 P_1>0.1	225.7±190.3 P_1<0.01. P_2<0.001
Transferrin, mg/dl	215.5 ± 49.1	188.2 ± 37.5	192.6±28.2 P_1>0.1	200.9±32.6 P_1<0.01

Note: P – significance of the difference between the parameters of healthy people and in children with chronic pyelonephritis. P_1 – significance of the difference between the parameters before and after treatment. P_2 – reliability of the difference between the traditional and the group of children who received the drug "Askozhel"

Table 3. – Dynamics of iron indices in patients with ChSNObP, depending on the method of treatment (M ± m)

Indicators	Healthy	Patients with chronic secondary non-obstructive pyelonephritis		
		before treatment (n=57)	after treatment	
			I group (n=10)	II group (n=20)
Hemoglobin, g/l	115.14±2.94	98.4 ± 7.1	99.1±1.77 P_1>0.1	105.5±2.04 P_1<0.01. P_2<0.01
Serum iron, µmol/l	14.6 ± 7.3	10.8 ± 6.3	11.97±0.02 P_1>0.1	13.1±0.5 P_1<0.02
Ferritin, mcg/l	238.2± 206.5	202.5± 199.2	205.11±1.06 P_1>0.1	220.04±198.3 P_1<0.001. P_2<0.001
Transferrin, mg/dl	215.5 ± 49.1	188.2± 37.5	190.5±25.6 P_1>0.1	197.7±30.2 P_1<0.05

Note: P – significance of the difference between the parameters of healthy people and in children with chronic pyelonephritis. P1 – significance of the difference between the parameters before and after treatment. P2 – reliability of the difference between the traditional and the group of children who received the drug "Askozhel"

Thus, in children with CP who received conventional therapy before discharge from the hospital, the level of serum iron content slightly increased and amounted to 12.37 ± 0.02 and 11.97 ± 0.02

μmol/L ($P_1 > 0.1$), this indicator in patients with the use of Askozhel was significantly higher in both forms of pyelonephritis and significantly differed from the indicators of group 1 (13.9 ± 0.1 P_1 < 0.05, P_2 < 0.05 in children with ChPP and 13.1 ± 0.5 μmol/l, P_1 < 0.01, P_2 < 0.01 in children with ChSNObP, significantly approaching the indicators of healthy children.

When compared with the healthy group, the ferritin content in patients of group 2 with ChPP was closer to the standard values (225.7 ± 190.3 μg/L versus 238.2 ± 206.5 μg/L) than in ChSNObP (220.04 ± 198.3 μg/L versus 238.2 ± 206.5 μg/L) and significantly differed from the indicators of group 1 (210.4 ± 1.13 μg/L with ChPP and 205.11 ± ± 1.06 μg/L with ChSNObP, P < 0.001).

Transferrin is an acidic glycoprotein consisting of a single chain, on which there are 2 sites that actively bind Fe. The synthesis of transferrin occurs in accordance with the content of Fe in the body: with IDS, the transcription of transferrin messenger RNA (mRNA) increases, and with normalization of the Fe level, it decreases. Most of the Fe-transferrin is obtained from hemoglobin during the destruction of old erythrocytes by macrophages. The latter, with the help of heme oxygenase, release Fe from the protoporphyrin ring. Serum transferrin is a source of Fe for all somatic cells. However, Fe is so tightly bound to transferrin that there is a specific mechanism for the entry of the Fe molecule directly into the cell. The transfer of Fe from transferrin to the cell is carried out by the transferrin receptor. Only erythroblasts and reticulocytes, but not adult erythrocytes, can take Fe from transferrin. Binding of transferrin to the receptor is a time, temperature and energy dependent process.

When compared with the group of healthy people, the content of transferrin in patients of group 2 with ChPP was 200.9 ± 32.6 mg/dL versus 215.5 ± ± 49.1 mg/dL, (P_1 < 0.02, P_2 < 0.02), with ChSNObP, it approached the indicators of healthy people (197.7 ± ± 30.2 mg/dl versus 215.5 ± 49.1 mg/dl) and sig-

nificantly differed (P_1 < 0.02, P_2 < 0.05) from indicators of group 1 (192.6 ± 28.2 mg/dL, P_1 > 0.1 in children with ChPP and 190.5 ± 25.6 mg/dL, P_1 > 0.1 in patients with ChSNObP), since against the background of anemia in CP a large number of drugs further depressed the hematopoietic system.

Summarizing the above, it can be noted that the drug "Askozhel" has a positive effect on the state of the circulatory system in patients with CP, increasing serum iron and normalizing the level of transferrin, especially the content of ferritin, while increasing the amount of hemoglobin.

The effectiveness of the inclusion of the drug "Askozhel" in patients with various forms of CP, was expressed not only in the positive dynamics of clinical symptoms, but also in improving the studied parameters of the blood of the body, had significant advantages over the traditional method of treatment in the most significant parameters.

In general, our data show that the use of the drug "Askozhel" in the period of exacerbation of CP promotes a faster transition to the stage of remission. The proposed new approach in the treatment of CP, in our opinion, is of great interest not only for the above properties, but also because it is available for almost any hospital and polyclinic.

Conclusions

1. Anemic syndrome accompanies the active period of CP in 20% of children. Its prevalence is steadily increasing in parallel with the degradation of renal excretory function from 17.0% to 36.4%.

2. The main predictors of anemia in CP are the age of 4–7 years, especially against the background of connective tissue diseases, the identification of concomitant somatic pathology.

3. The use of the drug "Askozhel" in CP is the most acceptable method of therapy. This method contributes to the earlier elimination of the clinical symptoms of the disease, leads to restoration, not only of iron indicators, but also to an improvement in the state of renal function, shortens the period of hospital stay and lengthens the period of remission.

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Section 3. Pedagogy

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PEDAGOGICAL-PSYCHOLOGICAL FEATURES OF THE DEVELOPMENT OF NON-STANDARD WAY OF THINKING IN STUDENTS

Abstract. Today's educators need to take a creative approach to their work, using effective means to absorb education at the intersection of purposeful individual and group interests in non-standard situations. Of course, this process is based on the demonstration of creative abilities from each educator. This article describes the pedagogical and psychological features of the development of non-standard thinking in students.

Keywords: education, knowledge, thinking, creativity, creative thinking, non-standard thinking, student, development, creativity.

Today, as in any other era, improving the quality of education, changing the worldview of students is a modern requirement, and one of the priorities is to direct people in society, especially young people, to deep thinking. It should be noted that this process is effective only when it is built on the basis of fundamental education, formed on the basis of the family and the educational institution, and combined with the educational process. At the same time, it is necessary to establish a link between the object and the subject of education and upbringing, so that this process is based on a complex approach to pedagogical and psychological factors.

The problem of creativity is one of the most studied issues in pedagogical and psychological sources, the emergence and manifestation of which depends on individual characteristics and real conditions.

The issue of creativity was first studied in 1959 by the American psychologist J. P. Guilford, and he introduced the term creativity into scientific circulation. In his view, creativity refers to a specific type of thinking and coordinates the solution of a problem to a single correct solution, providing several alternative approaches to the problem [2, 12]. Indeed, as the creative researcher J. P. Guilford points out, while at the same time leading to the emergence of a non-standard approach to an existing problem from different perspectives, its solution provides rationality in the process of thinking operations i.e. analysis and synthesis.

According to the researcher A. G. Asmolov, the implementation of scientific research and design work creates active imagination in students, creating the fantasy of a non-standard approach [5, 107]. Of course, this process leads to the emergence of convergent and divergent components of the non-standard approach in students. In this regard, the researcher S. A. Mednik drew attention to the fact that the non-standard creative process is associated with cognitive activity, advancing scientific views on the existence of convergent and divergent components.

According to S. A. Mednik, the process will be more creative if the approaches to solving the existing problem are formed on the basis of several alternative options based on scientific and practical hypotheses. According to his scientific approach, the

process is determined not by its specificity, but by the final stage of mental synthesis and the breadth of the field of associations [8]. From this point of view, creativity requires purposeful and effective use of its elements, without excluding convergent thinking.

In our view, creative individuals move towards a new solution and a combination of scientific hypotheses based on divergent thinking, while maintaining the association of the associative process with the reality that occurred earlier in convergent thinking.

If we define the concept of creativity from a psychological point of view, creativity is a non-standard thinking ability inherent in the individual, a combination of principles based on creativity, as well as the ability to think in accordance with subjective factors in the system of objective perception of reality.

Based on this approach, we can say that the development of non-standard thinking in students is a priority of modern education, where the transformation of knowledge, skills and abilities from teacher to student on the basis of reproductive factors the development of the ability to formulate an algorithm for independently determining educational issues is required.

Asking what tasks are on the agenda of today's education system, it is necessary to focus on the formation of mobile aspects of non-standard creative abilities that the learner must learn and master throughout life, as well as self-formation.

Of course, such a process is interpreted in pedagogy against the background of problematic situations of creativity, the formation of non-standard abilities associated with solving a number of problems in a changing educational environment, formed on the basis of decision-making competence in different situations.

Researcher M. Choshanov's scientific comments in this regard are noteworthy, and in his view, non-standard creative ability in a person includes the following competencies: first, the ability to express the interests of the person based on the existing needs; second, the ability to find alternative sources of infor-

mation necessary for life and work; third, the ability to make decisions aimed at improving the content of the educational process in different pedagogical situations; fourth, the ability to solve a real problem, find original solutions and adjust the situation to their advantage [6].

Of course, this process reflects the content of education based on the ideas of the development of the student's personality and coordinates its tasks and conditions. At the same time, special attention should be paid to the organization of education, it is desirable that the activities of teacher-student cooperation be carried out within the zone of proximal development. This process certainly shapes the non-standard thinking ability of students and is a factor in the development of cognitive activity.

While the researcher T. A. Rebecca argues that creativity defines and describes the essence of the non-standard approach [2], according to N. M. Gnatko's scientific approach, the process of non-standard thinking in creativity is recognized as the result of subjective factors [1]. From this point of view, the pedagogical and psychological features of the development of non-standard thinking in students are the mechanism of its development and individual ability, considering creativity as a function of the problem situation and as a social phenomenon.

According to the researcher ES Rapatsevich, non-standard in creative thinking is directly related to the personality and activity of man. is recognized as a work of art creation and a new approach. Non-standardization in the pedagogical field is the introduction of new methods, forms, principles, technology and pedagogical mechanisms into the process of education and upbringing [4].

From the above scientific point of view, we think it is appropriate to pay attention to the following when introducing students to non-standard creative thinking: to look at non-standard thinking as a product of creativity and make the educational motivational factors that develop it a key component of the professional activity of every teacher;

recognition of a non-standard approach as a new approach and problem-solving based on creativity, as well as the implementation of psychological support in the framework of psychological technology for the emergence of creative activity; the study of non-standard thinking in creativity as a special feature of the individual and evaluated as a factor of subjective-personal novelty and important scientific and social value.

As the researcher E. Picard admits, non-standard thinking in creativity is a new approach of the subject of activity, a reflection of the processes that are important in the socio-cultural context. This creates a source of new opportunities for individuals and groups, as well as individual and social entities [9].

In the scientific views of the researcher Ya. A. Ponomarev, non-standard thinking is recognized as a factor of an individual's internal resources and creative potential, and emphasizes that it is a holistic mental process [3]. From this point of view, it is important to observe the organic connection, divergent and convergent thinking process, creative aspects and all the uncertainties and complexities that occur in the manifestation of non-standard thinking in the student's personality. This process requires a comprehensive approach to education and is studied in direct connection with the laws of general creativity. Because a state where thinking about what other people say, not having the courage to express oneself, an inner fear of making a mistake, always feeling the danger of being criticized when expressing a new idea, or a dogmatic and conservative approach that destroys the non-standard creative process and leads

to the disappearance of ideas relevant to the life of society under the influence of a position of uncertainty and abstraction. This increases the rigidity of thinking of young people and develops their intellectual dependence. It will also increase the stagnation of industries that require an innovative approach, while maintaining dependence on imports of new ideas and innovative projects, leading to a further increase in the need for young people with creative abilities for the state and society.

In general, it is possible to recommend a complex order, defining the pedagogical and psychological features of the development of non-standard thinking in students with the following criteria: first, originality in the process of thinking and analysis; second, the continuity of content and logic in the stated opinion; the third is to ensure the transformation of rigidity and dogmatic approach to creativity; fourth, the focus is on overcoming stereotypical factors and traditional constraints; fifth, the balance is ensured and based on a rational approach; Sixth, the dynamics of change of the source material; seventh, to express the expressed non-standard ideas in a concentrated form; eighth, the combination of theoretical and practical elements in new ideas.

In conclusion, in fact, the creative components of the student are not only a criterion for non-standard thinking, but also a criterion that determines the level of fundamental knowledge. Today, in the world community, the knowledge "transferred" to the learner on the basis of a non-standard approach is becoming the only source of sustainable competitive advantage in all areas.

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Section 4. Political science

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PROBLEMS OF GENERAL SYSTEMS THEORY

Abstract. The system approach was the adequate answer to a call to a classical science. Thanks to interdisciplinary character of system researches in science development there was a tendency of a universalisation of knowledge that has helped to lower duplication of theories, it is more rational to distribute forces of scientists and to concentrate resources on priority directions. The category "system" has proved the operational and high potential. The system methodology has been recognised by the effective research tool which can be applied as in natural, technical, and in humanitarian sciences.

Keywords: the system analysis, system, environment, "inputs", "exits", «a black box», "feedback", requirements, support, cybernetic model of political system, political system,

Since the mid-twentieth century, systems research and the problems of general systems theory have become increasingly important in scientific knowledge. Three reasons have led to this result. First, most of the traditional scientific disciplines, such as biology, psychology, sociology, have significantly transformed their subjects, which, as a rule, are a set of interrelated elements, representing holistic entities (systems and structures). Secondly, technological progress in the mid-twentieth century and the wide introduction of automation principles to technology have led to the fact that the main objects of modern technical design are control systems (large systems), which by their structure and the process of their creation are typical patterns of system objects (it should be noted in this connection the appearance of a whole complex of new disciplines, such as cybernetics, information theory, bionics, etc., whose main tasks consist in the study of systems of different types). Thirdly, the realization of the fact that the tasks of systems analysis were widely introduced in modern science led to the emergence of a number of generalized concepts that sought to construct a general theory of systems, a systems science, a methodology of systems analysis.

While the speech of Ludwig von Bertalanffy dedicated to these problems at the IX International Philosophical Congress in 1937 was actually overlooked, twenty years later, in his speech at the XII International Philosophical Congress, he was able to summarize certain results of developing a general theory of systems in its various variants.

It is expedient to distinguish three main stages in the development of the problems of the general theory of systems:

1) Immediate predecessors (late nineteenth-first third of the twentieth century), of which various variants of organismic concepts, the theory of integrative levels (G. Brown, R. Sellars) and the

universal organizational science of A. Bogdanov are of the greatest interest.

2) L. von Bertalanffy's general systems theory (40–50-ies of the XX century), which is characterised by a clearly expressed interest in the general worldview aspects of the general systems theory, by its focus on biology, and by the isomorphism of laws, which forms the basis of the concept.

3) the modern stage of development represented by a number of competing variants of the system-wide approach (L. von Bertalanffy. M. Mesarovich, R. Akof, W. Ross Ashby, L. Zadeh, O. Lange, A. I. Uemov). While agreeing in their understanding of the general tasks of the theory of systems, the above authors differ significantly in their characterization of the ways of constructing this concept.

It was only after World War II that we can actually talk about the organization of the systems movement. The first step in this direction was the creation in 1954 in the United States of the Society for General Systems Research that emerged largely as a result of the scientific and organizational activities of L. von Bertalanffy. During his theoretical struggle against mechanistic and vitalistic ideas at the end of 20-ies and beginning of 30-ies, L.von Bertalanffy formulated a number of principles for studying living objects as open systems, i.e. as complete sets of interconnected elements which are in the process of constant exchange of substance and energy with the environment. In the 1930s he generalized this concept, formulating the task of building a general systems theory – an interdisciplinary scientific field, aimed at developing principles for the study of systems of any type and any complexity. However, the intellectual climate of the period was not conducive to a favourable reception of these ideas, and Bertalanffy postponed the publication of material on general systems theory until better times.

The post-war period brought with it important changes in the theoretical and methodological orientation of scientific research. The emergence of cybernetics and the whole complex of related sciences significantly increased the value and generalisation in science. Bertalanffy's first publications on general systems theory were met with great interest from the scientific world.

In this environment, the Society for Research in General Systems Theory was established at the annual meeting of the American Association for Advancement of Science in 1954. Its founding members were L. von Bertalanffy, the famous philosopher, psychologist and expert in mathematical biophysics A. Rapoport, the economist C. Boulding and the biologist R. Gerard. The Society set itself the following objectives: 1) to explore isomorphisms of concepts, laws and models in different fields of science in order to transfer them from one discipline to another; 2) to contribute to building adequate theoretical models for those fields of science where they do not exist; 3) to minimise duplication of theoretical research in different scientific fields; 4) to promote the unity of science by establishing links between specialists in different sciences.

Since 1956, the Society for General Systems Research has been publishing a yearbook called General System, edited by L. von Bertalanffy and A. Rapoport. The yearbook publishes studies devoted both to the analysis of the principles and methods of systems approach, and to specific developments in applying systems theory to the problems of biology, sociology, cybernetics, psychology, and international relations. In the 50's numerous research groups of systems emerged. Such groups pursued purely practical goals, in particular, solving specific problems of systems engineering. In the USA the most powerful of these groups are the RAND Corporation, the Systems Development Corporation and others.

In the USA, along with the Society for General Systems Research this work is carried out by the System Research Center, established in 1959 at Case Western Reserve University. The leading figures of this Center were the founder and former director of the Center D. Ekman, director M. Mesarovich – a specialist in mathematics and computer engineer-

ing, R. Ackoff – one of the founders of the method of operations research, D. Fleming, I. Lefkowitz.

The Case System Centre has set itself the task of stimulating and coordinating research in systems science, systems engineering and mathematical systems theory, as well as training personnel in these fields of science. The centre focuses on systems theory problems (decision-making, multi-level multi-objective systems), as well as modelling of system processes

The widespread use of the term "system" in modern science symbolises the commitment of a certain group of scientists to a systems worldview. The emerging trend can be termed the systems movement, as it brings together representatives from different fields of science and technology has an interdisciplinary character. The methodology that guides the latter can be termed the systems approach.

Systems analysis is one of the methods of investigating complex organised objects, which consists in considering them as holistic entities with integrative qualities. The bankruptcy of the mechanistic worldview has put on the agenda the development of new principles of scientific cognition, which focus on the integrity and complexity of the objects under study.

Another methodological prerequisite for the formation of the systems approach was an attempt to overcome elementarism. Elementarism proceeded from the fact that the problem of researching complex objects acted as a problem of reducing the complex to the simple, the whole to a part, and if a researcher did not know the initial atom, a simple element, it was regarded only as a sign of weakness and undeveloped cognition. On the contrary, the concept of integrity insisted on the irreducibility of the complex to the simple, of the whole to the part, on the presence of the integrated object of such properties and qualities, which could not be attributed to its parts and the nature of which often was trying to find out the reasons [1].

Another prerequisite for the systems approach was the expansion of the scientific notion of causality that emerged in the process of criticizing mechanistic ideas. The basis of the mechanistic worldview is the principle of unambiguous determinism, in which each cause necessarily produces a single consequence, cognition was carried out within the dichotomy of 'necessity-accident'. Such a straightforward determinist approach could not provide satisfactory answers to the questions posed by biology, psychology and sociology.

Also most influential in breaking down the mechanistic worldview was the creation of statistical physics and the theory of relativity. Statistical physics proved the high value and accuracy of the probabilistic approach compared to the principle of unambiguous causality. The theory of relativity was a direct challenge to the mechanistic picture of the world, as it disproved all its postulates.

The relevance of the emergence of the systems approach was strengthened by the need to create conceptual schemes that could facilitate mutual understanding between representatives of different sciences, avoid duplication of theoretical work, and increase the effectiveness of scientific research.

What is the concept of a **system**?

The science has not yet worked out a unified position, a generally accepted definition. I. Blauberg and E. Yudin believe that, from the methodological point of view, the meaningful way of defining **the concept of a system** through an interrelated sequence of features, when adding each new feature increasingly limits the class of objects falling under the definition, but at the same time the remaining objects receive a more and more detailed substantive characteristic [1], seems promising.

R. Ackoff believes that a **system** can be defined as any entity, conceptual or physical, that consists of interrelated parts [2]. A. Hall and R. Feigin define a system as a set of objects together with relationships between objects and between their attributes (properties) [3].

L. von Bertalanffy gives the following definition: a **system** is a complex of interrelated elements, so interconnected that if you change one element, the rest will also change and, therefore, the whole totality will change [4].

Several definitions of a **system** can be found in Webster's Dictionary:

1. A complex unity formulated by many, usually different factors and having a common plan or serving a common purpose.

2. A collection or combination of objects united by regular interaction or interchangeability.

3. An orderly functioning wholeness, totality [5].

A. Rapoport believes that a **system** is not simply an aggregate (totality) of units (particles, individuals) where each unit is governed by the laws of causality acting upon it, but an aggregate of relations between these units. Rapoport makes an interesting observation. He writes: the more organised a system is, the more opportunities it has to counter perturbations with respect to 'achieving its chosen goal'.

Cybernetic approaches to understanding a system. According to M. Drenik, a **system** in the modern language is a device that takes one or more inputs and generates one or more outputs. R. Kershner's view, a system is a collection of entities or things, animate or inanimate, that takes some inputs and acts on them to produce some outputs, while pursuing the machinations of certain functions of inputs and outputs [6].

L. Blumenfeld recognises the quality of systemicity only when four conditions are met: A system is a totality of real or imaginary elements separated from the rest of the world in any way. This totality is a system if: 1) the links existing between the elements are given; 2) each of the elements within itself is considered indivisible; 3) the system interacts as a whole with the world outside the system; 4) when evolving through time, a totality will be considered as one system if an unambiguous correspondence can be drawn between its elements at different points in time [6].

V. Sadovsky and E. Yudin distinguish four criteria: 1) a system is an integral complex of interrelated elements; 2) it forms a special unity with the environment; 3) as a rule, any system under study is an element of a higher-order system; 4) elements of any system under study in turn usually act as lower-order systems [5].

Thus, a system is a theoretical construction and an actually existing property of some class of objects, characterized by the following features:

1) the system is characterized by integrity, interdependence of elements (subsystems), leading to the emergence of an integrative quality;

2) the system is distinguished on the background of the environment;

3) the system communicates with the environment as a whole;

4) When one of the elements (subsystems) changes, the quality of the whole system changes.

The most important thing, according to L. von Bertalanffy, about the systems approach is its **interdisciplinary nature**. Bertalanffy wrote: "If you carefully look through the yearly periodicals of the Society for General Systems Research, you will easily find the following important fact: similar and even identical in structure reasoning applies to phenomena of very different kinds and levels – from chemical reaction networks in a cell to animal populations, from electrical engineering to social sciences… Moreover, in many cases there is formal correspondence, or isomorphism, of general principles and even special laws. The same mathematical description can be applied to very different phenomena. From this, in particular, it follows that the general theory of systems, among other things, also facilitates scientific discoveries: a number of principles can be transferred from one field to another without having to duplicate work, as was often the case in science in the past" [4].

System concepts

"Environment". As noted by A. Hall and R. Feigin, the environment is the totality of all objects whose properties change affect the system, as well as those objects whose properties change as a result of the behavior of the system [3].

The term **"subsystem"**. From the point of view of cybernetics, a subsystem is a set of elements united by a single process of functioning, which in interaction implement a certain operation, necessary to achieve the goal of the system as a whole [7].

"Inputs" and "outputs". Communication between the system and the environment takes place through "inputs" and "outputs". Energy, substance or information enters the system through the "input" and the processed energy, substance or information is output to the environment through the "output". Information is understood in a cybernetic sense, as "the designation of content received from the external world in the process of our adjustment to it and the adjustment of our senses to it. The process of acquiring and using information is the process of our adjustment to the contingencies of the external environment and our living in that environment [8].

"Black box". There are systems in nature which are very difficult to study because of the fundamental impossibility for the researcher to look inside them. The application of the research black box principle, can prove very useful. The black box principle originated in electrical engineering, but has since spread to all fields of scientific knowledge. The essence of the method is this: the researcher, manipulating at will the inputs and making any observations on the outputs, must infer what is inside the box [9]. This approach opens up a wide range of possibilities for studying systems whose structure is either unknown or too complex to be able to infer their behaviour from the properties of the constituent parts of these systems and the structure of the links between them [7].

The term **"feedback"**. N. Wiener defines feedback as "the property that allows future behaviour to be regulated by past performance of orders", or as "a method of controlling a system by incorporating the results of its previous performance of its tasks" [8].

Feedback is the influence of the outputs of some system on its inputs, expressed in the influence of the results of the functioning of this system on the nature of its activities. Unlike direct communication, which is the transfer of information from a controlling subject to a controlled object, feedback performs the function of informing a subject about the results of commands and serves as a means of correcting the activity of a controlling subsystem and stabilizing the functional parameters of the whole system. Forming a closed circle of information circulation, direct and feedback communication contributes to more effective achievement of goals by the system. According to academician V. Arnold, management without feedback always leads to disasters [10]. Without feedback we cannot even talk about governance.

The understanding and concepts of the political system

To begin with, it is necessary to understand that the systems approach in political science is to perceive political systems as organisms that are in their environment and respond to impulses coming from them. All human actions and behaviour are treated as a systemic order phenomenon in their entirety.

The systems methodology comes from sociology, thanks to T. Parsons. Parsons laid the foundations for a systemic analysis of social life as a whole, presenting society as an interaction of four subsystems: societal community, fiduciary subsystem, politics and economy. The first subsystem consists of norms and has the function of integration; the second includes values and is responsible for the reproduction of the pattern; the third is composed of collectives and serves to achieve goals; the fourth has roles as structural components, and the main function is adaptation of the social system. Parsons developed a structural-functional model of the social organism. According to his theory, society is an infinite set of human interactions, with aspects of it that are relatively stable (structures) and have specific roles and meanings (functions). Social institutions, according to Parsons, are a set of patterns and models that determine the expected behavior of members of society, and which form the foundation of the structure of the social system, being relatively stable formations that order social actions. Parsons also introduces the notion of process, which is paired with the notion of structure. Function links structure and process and establishes their meaning for the system.

Parsons views society as a social system comprising four subsystems: adaptation (economics),

purposefulness (politics), latency (institutions of socialisation) and integration (social community).

Politics, according to Parsons, as a subsystem of society includes the definition of collective goals, the mobilisation of resources and the decision-making necessary to achieve these goals.

Parsons identifies three institutions in the political subsystem: leadership, authority and regulation.

The institutionalisation of leadership is understood by Parsons as a model of 'a normative order through which certain sub-groups, by virtue of their position in a given society, have the permission and even the obligation to take initiatives and decide for the sake of achieving community goals together with the right to involve that community as a whole'.

The second institution is the institution of government. Power accumulates in the institutions of government and comes from there.

The third institution of politics is regulation. It consists in issuing norms and rules, which create a clear basis for social control. This category includes the law itself, professional norms, party and association statutes.

Thus, the political system is an autonomous and open system It maintains constant relations and exchanges with the rest of the subsystems of society. As in the economic system, the same kind of exchange of factors (inputs) and products (outputs) can be found.

Tolkott Parsons laid the foundations for systems analysis of social life in general, David Easton applied general systems theory to the analysis of politics. According to Easton, politics is a 'volitional distribution of values'. A political system can be defined as a set of interactions through which a volitional distribution of values occurs.

Easton sees political life as 'a system of behaviour embedded in the environment and thus subject to its influence, but with the capacity to respond to it'. "Systems analysis of political life is based on the notion of a 'system immersed in the environment' and subject to its influence … Such analysis assumes that the system, in order to survive, must have the capacity to respond.

The political system is seen as a black box. Easton leaves out what goes on inside it, as systems analysis covers mainly the system's relationship with the environment. The latter is seen as the intra-social and extra-social environment.

The intrasocial environment includes non-political systems that are part of the same society as the political system: ecological, biological, psychological, social systems.

The extra-social environment includes all those systems that exist outside global society: international political, ecological and social systems.

The political system is not a 'closed' but an 'open' system, maintaining numerous and diverse interrelations and interchanges with the environment, immersed entirely in it and in complex relations with it. Easton compares the political system to the economic system. The political mechanism functions in the same way as the economic mechanism. There is also what goes into the mechanism ("inputs") and what comes out of it ("outputs"). There is what feeds into the system and what the system produces.

"Costs" ("input"). Easton distinguishes between two types of input: requirements and support. They must be continuously fed into the system, otherwise it will cease to function due to 'underloading'. Excessive demands on the system's ability to produce relevant outputs (i.e. value distribution) can lead to system overload or potential stagnation. A high level of support is highly desirable for the system, but if it fails to meet the requirements, it loses support and self-preservation. It is a question of a certain dynamic balance of requirements and support.

1. Demands. Demands can be defined as a form of expression of opinion on the legitimacy of a binding distribution by actors of power. A demand can be narrow, specific and simple. Flooding can stimulate a demand for a dam; the revelation of corruption in government can stimulate a demand for greater control over lobbying activities. In addition to demands, a lot of different information is introduced into a political system: expectations, opinions, motivations, ideolo-

gies, interests and preferences of the members of a given system. All these may coincide with the demands.

The accumulation of a large number of demands creates an overload. This overload can be quantitative if the requirements are too numerous and qualitative if they are too complex. Quantitative overload relates to the actual accumulation of numerous demands, which the over-saturated system can no longer cope with: parliament cannot consider all the texts of bills that are submitted to it; government cannot consider all the demands that beset it, etc. Easton compares this quantitative overload to airport congestion.

Qualitative congestion relates to the complexity of the demands placed on the system, which relate to difficult problems that take a long time to resolve.

Easton identifies three main functions of demands:

a) Expression of demand. Through this function, various demands are articulated, addressed to the political system predominantly through pressure groups. The process by which individual groups and individuals make demands on those who make political decisions is called articulation of interest by Almond.

b) demand management. Demands can quickly overwhelm the system if their flow is not filtered, channeled and regulated. Easton divides regulation into structural and cultural regulation.

Structural regulation refers to the exercise of specialised functions in the filtering and transmission of demands. Access to the political system is through structural doors guarded by gatekeepers. At the entrance to the political system, they channel, that is channelise and filter demands. The number and diversity of these gatekeepers and doors increase with the development of society. Parties, the upper classes and parliamentarians are the structures that regulate demands.

Cultural regulation relates to norms, values and attitudes that do not allow or restrict certain demands. Such cultural prohibitions may concern both the content of the demands (some demands are con-

sidered (unreasonable, immoral, etc.) and the form (e.g. Western political culture prohibits the use of violence to express political demands).

Nevertheless, the system, despite its dual regulation, may face overload. In this situation, the system has two choices: to increase the capacity of communication lines by increasing the number and diversity of information channels (through specialisation of personnel, growth of bureaucracy, etc.), or to recycle demands in such a way as to lead to a reduction in them.

c) Reducing demands. With this function the flow of demands is systematised, streamlined, reduced to a limited number of alternatives which are provided to the political system. A multitude of identical demands are reduced to a single demand. Easton calls this a combination, a 'combination of demands', while Almond calls it an aggregation of interests. Political party programmes serve this process. In Western systems, parties are the main structures of demand reduction. By aggregating the demands of those whose interests it expresses, the party formulates a single demand which is put before the authorities.

2. Support. In addition to the demands which tend to weaken the political system, the latter enjoys support which strengthens it. Support encompasses all positions and behaviours favourable to the system: patriotism, respect for institutions, loyalty to the leadership in power, demonstrations or campaigns in support, fulfilment of military duty, payment of taxes, etc.

Easton names three types of support:

a) support for the political community as a whole (loyalty to the collective, the national community);

b) support for the regime;

c) support for the authorities.

"Outputs". Everything that "enters" the political system is responded to by an "output": it satisfies demands or evokes support. The "output" of the system can be new laws, regulations, subsidies, information campaigns, public allocations. According to Easton, the system responds with its "product" to the

impulses it receives; these "products" are decisions and actions. Decisions are enforced by law. Actions are not coercive, but they also affect the lives of citizens (economic and social policy, foreign policy).

The importance of the emanating factors of a system is that they serve to conceptualise the way the system responds to the environment. Outputs are not final factors. Rather, they are a fragment of a continuous loop of action ("feedback loop") in which the "input" and "output" directly or indirectly affect each other, the entire political system and the environment.

"Feedback loop". This concept was introduced to refer to the return of information and how to take advantage of it. Feedback is the main mechanism for resolving tensions in society, but it only fulfils this function because of the ability of power to respond to impulses coming into the system. Feedback is referred to as "the property of regulating patterns of action in the future, based on the past".

Feedback allows the system to make sense of how close it has come to its goals and how it should change its behaviour to get as close to those goals as possible. Without feedback, each 'outgoing' factor would be devoid of interconnectedness with the other factors. Each interaction – an "interaction" with the environment in the form of an "outgoing" factor, followed by feedback information about the consequences, complements the knowledge of the system coming from the decision-making centre. This information is about the nature of the system itself, its environment, its resources, the resistance it encounters in exercising its will. Feedback allows the members of the system to learn to know themselves.

If the power ignores feedback, the effectiveness of the implementation of its goals is low, because it will not be able to weigh the level of support of the system's representatives. Feedback is fundamental both to eliminate errors in order to improve the system and to find new goals and ways to achieve them.

Proponents of the structural-functional approach in the study of the political system are G. Almond and D. Powell. Their names are associated with the development of comparative analysis of political systems, which involves the transition from the study of the formal components of the political system to the concrete manifestation of political behaviour.

For Almond and Powell, structure and culture take centre stage in their analysis. By "structure" they mean the activities that shape the political system. That part of people's activity that is involved in the political process is called a role. Roles are the units from which all social systems, including political systems, are composed. Therefore, one of the main components of the political system is the political role. Specific sets of interrelated roles constitute structures. A judge is a role, a court is a structure of roles.

Almond and Powell define the political system as a set of roles and their interactions, carried out not only by government institutions but also by all structures in their political dimension. By structure they mean a set of interrelated roles.

Almond and Powell liken the political system to a global society: they view it by immersing it in its environment. Almond and Powell's functional approach distinguishes three analytical levels in the political system: considering the system in its interaction with its environment, in its internal functioning, and in its maintenance and adaptation. Almond and Powell divide the functions of the political system into incoming and outgoing. The study of incoming and outgoing functions reveals the importance of two important mechanisms that are necessarily present in any system of governance. First, there is the supervisory mechanism, which captures the demands and support that make the system work. Secondly, attention is drawn to the fact that there must be a conversion (transforming) mechanism which transforms incoming impulses into outgoing products in the process of selection, limitation and ordering.

A specific feature of Almond's structural functionalism is the comparative study of political systems that compares system capabilities, conversion functions, support and adaptation functions and

relationships between levels of functioning. G. Almond studied the negative consequences of the practice of transferring Western systems to developing countries in the 50 s and 60 s. Caught in an economic, cultural and religious environment different from that of the West, the political institutions were unable to perform many functions and achieve sustainable development of society. This practice gave impetus to development of comparative studies of political systems.

G. Almond and D. Powell expanded the scientific horizons of political system theory. Almond enriched political system theory by examining the role of cultural factors, as well as the comparative study of different types of political systems.

Karl Deutsch, a professor at Harvard University, proposed a highly daring system of cybernetic analysis of the political process. Politics and government are presented essentially as a process of managing and coordinating the efforts of people to achieve set goals, with the political system being identified with a projectile pointing at a target.

The political system is like a cybernetic self-tuning system. Control lies in piloting, which depends on information about the position of the target, the distance left to cover, and the results of previous actions. K. Deutsch gives an analysis in terms of feedback, in terms of managing actions based on experience of previous mistakes.

According to K. Deutsch, the political system includes four blocks (receptors, memory and values block, decision-making centre, effectors), which are responsible for different levels of processing incoming information. There are several stages in the process of intra-system conversion:

1) First, information from the internal and external environment is received by receptors (sensors). In addition to simple interception, the receptor carries out coding, information selection and data processing.

2) The information then enters the memory and values block, where it is processed and serves as the basis for the DMC (decision-making centre) block. The memory and values block accumulates and stores information, comparing new information with information about already existing experience.

3) Based on the findings of the memory and values block, the DMC prepares decisions and gives orders to the effectors, i.e. executing units.

4) The effectors implement the decisions of the DMC. There is also a feedback in the scheme. Receptors receive information not only from the environment, but also from effectors, which inform them about the results of implementation of decisions and about the state of the system itself. Information on the correction of decisions is returned to the system as a new input, new inputs and is processed. The processed information is fed back into the DMC memory block.

According to K. Deutsch, the system is not in "equilibrium". It is involved in a constant search for, and refinement of, a goal, the realisation of which depends on the ratio of four quantitative factors:

1) The information load on the system. It corresponds to the extent to which there is a change in the position of the target in relation to the search system. In politics, it corresponds to the magnitude, scale and frequency of change that the government must deal with.

2) Lag (delay) in the response of the system. It refers to the time lag between receiving the information about the position of the target and the action of the search engine. K. Deutsch gives the example of the time lag that elapses between receiving information about the position of the enemy aircraft and the moment when the anti-aircraft guns are actually pointed at the spot where it will be shot down. In politics, there may be a lag that will force the government or party to respond to a new emergency.

3) Increment, i.e. the sum of the changes in one or another of the functioning parameters as a result of corrective operations. If the increment is large, there is a danger that over-adjustment will deviate the system from the desired direction. An overreac-

tion deviates from the desired goal. In politics, increment means the responsiveness of the political system to new facts.

4) Precedence is the distance between the correctly predicted position of a moving target and its actual location at a given moment according to the latest signals received. Considering the bias, the hunter shoots ahead of the flying bird, he does not aim at the bird itself, but at the point ahead along the trajectory of its flight.

When reaching the target, says K. Deutsch, possibility of success is always inversely proportional to information load and delayed reaction of the system. Up to a certain point, the chances of success can be related to the magnitude of the increment, but when its level is too high, the relationship becomes reversed. The chances of success are always related to "anticipation", to being ahead of the curve.

Thus, a political system acts as a cybernetic system: it makes its own decisions, based on information about the external environment and about its own state. The importance of information for the stability of the system cannot be overestimated. It is necessary for information to nerve the system with its many networks, the "nerves of control". The value of Deutsch's theory lies in the fact that it makes it possible to assess the effectiveness of political systems without excessive ideologicalism.

Therefore, the **systems approach** was an adequate response to the challenge of classical science. Due to the interdisciplinary nature of systems research in the development of science, the trend of universalization of knowledge appeared, which helped to reduce duplication of theories, to distribute the forces of scientists more rationally and to concentrate resources on priority areas. The category of system proved to be operational and of high potential. Systems methodology has been recognised as an effective research tool that can be applied in both natural, technical and human sciences.

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RESEARCH OF THE AMPLITUDE-FREQUENCY CHARACTERISTICS OF A QUASI COMPLEMENTARY EMITTER FOLLOWER ON THREE-STRUCTURAL INJECTION-VOLTAIC TRANSISTORS

Abstract. In this article shows the results of an experimental study of the amplitude-frequency characteristics of the quasi-complementary emitter followers on three structural injection-voltaic transistors.

Keywords: amplifier; the quasi-complementary emitter followers, the three-structural injection-voltaic transistor, current-voltage characteristic, amplitude-frequency characteristic.

I. Introduction

In the final stages of low-frequency power amplifiers, complementary and quasi-complementary emitter followers (CEF and QCEF) are widely used on powerful bipolar transistors operating in the push-pull mode of class "AB". For cascades with a large output power, it is not always possible to select a pair of complementary transistors. In this case, in the output stage, quasi-complementary emitter followers (QCEF) can be used on powerful transistors of the same type.

The main disadvantage of quasi-complementary emitter followers is the instability of the operation mode due to an increase in temperature or supply voltage values.

The main disadvantage of the complementary emitter follower [1] operating in the "AB" mode is the instability of the operating mode with increasing temperature or the supply voltage at which the 100% negative current feedback characteristic of the emitter follower disappears through the load resistor due to the fact that these external destabilizing factors are equivalent to common-mode signals. To reduce the influence of temperature and other destabilizing factors, additional local negative feedback is introduced using two resistors connected between the emitters of transistors [1]. But this method is not effective enough and reduces the power given to the load.

In [2; 3; 4; 5], an injection-voltaic transistor (IVT) made on germanium and silicon transistors,

and having an extended range of stable operation, was proposed and experimentally investigated.

In [6], a complementary emitter follower is highly resistant to the action of destabilizing factors, in which injection-voltaic transistors (IVT) are used as output transistors.

The main disadvantage of a complementary emitter follower for IVT is the use of transistors made of semiconductor materials with different bandgaps, which will result in low manufacturability in the integrated design. In addition, IWT has a small range of stable operation in the field of secondary breakdown [6].

To ensure the manufacturability of manufacturing a complementary emitter follower in integral design, it is advisable to use three-structure injection-voltaic transistors (TIVT) [7] made on a homogeneous material as output transistors. TIVTs also have an extended range of stable operation in the field of secondary breakdown and an expanded range of temperature stability compared to IWT.

In [8], an efficient QCEF for TIVT was proposed, which has an extended range of stable operation with increasing temperature and increasing voltage values of power supplies.

II. Methods and experiments

In [9], a quasi-complementary emitter follower is highly resistant to the influence of destabilizing factors, in which three-structure injection-voltaic transistors (TIVTs) are used as output transistors. The scheme of a quasi-complementary emitter follower at the TIVT is shown in Fig. 1, In the above diagram, the upper arm of the QCEF consists of a composite TIVT connected according to the Darlington scheme (TIVTs are connected according to the CK-CK circuit), and the lower arm also consists of a composite TIVT connected but according to the Shiklai scheme (TIVTs are connected according to the CE-CK circuit).
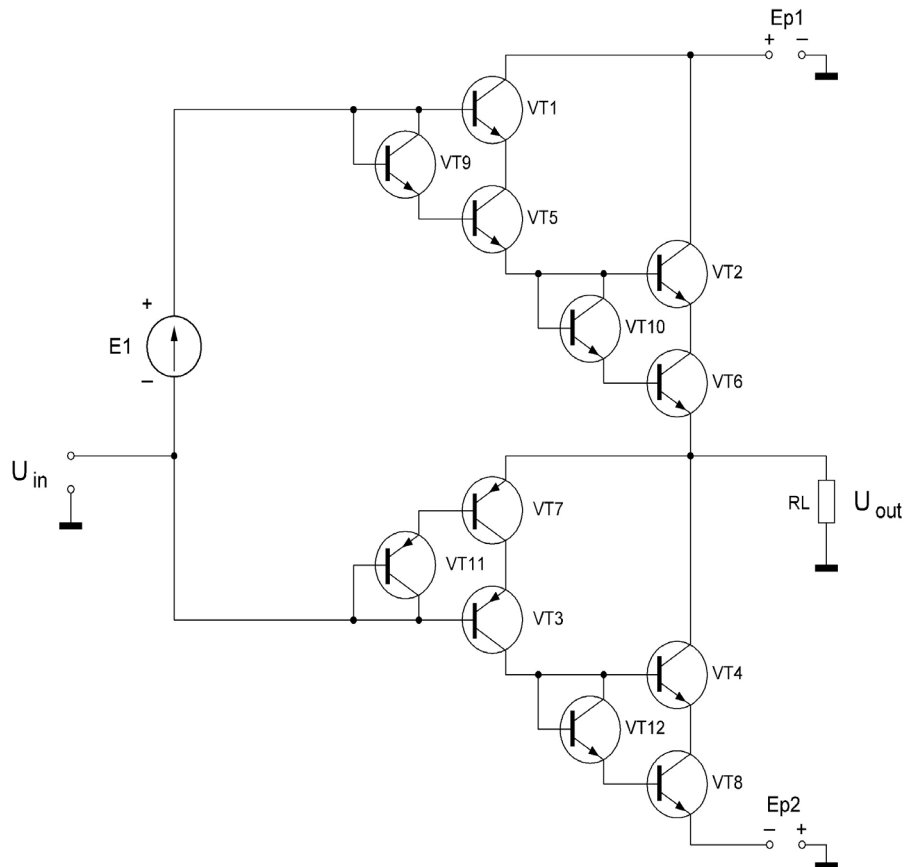

Figure 1. Scheme of a quasi-complementary emitter follower at TIVT

Thus, the quasi-complementary emitter follower on the TIVT consists of four TIVT (two in the upper and two in the lower arms). Let us consider in more detail TIVT (Fig. 2). TIVT consists of three transistor structures [7].
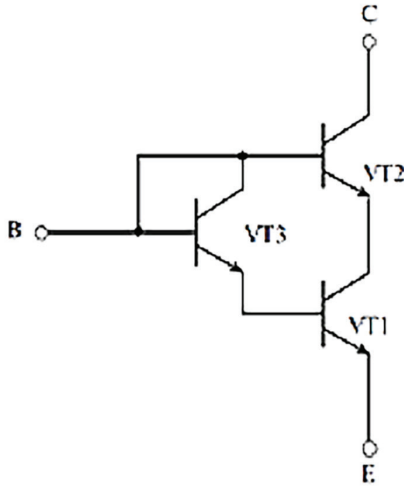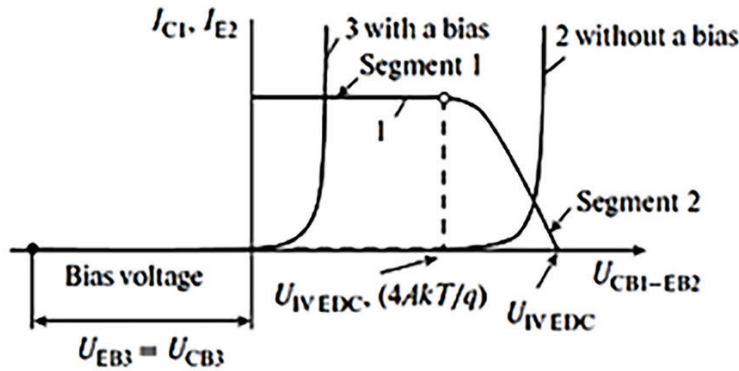

Figure 2. The scheme of the TIVT

The collector potential VT1 is always lower than the base potential of the second and third transistor structures by the value of the forward voltage of the emitter-base junction of the second structure. Consequently, the intersection of the characteristics of the first and second structures at any values of U_{KE} and U_{EB}, due to the displacement $U_{EB3} = U_{KE3}$, will be in the horizontal section of the injection-voltaic regime (Fig. 3). The first and third structures play the role of an ideal stable current generator feeding the emitter of the second transistor structure.

The data used is from the results of The results of studies of TIVT show [7] that TIVT stably operate at higher values of the collector-emitter reverse voltage UKE (2–3 times higher than the maximum allowable) than in the case of individual structures. The power dissipated on the collector exceeds the passport value of the maximum permissible power for the VT2 transistor by more than 3 times.

Figure 3. I – V characteristic illustrating the operation of the TIVT. Output I – V characteristic (curve 1) VT_1 and output I – V characteristics (curve 2 – without bias and curve 3 – with bias voltage) VT_2

In [10], a mathematical model of TIVT in a common emitter circuit was proposed and theoretically investigated. Output characteristics of TIVT in active mode, with UKE> UBE, is described by the expression:

$$I_K = I_{K2} = \alpha_{N1}\alpha_{N2}I_{E01}(1 + \gamma(U_{KE} - U_{BE1}))\exp(b_{E1}U_{BE1}) \quad (1)$$

where

$$U_{BE1} = \frac{1}{b_{E1} + b_{BE3}}\left[\ln\left[\frac{I_{E03}}{(1 - \alpha_{N1})I_{E01}}\right] + b_{E3}U_{BE}\right]$$

– the voltage at the emitter junction of the transistor VT_1;

α_{N1}, α_{N2} – transmission coefficients of emitter currents of transistors VT_1, VT_2;

I_{E01}, I_{E03} – saturation currents of emitter junctions of transistors VT_1, VT_3;

γ – s the coefficient describing the modulation of the base width (Earley effect);

b_{E1}, b_{E2} – are the ideality parameters of the I – V characteristic of emitter junctions VT_1, VT_3.

$$I_K = I_{K2} = \alpha_{N1}\alpha_{N2}I_{E01}\exp(b_{E1}U_{BE1}) - $$
$$- I_{K02}\exp(b_{K2}(U_{BE} - U_{KE})) \quad (2)$$

where I_{K02} – saturation current of the collector junction of the transistor VT_2;

b_{K2} – is the ideality parameter of the I – V characteristic of the collector junctions of the transistor VT_2.

Input characteristics of TIVT in active mode, with $U_{KE} > U_{BE}$, is described by the following expression for the base current:

$$I_B = [1 - \alpha_{N1}\alpha_{N2}]I_{E01}(1 + \gamma(U_{KE} - U_{BE1}))\exp(b_{E1}U_{BE1}) \quad (3)$$

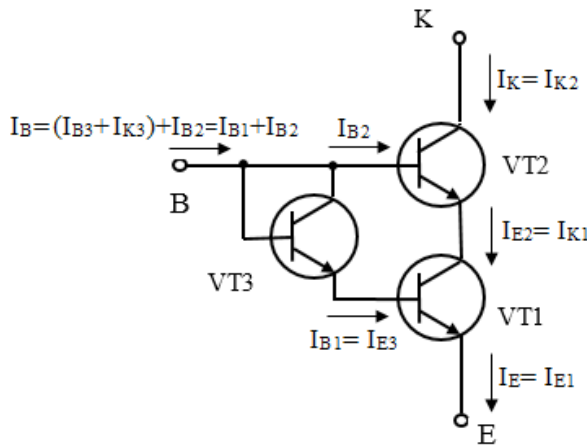To determine the current gain of the TIVT, we will use Figure 4.

Figure 4. Current distribution in an injection-voltaic transistor

Fig. 4 shows that the current gain of the TIVT is determined by the following expression:

$$\beta_{TIVT} = \frac{\partial I_K}{\partial I_B}\bigg|_{U_{KE}=const} = \frac{\Delta I_K}{\Delta I_B} = \frac{\Delta I_K}{\Delta I_{B1} + \Delta I_{B2}}$$
$$= \frac{1}{\frac{1}{\frac{\Delta I_K}{\Delta I_{B1}}} + \frac{1}{\frac{\Delta I_K}{\Delta I_{B2}}}} = \frac{1}{\frac{1}{\beta_1} + \frac{1}{\beta_2}} = \frac{\beta_1\beta_2}{\beta_1 + \beta_2} \quad (4)$$

In a particular case, if the current gains of transistors VT_1 and VT_2 are equal $\beta_1 = \beta_2 = \beta$, then the current gain of the TIVT is determined by the expression:

$$\beta_{TIVT} = \beta / 2 \quad (5)$$

The upper arm of the quasi-complementary emitter follower circuits on the TIVT (Fig. 1) consists of two TIVT connected according to the Darlington scheme. As is known [11], the total current gain β

for a composite transistor connected according to the Darlington circuit is equal to the product of the current gains of individual transistors. Thus, the total current gain β for a composite TIVT connected according to the Darlington scheme is also equal to the product of the current gain of individual TIVT:

$$\beta_{DTIVT} = \beta_{TIVT1}\beta_{TIVT2} = \frac{\beta_1\beta_2\beta_3\beta_4}{(\beta_1 + \beta_2)(\beta_3 + \beta_4)} \quad (6)$$

With equal current gains of all transistors $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta$ the total current gain βDIVT for a composite TIVT connected according to the Darlington scheme:

$$\beta_{TIVT} = \beta^2 / 4 \quad (7)$$

The lower arm of the quasi-complementary emitter follower circuits on the TIVT (Fig. 1) consists of two TIVT connected according to the Shiklai scheme. The total current gain β for a composite TIVT connected according to the Shiklai scheme is also equal to the product of the current gain of individual TIVT:

$$\beta_{ShTIVT} = (\beta_{TIVT1} + 1)\beta_{TIVT2} \cong \beta_{TIVT1}\beta_{TIVT2} \quad (8)$$

It should be noted that large fluctuations in currents and voltages in power amplifiers and the nonlinearity of the transistor characteristics jointly affect the parameters of the amplifier. And small-signal analysis, assuming the linearity of the transistor, becomes invalid. Consequently, in amplifiers of a large signal, graphical methods of analysis are more often used [11].

To implement the investigated QCEF at TIVT (Fig. 1), different-type transistors based on silicon KT-315Г (VT_1, VT_2, VT_4, VT_5, VT_6, VT_8, VT_9, VT_{10}, VT_{12}) with n-p-n and KT-361Г structures were used by industry (VT_3, VT_7, VT_{11}) with p-n-p structure. To study the amplitude and frequency characteristics of the QCEF at the TIVT, a bipolar power supply of 20 V was selected as a power source and active load $R_L = 620$ Ohm.

III. Results

In Fig. 5, shows the combined transfer characteristic of the investigated QCEF to TIVT in mode

"B". In the investigated QCEF on the TIVT, as well as in the known schemes, near the zero input voltage, the current in the open TIVT is very small, and the internal resistance is large.
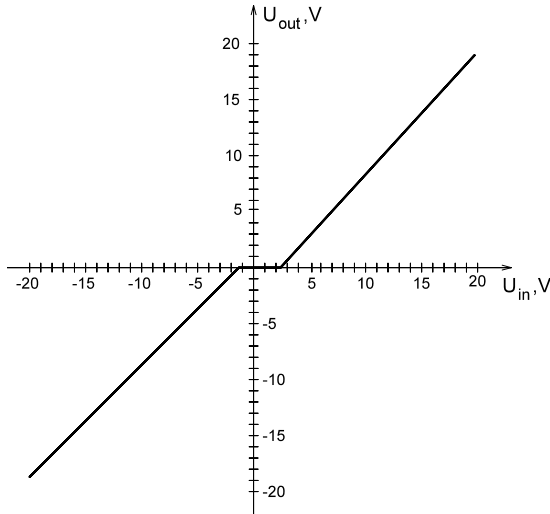

Figure 5. Combined transfer characteristic of QCEF to TIVT in mode "B"

As a result, the increase in voltage at the load in this area is less than the change in input voltage. This is the reason for the appearance of a break in the characteristic near zero. The resulting distortion of the output voltage is called transient distortion [1]. To eliminate transient distortion, as is known, a small quiescent current is passed through transistors, that is switch to the "AB" operating mode.

In the QCEF circuit under study, to switch to the "AB" operating mode, the transistor quiescent current is 1mA, which is set using bias voltage source E_1.

In Fig. 6, shows the amplitude characteristic (AC) of the QCEF on a TIVT, at a quiescent current of transistors $I_0 = 1$ mA and applying a harmonic signal with a frequency of 1 kHz to the input of the QCEF on a TIVT.
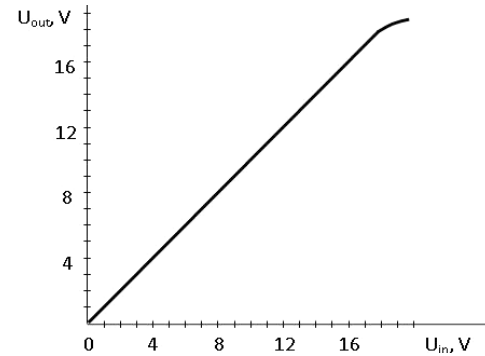

Figure 6. The amplitude characteristic of the QCEF at the TIVT at $E_{P1} = E_{P2} = 20V$, $I_0 = 1mA$, $f_0 = 1kHz$ and $R_L = 620$ Ohm

The amplitude characteristic of the circuit under study is linear enough for practical use and has the same bend characteristics at high input voltages, as in the circuits of well-known QCEFs on bipolar transistors. This is also explained by the nonlinearity of the current-voltage characteristics of injection-voltaic transistors.
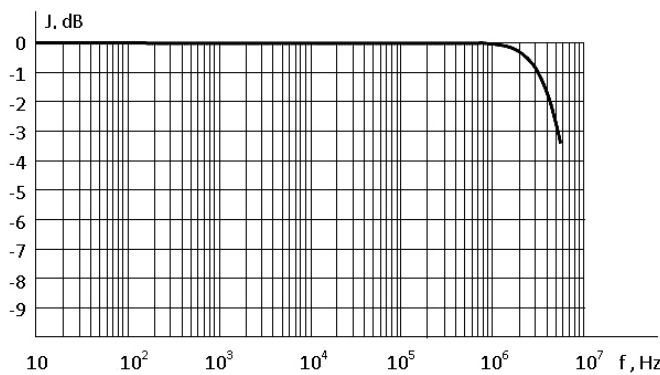
Figure 7, shows the amplitude-frequency characteristic (AFC) of the investigated schemes as a function of the relative gain of the frequency J = φ(f), which has the same form as the well-known QCEF circuits on single bipolar transistors

Figure 7. The amplitude-frequency characteristic of the QCEF at the TIVT at $E_{P1} = E_{P2} = 20$ V, $I_0 = 1$ mA, $f_0 = 1$ kHz, $U_{MIN} = 6$ V and $R_L = 620$ Ohm. From Fig. 7, shows that the amplitude-frequency

characteristic of the investigated QCEF scheme at the TIVT is uniform without "peaks" and "troughs" and the upper cutoff frequency at the level of –3 dB relative gain is 5 MHz.

IV. Conclusion

The developed quasi-complementary emitter follower has a fairly good uniform amplitude-frequency response in a wide frequency range. The study of AFC, AC confirms the practical feasibility of using QCEF on TIVT for building powerful output stages of transformerless power amplifiers.

Thus, the use of TIVT as amplifying elements in QCEF makes it possible to build powerful output stages of transformerless power amplifiers with high operational reliability in changing operating conditions, highly stable to destabilizing factors (inconsistency of the supply voltage and temperature). The proposed QCEF can be used in the final stages of power amplifiers, radio technical devices, industrial, information and automotive electronics.

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Section 6. Physics

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FUNDAMENTAL MANAGEMENT (*E g, µ* BAND STRUCTURE) SILICON IS A NEW DIRECTION IN THE FIELD OF SEMICONDUCTOR MATERIALS

Abstract. In this paper, we consider the physical foundations for the formation of electronetral molecules between atoms of groups *III* and *V*, as well as elements of groups *II* and *VI* located in neighboring sites of the silicon lattice. Elements will participate in the formation of molecules. Preliminary results have shown that in the case of formed elementary cells Si_2Zn-Se^{++} with a maximum concentration, E_g – varies from 1.35 to 1.12 eV and, accordingly, from 2.67 to 1.12 eV.

Keywords: silicon, Kloun interactions, nanoclusters, heterovarigone structures, selenium, zinc.

1. introduction

The development of modern micro and nano-electronics requires the creation of new materials with unique energy properties and functionality. In this regard, nanostructured semiconductors based on silicon are of great interest. Although such materials can be obtained by the formation of clusters of various impurity atoms [1–2], studies have shown that the preparation of such materials does not allow solving problems in modern nanoelectronics. This is mainly due to the low concentration, distribution control and composition of impurity nanoclusters in silicon. Therefore, the formation of a new type of binary cluster nanostructures with the participation of elements of groups *III* and *V*, as well as *II* and *VI* groups in silicon lattices is of great interest. The valences of groups *III* and *V* in silicon have a high solubility $(N - 10^{20} - 10^{21}$ cm$)$. In a separate state, they create shallow donor and acceptor levels, and they, in turn, create additional electrons in the conduction band and holes in the valence band.

This paper discusses the physical foundations for the formation of electronetral molecules between atoms of *III* and *V* groups, as well as *II* and *VI* groups of elements located in neighboring sites of the silicon lattice (Fig. 1.).

As can be seen from the model, the new material is neither covalent nor ionic and formed a bond, but a strong bond with an ionic-covalent appearance was obtained. According to the proposed model, the crystal type $Si_2A^{II}B^{VI}$ as a separate material in the lattice of compounds itself and the association of $A^{II}B^{VI}$ structures separately, the compound is displayed. This is a brand new material.

Being, it does not repeat its basic properties and processes in it will not be the same as in the first example. Including the surface of the new material, and due to $Zn^{++}Se^{-}$ nanoclusters in local places of the volume, transitions and mobility occur, the life of charge carriers and absorption coefficients will also be different. During the formation of such electrically neutral molecules, the tetrahedral chemical

bond of the silicon lattice is not disturbed. At the same time, these impurities do not create additional electrons in the conduction band and holes in the valence band, which are also lattice defects.
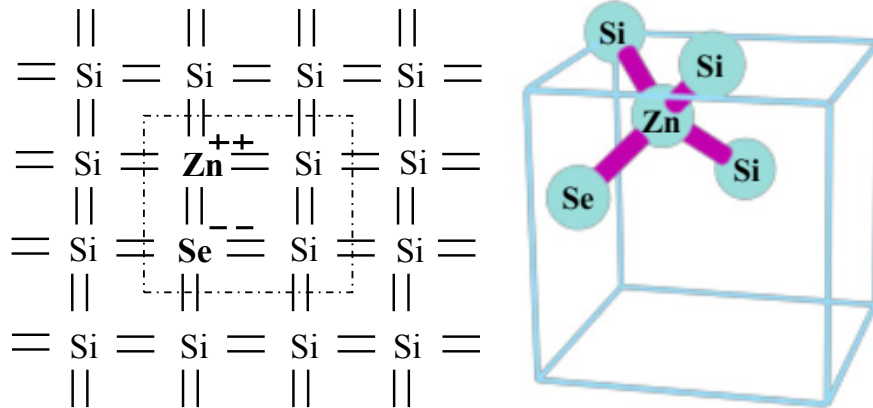
Figure 1. Formation of binary elementary cells $Si_2Zn - Se^{++}$ in silicon with ionic-covalent bonds

When these impurity atoms are in a lattice without formed molecules, each of them creates an electric potential around itself, which is also a lattice defect. During the formation of electrically neutral molecules between the atoms of groups *III* and *V*, as well as groups *II* and *VI*, no energy levels are created in the band gap of silicon, i.e. no additional charge carriers appear. Especially in the formation of molecules, the presence of a high concentration of impurity atoms is taken into account. In the state of a molecule, the energy potential of each atom is shielded from each other, while it is necessary to take into account the Coulomb interactions. All of the above is a stimulating factor in the formation of electrically neutral molecules and provides the most thermodynamic equilibrium state. Therefore, it can be assumed that, under subtle practical conditions, elements of groups *III* and *V*, as well as *II* and *VI* groups, will participate in the formation of molecules. When electrically neutral molecules are formed, new elementary cells of the $Si_2Zn - Se^{++}$ type are formed. The concentration and distribution of such binary elementary cells is mainly determined by diffusion, i.e. temperature and diffusion time.

2. Methodology

As shown by the preliminary results of the experiment, it is possible to form such unit cells up to a concentration of $N - 10^{20} - 10^{21} cm^{-3}$ (Fig. 2.), and their distribution over the depth of the sample is described:

$$N = (N_1 \cdot N_2)^{-1/2} \cdot erfc\left(-\frac{x}{\sqrt{2\left(\frac{D_1 + D_2}{2}\right)t}}\right)$$

where D_1 and D_2 are the diffusion coefficient, N_1 and N_2 are the solubility of impurity atoms in silicon at the diffusion temperature, and t is the diffusion time.
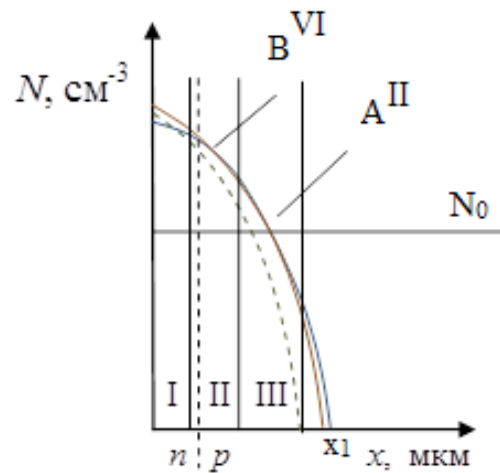
Figure 2. Concentration distribution of clusters based on $A^{II}B^{VI}$ binary nanocrystals

3. Result and discussion

Calculations and excrement show that the x_1 – value can be controlled from 0.5 to 10 μm. The results of studying the elemental composition of structures obtained based on binary compounds of the

$Si_2Zn - Se^{++}$ type, binary compounds $Si_2Zn - Se^{++}$

are indeed formed on the surface on the analyzer <<Jeol>> JSM 5910 LV-Japan (Fig. 3).
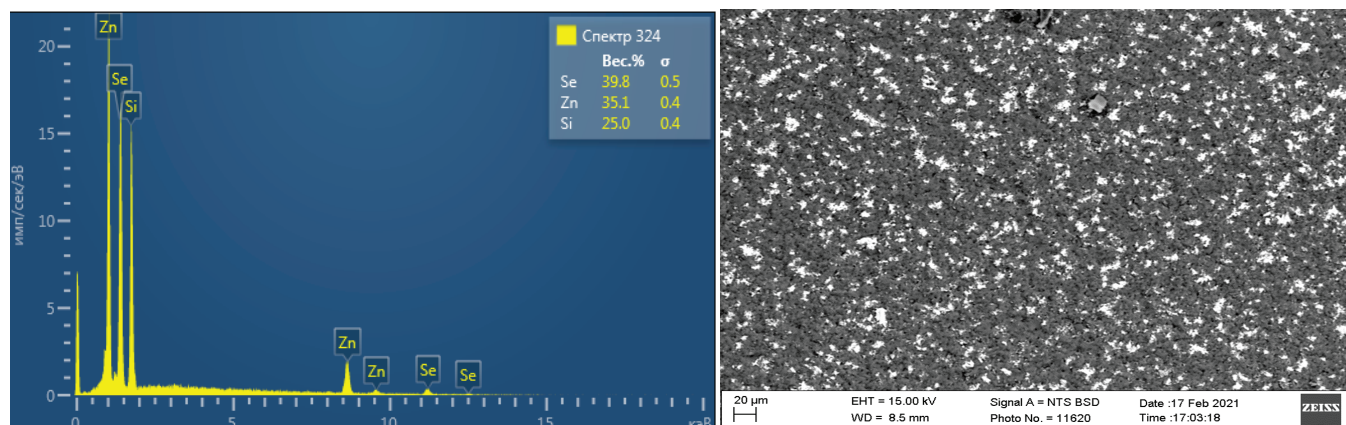

Figure 3. Results of X-ray microanalysis of the $Si_2Zn - Se^{++}$ structure
after diffusion at T = 1200 °C, t = 2 h on the silicon surface

In this surface layer, the electrical properties (carrier concentration, mobility, and band gap) were almost the same as those of pure $ZnSe$ binary compounds. As the depth increases, the concentration of binary compounds decreases and the complex passes to the next neutral compound of the $Si_2Zn - Se^{++}$ type. The results of studying the absorption spectra on the SHIMADZU UV 1900 i setup showed a decrease in the concentration of zinc and selenium impurity atoms relative to the surface (Fig. 4).
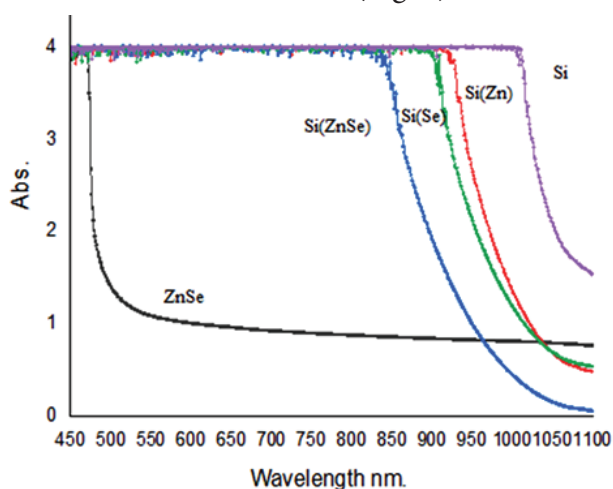

Figure 3. Absorption spectra versus wavelength of $ZnSe$ and $Si_2(ZnSe)$, $Si(Se)$, $Si(Zn)$ crystals measured at 300 K after diffusion at T = 1200 °C, t = 2 h on the silicon surface

The analysis of the obtained research results corresponded to the results of theoretical calculations, which made it possible to obtain heterovarigone structures in a silicon matrix with control over the concentration of zinc and selenium impurity atoms. We have shown the production of graded-gap structures due to the formation of binary neutral compounds of the $ZnSe$ type. In the silicon lattice, which makes it possible to control the band gap of such structures with the help of additional thermal annealing. The physical parameters of new binary elementary cells are determined by the basic physical properties of materials where the concentration of binary elementary cells is high.

4. Conclusion

And the parameters of these cells E_g, μ band structure will differ significantly from the lattice parameters, as well as from the parameters of the $ZnSe$ crystal. Thus, at the surface of a silicon crystal, an almost new semiconductor material is created, with new fundamental parameters. These new fundamental parameters mainly depend on the concentration of binary elementary cells. Preliminary results showed that in the case of the formation of $Si_2Zn - Se^{++}$ unit cells, the maximum E_g concentration varies from 1.35 to 1.12 eV and, accordingly, from 2.67 to 1.12 eV, i.e. in the x_1 region, a graded-gap

heterostructure is obtained. In this region, the value of the band gap varies smoothly, and the electron mobility and band structure should also change. Currently, such studies are being carried out both in experimental and theoretical aspects. And they are also conducted on the basis of modern microscopic and X – ray diffraction analyzes in order to clearly determine the distribution of binary elementary cells along the depth of the sample. It should also be noted that the diffusion technology of formation proposed by us is a unique technological solution that allows you to control the fundamental parameters of the main electronics material – silicon.

Now a few words about the unique functionality of silicon enriched with binary elementary cells. Based on such materials, it is possible to create photocells with a maximum absorption coefficient in a wide spectral region, with the help of which we can create highly efficient photocells with an efficiency no worse than that of multistage photocells based on *III–V*. This allows to significantly reducing the cost of photovoltaics, which is used on a large scale in earth conditions. In addition, based on such materials it is possible to create a highly sensitive photodetector operating in a wide range of the spectrum. In the future, with the improvement of technologies, it will be possible to obtain such materials based on silicon, with the help of which it is possible to create a highly efficient emitting device with various wavelengths. Further study of physical, optical, photoelectric properties allows us to discover a number of unknown new physical phenomena with unique functionality.

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Section 7. Economics and management

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CORPORATE RESPONSIBILITY IN GEORGIA: CHALLENGES AND NEW OPPORTUNITIES

Abstract. The goal of the scientific article is to search the challenges of corporative responsibility of buiseness sector and new opportunities in Georgia. The article presents an analysis of the main findings of the study based on information provided by businesses, experts and media representatives. The research is fully based on the information provided by the companies in the frame of interviews.

Keywords: business sector, corporate responsibility, corporate management, responsible business, inclusive politics, gender equality, marketing budget.

1. Introduction

Covid-19 pandemic caused social, economic and the environment protection crisis as in different countries of the world as in Georgia. Progress of countries in meeting the Sustainable Development Agenda has been significantly hampered and in some areas the situation has even deteriorated (Vanishvili Merab, et al. [13]).

The following challenges were mainly identified in corporate liability in companies operating in Georgia before the pandemic: low awareness, lack of strategic or systematic approach to the issue; Unpreparedness for multi-sectoral partnerships and mistrust between sectors.

The pandemic has further enhanced the importance of responsible business behavior and demonstrated the leadership of companies around the world in the regard of copying with social, economic and environmental challenges (Otinashvili Ramaz, Vanishvili Merab [4]).

Accordingly, conducting of searching of corporative responsibility in Georgia again, became important in order to establish how the behaviour of Georgian business and their attitude towards corporative responsibility changed in the results of the pandemic.

The world business community convinced once again of the importance of corporate responsibility for risk management or business sustainability.

Corporate responsibility is beneficial to both business and society and the environment – this is an inevitable fact (Vanishvili & Katsadze [12]).

This scientific article reflects both the immediate steps taken by companies in response to Covid towards employees, partners, customers or the general public, as well as their future plans for the implementation of sustainable and responsible business.

2. Materials and Methods

The aim of the study is to determine how the economic or social crisis caused by the pandemic has affected the behavior of the business sector, in the social, environmental or governance direction. In order to prepare a scientific article, a qualitative research methodology was developed and the following work was carried out:

The first stage – in-depth interviews: Qualitative research was conducted using in-depth interviews to obtain exploratory information. Structured questionnaires included open-ended questions; A total of 120 in-depth interviews were conducted, including with 108 businesses, 7 industry experts and 5 media representatives. Online meeting platforms were used to conduct the interviews.

The second stage – Focus Group Sessions: Following the in-depth working interviews, focus group sessions were conducted to reveal common challenges in regard of corporate responsibility during pandemics in the companies existing in Georgia. The focus group issues included 9 topics for discussion. Three focus-group separate sessions were held with the representatives of small, medium and big companies. Each session of the focus-groups was conductied via online platfroms.

3. Results and discussion

Based on the research, the results were sorted into the following main thematic areas: strategic approaches to the corporative responsibility and priority directions; corporate responsibility decision making process; social or environmental resources allocated to the business sector; coverage of corporate liability; sustainable corporate governance and labor relations; basic challenges and new business opportunities; multi-sectoral cooperation within the framework of corporate responsibility.

3.1. Strategic approach to the corporate responsibility and priority directions: the conducted research confirms that there is not a written corporate responsibility strategy document in most of the surveyed companies. Exceptions are large companies operating in the retail market (mainly financial institutions) and Georgian offices of international companies (Merab et al. [2]).

The priority areas defined and established in terms of corporate responsibility are mostly found in large or some medium-sized companies; On the example of the surveyed large and some medium-sized companies, the following priority areas in terms of corporate responsibility were identified: Support for persons with disabilities and socially vulnerable groups, education, innovation, promotion of sports and healthy lifestyles, protection of the environment and use of secondary resources, care of employees, empowerment of women and support of gender equality, support of the arts (Vanishvili & Sreseli [11]).

3.2. Corporate Liability Decision Making Process: It was revealed that the budget allocated within the framework of corporate responsibility and a separate structural unit / a manager are not found in most of the companies operating in Georgia, besides in exceptional cases – large financial institutions, hotels, shopping malls, construction companies and local offices of international companies (Vanishvili & Lemonjava [8]).

In the case of most of the surveyed companies, the decision-making structural unit is: Marketing / Public Relations, Human Resources Department / Manager, as well as in some cases Administrative Department / Manager or Director (mainly in medium or small companies).

3.3. Resources allocated for social or environmental direction in business sector: In most cases (for large and medium-sized companies), the budget allocated under corporate responsibility is a part of

the marketing budget or reserve funds. Small companies basically allocate budgets spontaneously for one-time activity (Vanishvili, Katsadze et al. [10]).

Representatives of the surveyed companies note that the decision-making process under the influence of the pandemic became faster and more flexible. Companies that did not shut down during the pandemic noted that the decision-making process for funding charitable and social projects was particularly accelerated.

3.4. Coverage of corporative responsibility: In the case of large companies, corporate responsibility is covered using both traditional and modern media platforms – social media, online publications and etc. In the case of medium and small companies, more emphasis is placed on low-budget media outlets for corporate liability coverage.

The pandemic in the use of communication channels did not lead to significant changes in large companies. Some companies, especially small and medium-sized companies, have paid more attention to web and social media platforms, which in most cases represent their own or their partners' Facebook pages and Internet media. Also, it was revealed that most of the surveyed companies do not cover charitable activities at all. The reason given is that they do not consider it expedient to speak about it in public and there are some moments of inconvenience (Vanishvili, Lemonjava et al. [10]).

3.5. Sustainable corporate governance and labor relations: During the pandemic, large companies were able to reorganize and implement some of their corporate responsibility activities on online platforms, while medium- and small companies found themselves in a rather difficult situation and took responsible actions only whenever they were possible.

There was also a case when the surveyed company created a "mental well-being library" where employees could find a variety of training and educational resources to help them cope with stress. One of the major financial organizations noted that an online garden was created on the online work platform for the children of employees, and applications for users have been refined to minimize the need for physical contact with managers (Bedoshvili et al. [1]).

Most of the surveyed companies note that the pandemic also affected the mental and psychological state of employees, especially during the first wave of the virus. Some companies (mostly large companies) reported that they had taken various measures to provide moral and psychological support to their employees. In particular, a number of large companies: hired psychologists, gave employees access to various psychological support applications, conducted webinars, as well as organized incentive activities. While, most of the medium and small surveyed companies used the method of active communication with them for psychological support of employees; Managers tried to encourage employees through personal and frequent communications (Shanava & Vanishvili [5]).

3.6. Key Challenges and new Business opportunities: Most of the companies named business re-arrangement and digitization of processes as a new business opportunity, except when the specifics of the business did not allow them to do so.

Due to the pandemic situation, some companies managed to master new business opportunities, create and sell face masks, disinfectant solutions, as well as companies became more active in the field of delivery service.

According to the companies surveyed, the main business challenges during the pandemic were: Instability of financial resources, challenges of teamwork due to remote working regime, the problem of technical equipment of employees, malfunction of communication channels with suppliers/customers.

Due to the remote working mode, the communication between the employees and the management was intensified in terms of the challenges arising in the team working process. Also, various activities were introduced – online trainings, seminars, joint efforts to adapt to the online working process (Shanava & Vanishvili [5]).

*3.7. **Multi-sectoral cooperation within the framework of corporate responsibility:*** In terms of cooperation, it was revealed that due to the pandemic, there is a growing trend of partnerships between businesses and non-governmental organizations, charity type partnership projects increased partnership-type partnership projects (Mihailovich & Elishukovna [3]).

In terms of partnerships, most of the large surveyed companies noted that progress had been made, representatives from the different sectors united (e.g., shopping malls, tourism sector representatives) and worked together on joint projects to cope with the pandemic difficulties. A part of the small companies stated that their main concern was "self-preservation" and the situation did not change in terms of partnership issues. In their case, multi-sectoral cooperation was not intensified within the framework of corporate responsibility.

4. Conclusion

The following conclusions and recommendations may be made as a result of the research:

1. The written corporate responsibility strategy is almost not found in companies operating in Georgia, except for large companies. In addition, corporate responsibility issues are mainly found in marketing strategy.

2. With the exception of some of the large companies operating in Georgia, almost no company has a separate department/manager to make corporate responsibility decisions. This function is often assigned to the management departments of marketing or public relations, communications, human resources or manager and it is a responsibility of the director or his/her assistant in small companies.

3. During the pandemic, switching to remote working mode and digitizing business as well as developing new digital products were named as a new business opportunity. As for the business challenges, the following key organizational problems were identified: Instability of financial resources, challenges related to teamwork due to remote work regime, problem of technical equipment of employees, malfunction of communication channels with suppliers/customers.

4. Due to the challenges caused by the pandemic, communication between the government and the private sector increased. In addition, during the pandemic, examples of cooperation between competing companies or companies representing different fields were identified in some areas.

5. The need to raise awareness of corporate responsibility for Georgian businesses should be especially emphasized. It is important that companies must see the true value of corporate responsibility, know where the line lies between marketing and corporate responsibility.

6. It would be interesting to develop an awareness-raising strategy on corporate responsibility at the country level, describing long-term and short-term goals in this regard, strategic alternatives to achieve them, the parties involved and their role.

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MAIN GOALS OF MARKETING MANAGEMENT OF ECONOMIC AND ENVIRONMENTAL SAFETY OF THE CONSUMER MARKET

Abstract. The article substantiates the need for marketing management of economic and environmental safety of the country's consumer market. The main task of providing the population with consumer goods should be solved by achieving commodity self-sufficiency and preserving the economic and environmental safety of goods. At the same time, the primary task of marketing impact is to study the needs of the market, effective demand and link them with ensuring economic and environmental safety.

Keywords: consumer market of goods, effective demand, quality of goods, management of economic and environmental safety, importers and manufacturers of goods, needs of the population, high-quality and economically affordable products.

I. Introduction

Taking into account that in 2022–2026 the development strategy of new Uzbekistan, within the framework of modernization and accelerated development of agriculture, provides for priority areas for the development and liberalization of the economy, deepening structural transformations and consistent development of agricultural production, further strengthening the country's food security within the framework of the state program, are accepted measures to ensure food safety, increase the production of fruits and vegetables, potatoes and grapes [1]. The scientific study of achieving this goal simultaneously demonstrates the competitiveness of national consumer goods in domestic and foreign markets and the relevance of the issue of ensuring the safety of consumer products imported into our territory.

Marketing plays an important role in the development of the consumer market of goods, which is carried out taking into account socio-economic, natural, demographic and other factors. It allows taking into account the needs, state and dynamics of effective demand and market conditions, the nature of development of foreign trade relations, as well as creating conditions for maximum adaptation of production to market requirements.

The objective need to spread marketing in consumer markets of goods is due to the following factors:

– first, this market contains, along with the most important vital need, a variety of interests: social, economic, environmental and others, the features of which must be taken into account when implementing national policy in general;

– secondly, to justify the concept of consumer market development, it is necessary to use the tools of marketing research that allow you to most effectively study and predict the state and development of the market [2].

II. Literature Review

Studying the experience of foreign countries in managing the economic and environmental safety of the consumer market is significant for modern national conditions, since a developed market, an effective system of support for its participants, as

well as a modern management system based, among other things, on the use of marketing tools, can be rethought and implemented in our country. At the same time, the greatest attention should be paid to the processes of integration, information support and product promotion, as well as the development of a social orientation of marketing.

In almost all developed countries, the consumer market is dominated by large corporations and financial and industrial groups. Integration in the agro-industrial complex, which is the consolidation of firms by combining additional marketing functions and activities under a single management, can be dictated by various motives: reducing risk, improving market positions, prospects for influencing prices, reducing costs by increasing production efficiency – with vertical integration; reduce competition, increase market share, save costs through efficient business management and specialization – with horizontal integration; reduce risk through diversification and create additional financial leverage – with conglomerate-type integration.

III. Analysis and results

Summarizing the experience of agro-industrial integration in economically developed countries, researchers distinguish the following models [3]: a contract system of relations between agricultural producers, processing, marketing and other organizations; agro-industrial formations created by combining the capital and labor of legal entities and individuals (corporations, cooperatives, etc.); plants that represent the entire technological cycle from the production of agricultural products, its processing and sales to the final consumer; associations created without the formation of an additional legal entity, headed by an integrator firm that carries out relations with other members of the association on a contractual basis or by participating in the formation of their ownership; holding companies.

For example, in the United States, up to 25% of all wholesale commercial products, 90% of broilers, and 30% of beef are sold under a contract system in which the supplier and consumer agree in advance on the size of batches, product quality, price, or method of calculating prices. Especially such relations are developed between producers of agricultural products and processing enterprises. For example, 99% of pigs in the United States, 98% in Germany, and 100% in France are slaughtered in meat processing plants. The share of direct links between meat processing enterprises and producers has significantly increased – more than 78% of livestock in Germany, 60% in France, and more than 70% in the United States are processed through direct links [4]. The advantages of this model for farmers are guaranteed sales and prices, as well as loans and technical assistance, and for processors-guaranteed supplies of agricultural products. Sales by contracts and direct connections are the most important forms of organization that ensure market stability and are created with the assistance of the state, which sets certain requirements for product quality. This makes the market predictable and regulated.

In the food market of many developed countries, cooperatives play an important role, which, depending on the tasks performed, are divided into marketing, purchasing, service and processing. In the Nordic countries, up to 80% of farmer's products are sold through the system of agricultural cooperatives. In particular, in Finland, up to 90% of all commercial milk is sold through cooperatives, in Sweden and Norway, cooperatives carry out up to 90% of the slaughter and processing of livestock, and about 80% of the sale of grain, eggs and other products. In Sweden, cooperative enterprises account for up to 70–80% of food production. In Germany and Italy, agro-industrial integration is defined by cooperatives for the production of feed, seeds, agricultural machinery, and chemicals. The processing industry and trade have a high degree of concentration and monopolization [3].

In the United States, agro-industrial integration has reached a very high level, which has made it increasingly difficult for small producers to compete with large corporations. Some States have laws that prohibit so-called corporate agricultural production,

while some States only allow family-owned firms to operate (Nebraska, South Dakota, and Iowa).

The US food industry has a high level of concentration: the share of the 8 largest companies in the total production of the meat – canning industry is 38%, cheese – making-51%, dairy (without canning) – 30%, flour-46%, cereals –97%, beet-sugar-96%, soy oil production-70% [3].

An important place in the us agribusiness is occupied by food trade, where there is also a concentration of wholesale trade. So, one of the largest companies "Great Atlantic and Pacific» has more than 3,500 stores in 33 us States, about 40 different food processing plants, purchasing offices and warehouses.

In the food markets of many developed countries (USA, Great Britain, Sweden, etc.), along with the above, there are consumer cooperatives created for the purpose of purchasing food and reducing food costs, as well as more active participation of consumers in the organization of retail trade. For example, in the United States in the 70–80 years several thousand clubs were organized for the purchase of food in the form of cooperatives, consisting of consumers who jointly make orders for food to wholesalers and distribute it among the members of the cooperative. It should be noted that consumer cooperatives are an alternative form of distribution, but do not replace its traditional forms.

Market promotion measures – a wide range of marketing activities aimed at increasing the value of products to consumers-are important elements of consumer product marketing in market economies. Marketing tools are advertising, packaging, quality control, personal sales, trademarks, coupons, etc. The importance of marketing activities in food markets is especially enhanced in the competition between individual products (beef – pork), types of food (fresh products – against frozen), and distribution channels (retail stores – catering), which forces manufacturers to increasingly use marketing methods. In particular, advertising is an important marketing tool at all stages of the food movement. In the United States, food processors account for about

half of advertising costs in the food industry and 25% of advertising costs in all manufacturing industries. The share of food retailers is 30% of the total cost of advertising the food complex; in terms of costs, it is ahead of any other group of retailers. The rest of the cost of advertising food products is covered by farmers, commercial groups and other food companies.

An important aspect of marketing in food markets is information support. For example, in the United States, Canada and a number of other countries, there are information centers that, based on government statistics, publish collections containing information about the quantity and quality of products produced in the country and its individual regions. Producers can report their offers for sale free of charge, as well as receive free information about the state of crops, market threats, weather forecasts, and so on. For buyers, the information is paid at the established rates. Thus, the availability of available information has a positive impact on the market situation and contributes to making motivated decisions in the field of food production and sale.

Analysis of foreign experience shows that marketing as a system of management decisions and activities is very effectively used in countries with developed economies within the framework of the general concept of market management. States, using all possible levers of influence on the market, actively operate marketing tools, thus increasing the information security of market participants, promoting the development of partnerships between them, supporting national agriculture and production, protecting and stimulating the consumer.

The implementation of the strategy for the development of the consumer market, in particular, involves solving the problem of providing the population with food, mainly through self-sufficiency. Achieving food self-sufficiency is the most acceptable option for the development of the country's food market as a whole, which is reflected in many programs [5].

Linking food resources to market needs, rapid response of production to changes in effective demand

with high quality of goods and low costs are the main directions of marketing impact on the consumer market.

We believe that the marketing approach to managing the economic and environmental safety of the consumer market involves the study of this market and the implementation of its full potential, aimed at meeting both internal and external needs. In addition, the normal development of society implies the need to manage the development of needs by implementing the main management functions (Fig. 1).

To effectively manage the development of needs for consumer goods, it is necessary to use the results of needs research obtained at the level of micromarketing, namely:

– structuring needs for consumer goods and assessing their significance for individual groups of the population;

– determination of consumer characteristics of goods;

– segmentation of consumers in accordance with the level of satisfaction of needs for consumer goods.

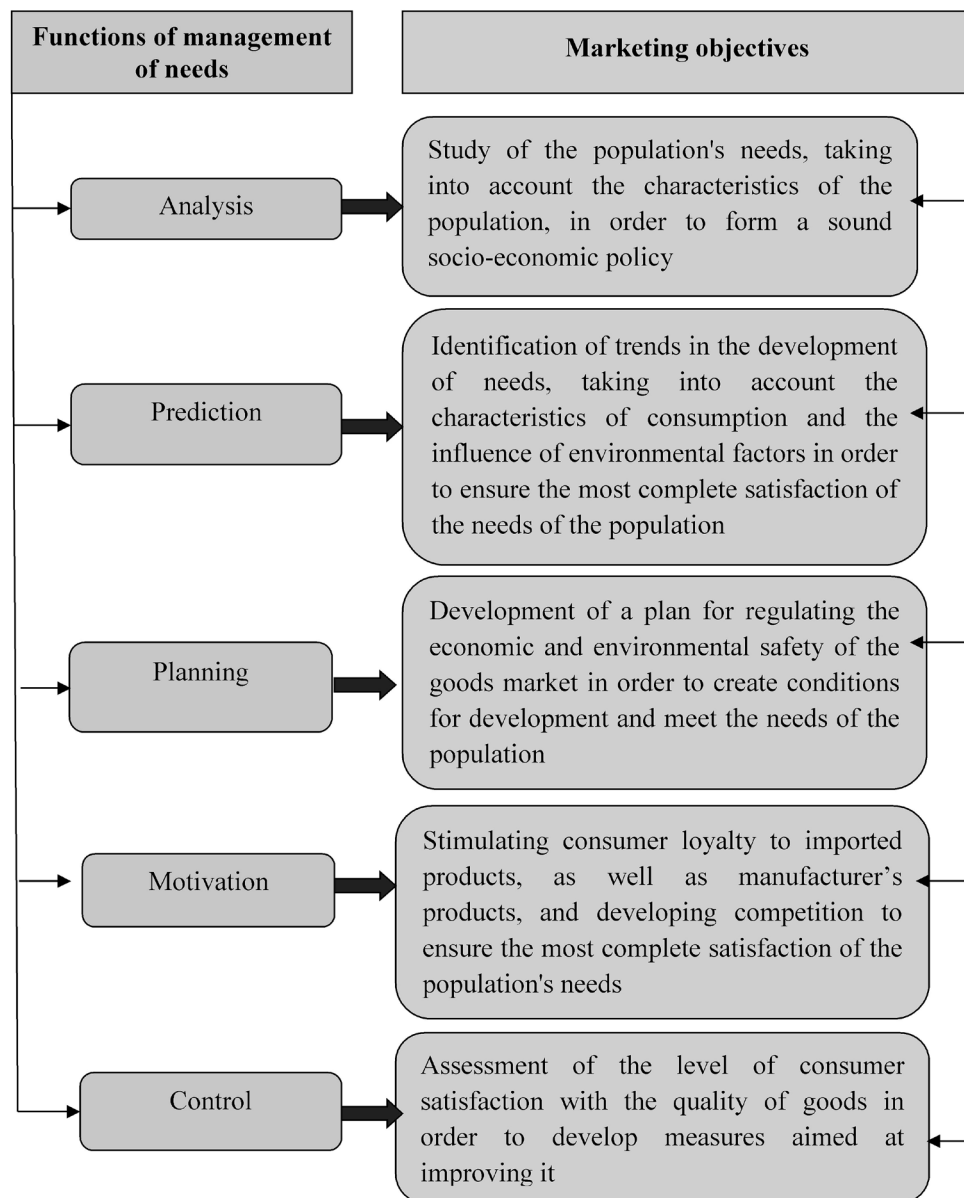| Functions of management of needs	Marketing objectives
Analysis	Study of the population's needs, taking into account the characteristics of the population, in order to form a sound socio-economic policy
Prediction	Identification of trends in the development of needs, taking into account the characteristics of consumption and the influence of environmental factors in order to ensure the most complete satisfaction of the needs of the population
Planning	Development of a plan for regulating the economic and environmental safety of the goods market in order to create conditions for development and meet the needs of the population
Motivation	Stimulating consumer loyalty to imported products, as well as manufacturer's products, and developing competition to ensure the most complete satisfaction of the population's needs
Control	Assessment of the level of consumer satisfaction with the quality of goods in order to develop measures aimed at improving it

Figure 1. Functions of marketing management of needs in the food market

Taking these positions into account in the management of economic and environmental safety of the consumer market will help to increase the economic and social orientation of state policy, create prerequisites for increasing consumer satisfaction with the quality of goods, and develop sound measures for state regulation of the consumer market and its balanced development [6].

Importers and producers of goods, acting on the principles of modern marketing, can achieve their commercial goals by meeting the needs of carriers of effective demand to the fullest extent possible, which implies harmonization of relations with consumers and orientation to their priorities.

IV. Conclusion and discussions

Based on our research of the consumer market of goods and the need for its regulation using marketing approaches, we can identify the following main goals of marketing in the consumer market of goods:

1) the most complete satisfaction of the population's needs for high-quality and economically accessible products through the most effective use of resource, production and labor potential, ensuring the profitability of producers of goods;

2) determining the directions of development of the consumer market based on the analysis of changes in effective demand and forecasting the situation on the goods market;

3) formation of consumer culture and consumer culture aimed at preserving the health and improving the quality of life of the population.

In the consumer market of goods, there is an objective need to align the goals of importers and manufacturers with state goals, which should be ensured through marketing, since it is a link between management structures and manufacturers. This process is carried out through information exchange, on the one hand, about the possibilities of importing or producing goods and their needs, on the other – about the situation in consumer markets, which, ultimately, allows to make the most correct management decisions regarding the development of the country's consumer market.

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MANAGING INTERCULTURAL COMMUNICATIONS IN DIGITAL REALITY: CHALLENGES AND OPPORTUNITIES

Abstract. In the 21st century, the interaction of civilizations has become an imperative of modern world business. The process is accompanied by contradictions, the overcoming of which brings us closer to world citizenship.

The world is becoming more and more united on the basis of economic, technological, information integration. Increased integration leads to an increase in cultural identity. This process creates a conglomerate of cultural societies that differ in their history, traditions, language and religion. They develop, interact and influence each other on the basis of intercultural communication.Both, public and private companies, regardless of their scale, are aware of the importance of managing intercultural communications. This is a new challenge for them, however, despite many difficulties, good shifts are observed (Thomas [1]).

Given the modern reality, the strategies for managing intercultural communications have almost completely shifted to the digital space, which, like all innovations, is accompanied by new opportunities and difficulties.While in early 2020, we thought we were sufficiently adapted to digital communications, the reality showed us – we misunderstood the role of digital communications.

Companies, public and private sectors have had to adapt to the new reality, rotate the work environment from offices to homes, manage staff remotely, train them with new technical skills, quickly eliminate unforeseen technical problems and completely transform into a new – digital reality.

Given that the management of intercultural communications is already a novelty for companies, they will have to create a new reality to minimize intercultural distance in remote – digital management.

Keywords: Intercultural, Challenges, Management, Digital.

Introductions: In the 21st century, the interaction of civilizations has become an imperative of modern world business. The process is accompanied by contradictions, the overcoming of which brings us closer to world citizenship.

The world is becoming more and more united on the basis of economic, technological, information integration. Increased integration leads to an increase in cultural identity. This process creates a conglomerate of cultural societies that differ in their history, traditions, language and religion. They develop, interact and influence each other on the basis of intercultural communication. At the same time, they are relatively independent and remain different, colliding with a single information space. These differences affect attitudes towards different issues – human rights, trade, environment, etc.– which is central to modern politics.

Given the modern reality, the strategy of intercultural communications management has almost completely shifted to the digital space, which like all innovations, is accompanied by new opportunities as well as difficulties.

While in early 2020, we thought we were sufficiently adapted to digital communications, the reality showed that we misunderstood the role of digital communications.

The public and private sectors have had to adapt to new realities, rotate the work environment from offices to homes, manage and hire staff remotely, train them with new technical skills, quickly eliminate unforeseen technical problems, and fully transform into a new digital reality.

Against the background that the management of intercultural communications is already a novelty for companies, they will have to create a new reality to minimize intercultural distance in terms of remote, digital management (Earley & Mosakowski [3]).

Since 1995, digital communication has gradually played an important role in the activities of companies. By the end of 2019, most of the world's companies were almost fully adapted to the digital space, however, the global constraints created by covid-19 in 2020 changed the dimension of digital communication capabilities in the shortest possible time and made their management particularly important (Forbes Georgia [4]).

The year 2020 revealed significant changes in people's digital communication behaviors. Humans' digital communication behavior changed in the very first quarter of the pandemic.

Necessitated remote work mode, with offices moving to homes, meetings moving from physical conference space to various online conference platforms, And informal relationships between employees from the company's dining / smoking areas to social networks.

In addition to the daily planning activities, the main task of the companies has been to maintain the company culture in remote conditions, which combines several important factors: maximum involvement of employees in the work process; maintain team activity; constructive movement of information and maintain informal relationships.

Switching to remote work has been an inconvenient process for some team members, some employees are still able to communicate with colleagues, and for others this process is difficult in the virtual space. They say that even new employees have not been able to communicate with colleagues and have a feeling that they are "alone", unable to work with team members. To summarize, the feeling of teamwork today is small. In order to create a fun mood in a virtual environment, it is possible to conduct various fun activities (Otinashvili & Vanishvili [6]).

After the usual physical communication, remote work should look like "real", so it is better for colleagues to communicate with each other with a video call instead of a phone call, which helps to maintain emotional engagement.

When starting a remote work practice, some adjustments and the development of new competencies are needed. Employees must learn to communicate online and conduct online meetings effectively, as well as collaborate with others remotely and use a variety of IT tools.

Results and discussion: workplace has weakened the importance of physical offices. Companies are given an unprecedented opportunity to pay minimal attention to their place of residence when selecting employees. It is possible to select the desired talent in any country of the world and include it remotely in the work process. This increases the multicultural benchmark of companies and the integration of different cultures into a common virtual space (Lewis [2]).

In the conditions of the pandemic, remote employment became possible in Georgia in several directions:

Education – Various educational institutions have managed to create an online learning platform in the shortest possible time, today it is possible to plan training on any topic in an online format, and at this time the trainer / teacher can be anywhere in the country or in any country in the world (Vanishvili, Katsadze & Vanishvili Nino [5]).

IT Directions – This field has had remote work experience before the pandemic, however the new reality has allowed us to distance the field almost completely, allowing.

HR direction – remote work made possible in all HR directions;

Services – The service sector has successfully moved into the online space, practice shows that remote services are becoming quite profitable for companies;

Call Center – In different businesses it has become necessary to add call center operators, and the work of employees in this profession is remotely as efficient as from the office.

Has increased, thus transforming the mono-cultural structure of companies as well.

Forming a multicultural team online is a new challenge for Georgian companies with limited multicultural management experience.

Conclusion: Multicultural team management is accompanied by a number of unique challenges and difficulties, these may be language barriers, teaching methods, ignorance of the culture of the colleague, and many others, the correct and delicate solution of which determines Goodden's overall success, so managers should be careful interests.

It is often believed that communication problem is a major factor that can destroy multicultural teams as participants may have different languages and communication styles.

In conversation, words convey our feelings, hopes and dreams. We are all closely related to our native language, which can make it difficult to travel to a foreign country where the majority of the population speaks another language. Now produce.

Managers must not only make sure that subordinates understand the company procedures and policies, but also ensure that everyone has an effective method of communication. For example, to say that this task is difficult would be insufficient. At the same time, the main language spoken in the office may be a second or third language for some employees, so colloquialism may be incomprehensible to them.

Moreover, they may mislead the use of slang and slang, which may seem completely incomprehensible to other team members. The problem is that some employees who feel uncomfortable with the language barrier may not be able to express their opinion on a particular issue at all.

One way to solve this problem is to develop a common communication system in the company, maybe the company will help several translators, create a working platform where all team members can express their opinion. It is advisable to offer the company's "native" language courses to employees. It is important that all team members feel needed and valued, it is not allowed to show favoritism towards those who speak the company's native language better.

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SOCIAL RESPONSIBILITY OF THE BANKING BUSINESS: CHALLENGES AND PROSPECTS

Abstract. In the scientific article, by taking into consideration newest literary sources and variable factual materials, there are examined challenges of corporate social responsibility in bank business and perspectives of development in Georgia. More concretely, purpose of research is revealing of challenges and factors hindering the development of corporate social responsibility of bank business in Georgia. It is also aimed to offering of corresponding recommendations on the basis of analysis of received results, as in the bank business, so at systemic level.

There was established that development of social corporate responsibility in the bank business requires popularization within the country scales and positioning as important component of economical development of the country, what is expressed in strengthening of the role of significance of corporate social responsibility and involvement of society as a whole.

Keywords: Corporate Social Banking Business, Corporate social responsibility, Social banks, Banking business, Social Finance, ESG Forms.

Introductions: Corporate social responsibility is a new challenge of modern world interest toward which was deepened in 2007–2010, after the world faced global economic crisis. In result of this crisis, social bank and social finances became important tendencies among customers of banking business (Vanishvili Merab, et al., [1]).

Crisis has transformed social banks from niche institutions to large, publicly apparent players. This success is conditioned by assuring of bank clients in the West that social bank is less speculative and more responsible, ethical and society-oriented way for keeping of money than traditional bank. After the crisis many people think that social bank is less egoistic and takes more care of general progress or interests of society than commercial bank.

Within the last 10 years corporate social responsibility became natural characteristic of banking business and banking business succeeded in perception of social responsibility as its main principle, in result of which there were formed aims and methods of environment protection, society-oriented activities. Corporate social responsibility became the best solution for integration of moral principles in nowadays economy into banking business.

Corporate social responsibility and social banking business in Georgia is comparatively new, although developing conception which is characterized by increasing tendency and is integrated into everyday life of society. It's growth is basically expressed in the mean and mostly in the large business, among them in the large banking subjects which have special attitude toward conception of corporate social responsibility and develop various methods in their everyday activities or long-term strategic aims (Otinashvili Ramaz, Vanishvili Merab [1]).

In the modern world, which is full of various challenges, and when the world is globally involved in competition chain, corporate social responsibility assists the business to maintain trust of employ-

ees, society, investors, to develop long-term purposes, which will be globally directed to the welfare of society.

From this standpoint it is especially interesting to observe development of social responsibility of banking business in Georgia, particularly, challenges it faces and perspectives of development.

Results and discussion: studies have shown that corporate social responsibility in Georgia is developing from 2004 and growing interest toward it is revealed every day. According to the data of 2021, Georgian financial sector basically consists of commercial banks. There are fifteen commercial banks on the market which possess 95% of the full assets of financial sector. Besides, concentration level is also high- particularly, two largest banks (Bank of Georgia, TBC Bank) own 70% of full assets. Besides, despite of the fact that share of microfinancial organizations is quite small, they play an important role, especially in financing of small and mean businesses and availability of finances in villages.

From presented 15 commercial banks, the mission of 12 banking subjects is carrying out of socially liable business so that to find areas of common interests with society and stages of development, to be able to create tools which cause in people the sense of reliable partner, offer to micro-, small – and mean business provision by sustainable financial services.

There shall be noted attitude of Georgian Government from the standpoint of assistance with development of social responsibility. Despite of the fact that the State is not directly involved in the management of conception of social responsibility, separate governmental initiatives and programs are directly or indirectly connected to and support introduction and development of social responsibility in Georgia. Important governmental initiatives are: "Purposes of sustainable development and Georgia", "Green economy", "EU Associations Agreement", "Business and human rights – Georgian governmental action plan for protection of human rights", "Tax benefits for charitable activities".

Georgian governmental initiatives within the frameworks of social responsibility also include the "Code of Corporate Management of Commercial Banks" which supports effective functioning and sustainability of banking sector and financial sector in general, improvement of investors trust and stable and effective functioning of the banking sector.

Nowadays, strengthening of the role of financial sector in sustainable development of the country in Georgia is supported by National Bank of Georgia. It develops the framework of sustainable development, within frameworks of which calls participators of capital market to take into consideration environmental protection, social and governing (ESG) issues and management of risks connected to them for financial stability and sustainable development of economy (Vanishvili, Katsadze, et al., [6]).

In 2021 commercial banks were first asked to fill in ESG (Information in ESG forms review key performance indicators of Georgian financial system in direction of ESG (Key Performance Indicators, KPIs) forms. There analysis and research have shown that ESG practice existed in banks are different. Small part of commercial banks is quite forward from the standpoint of management of ESG and sustainable development and they also have other social and environmental policies. From the other hand, there still are banks which do not have ESG policy yet. Although, some of them are in the process of development of the same policy, and some of them plan to introduce ESG practice in the nearest future.

In connection to ESG reports of banking business "sustainable development in Georgia, report 2021", there is also noted that based on the data of 2021, majority of commercial banks in Georgia do not have explanation of green loans or system of their classification and correspondingly they do not possess data on green loans. Only six from fifteen banks submitted data on green loans. Besides, from the mentioned six banks majority do not have official explanation or classification system of green loans and have in their reports only data of loans issued for financing of projects

connected to energetic efficiency and renewable energy (Vanishvili & Katsadze [6]).

On the basis of all the mentioned we can note that despite of higher than average development of social responsibility in the bank sector, they still do not have correct explanation toward green loans.

Based on the analysis of ESG reports of 2021 by the banking sector, there was ascertained that Georgian financial institutions see significance of CSR as the means of improvement of image and reputation. In majority of cases accent of banking business is directed toward creation of new products and innovations which allow them to be included in society. And they less acknowledge the fact that correctly realized corporate responsibility is the basis for improvement of financial results (Shanava & Vanishvili [2]).

Despite of the mentioned, banking business in Georgia, in relation to its possibilities, spends quite large amounts for charity and various activities beneficial for society. If some years ago such initiatives often had system-less, spontaneous character, in the last years there is noted a tendency of moving to more systemic, planned activities having sustainable results. Bank subjects pretending for the role of leaders of Georgian banking business, acknowledge that for achievement of success and maintaining of competitiveness they shall be guided by high standards of corporate social responsibility and correspondingly be accountable toward society.

In Georgian banking business one of the largest bank groups is TBC Bank, which offers to society wide spectrum of traditional financial services. Has customer-oriented business model, is always distinguished by innovation and creates projects corresponding to behavior or demands of the customers.

Purpose of TBC Bank is to manage with responsibility the environmental and social risks connected to activities of its business customers. It has undertaken an obligation to actively finance such business activities which increase positive influence over environment and economy. 83.2% of their sustainable portfolio includes projects of renewable energy, 2.8% – energy-effective projects, 10.8% – projects for supporting of youth, and 3.2% – projects "women in business".

Each activity realized by TBC Bank which is connected to corporate social responsibility of business making, from its part, is connected to the outflow of monetary means and increasing of expenses, although real result in connection to complete profitability is positive, because expenses and investments made in motivation and growth of employees and also in maintaining of customers satisfaction, finally positively influences on profitability and image of the company.

In Georgia, from 2007 there are actively conducted researches in direction of corporate social responsibility, they are basically related to the estimation of scales of disclosure of CSR novelties or new tendencies, its development level, which is generally typical for Georgian business. By researches it is confirmed that from 2007 to present interest toward the social responsibility is growing. Dynamics of its development and integration into business activity is becoming annually noticeable. Growing dynamics is basically noticed in the large and mean business.

By analysis of full or separate fragments of researches of 2007–2021 we can say an opinion that despite of positive dynamics, in Georgia corporate responsibility goes forward, although with slow tempus, in acknowledgment of the contents or conception meaning which are represented by CSR. And again, beyond of all positivity it is interesting to define the level of society awareness, while social responsibility is managed right by request of such society and in such environment where business is operating (Shanava & Vanishvili [2]).

Purpose of research conducted by is in June 2021 was to answer the main question: how is attitude of the customer and quality of awareness toward corporate social responsibility of banking business. Analysis of results has shown us that estimations of research participators in connection to contents of

social responsibility is non-homogenous: 73.3% of interviewed considers that social responsibility is "support of such actions which in prolonged period create welfare of society", 63.2% focused on participation of the company in environmental measures/ ecology, 58.7% fixes that social responsibility is support of society with disabilities, 51.4% consider that social responsibility is support of education/ culture/ sport, and according to 41.7%, social responsibility means charity.

Analogously, non-homogenous estimations were received by us in connection to the "perception" of social responsibility. At the question: which criteria shall the company meet in order to consider it, as socially liable, 59.9% of respondents responded that within the frameworks of social responsibility the company shall offer to society product of good quality, that is safe and has a fair price.

We have to note that at the question "How many banking business existed in Georgia uses social responsibility", 55.5% of questioned respondents think that less than 25% of banking companies apply social responsibility in their activities.

It is attention-worth fact that according to the data of 2021, the mission of twelve from fifteen commercial banks registered in Georgia is social responsibility, and society has no information in connection with this, or possess such information in a small volume.

We think that this question requires deep analysis, from the one hand, we can consider response of respondents as deficiency of information, for example, social measures are less illustrated in the media, informative magazines-newspapers, company webpages, or, from the other hand, the interest of society itself is low, to get more information on companies or organizations they come across with and every day became their customers at their own will or accidentally (Vanishvili, Lemonjava, et al., [6]).

According to the information of majority of respondents, information on social responsibility of bank organizations is not enough, and according to

the opinion of 85.8% – realization of social measures is necessary. Both components for CSR are casual-resultative and if the customer becomes more demanding toward the company, in order to get correct information on conception of CSR, to get information on realized social measures, the purpose will unconditionally bring us to the result and perception of society that companies in Georgia have less sense of responsibility toward CSR, will be changed in opposite direction.

According to the results of study we can suppose that in most cases companies perceive social responsibility as expenses and not as investments and they are less involved in social measures to be realized. 53% of interviewed considered that government less supports social measures. Here too, from the one hand, we can agree with opinion of society, while direct obligation of the State and government is improvement of social condition of society, creation of sustainable economical environment, and, from the other hand, while social responsibility is willful activity, the society itself and business shall be interested in creation of significant ecological conditions and financial availability for activities or living environment.

And finally, what about the fact that measures realized by banks are less known for society, it is wishful to make information more available via various mass spreading, internet or company webpage.

Conclusion: based on the results of study, there were made the following recommendations for development of corporate social responsibility in banking business: (1) the first purpose of banking business is development and support of economical sustainability of the country. Correctly planned and realized by them social responsibility is the basis of long-term success as inside the country, so abroad; (2) in order to increase involvement and role of the government in development of social responsibility it is needed to introduce various normative acts or laws, to introduce encouraging benefits for business; (3) business and government shall act within frameworks of social responsibility

in order to observe those three components which are unified by conception – corpo corporate rative

social responsibility – planet, environment, society.

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