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CONTENT

CHEMICAL SCIENCES

Koshchii I., Klimko Yu., Vasilkevich O.

ANTI-CORROSION AND ANTIBACTERIAL TESTS OF
QUATERNARY SALTS BASED ON PYRIDINE-
CONTAINING AMIDES AND UREAS.....3

ECONOMIC SCIENCES

Yatno, Rini Adiyani, Kurniawati

Darmaningrum

ANALYSIS OF PUBLIC SATISFACTION WITH PUBLIC
SERVICE PERFORMANCE AT JATISRONO DISTRICT
OFFICE (CASE STUDY ON THE COMMUNITY IN
JATISRONO DISTRICT, WONOGIRI REGENCY) 19

Sri Wijastuti, Darsono, Kurniawati

Darmaningrum

ENHANCING RURAL TOURISM THROUGH DIGITAL
MARKETING: ANALYZING TOURIST BEHAVIOR IN
TEMBI TOURISM VILLAGE 28

Abasova S., Hasanzade R.

ANALYSIS OF INVESTMENT PROMOTION IN
AZERBAIJAN'S ECONOMIC RELATIONS WITH THE
ORGANIZATION OF TURKIC STATES (OTS).....35

Sartanova N., Kenzhebekova D.

THE ROLE OF FINANCIAL LITERACY IN ENSURING
FINANCIAL SECURITY OF THE POPULATION 41

Shaoyun Lin, Dorj Tuvd, Ochgerel Buljinsuren

EMPIRICAL ANALYSIS OF THE IMPACT OF AI ON THE
EMPLOYMENT OF EMPLOYEES IN SERVICE
ENTERPRISES 45

Urinov B.

CONCEPTUAL FRAMEWORK OF CORPORATE
GOVERNANCE.....54

MEDICAL SCIENCES

Khozhayev A., Kaliyeva I., Balakhanova S.,

Stamkulova G., Ormanov K., Taiteli G.

OVARIAN CANCER: A MODERN VIEW OF THE
PROBLEM 59

PEDAGOGICAL SCIENCES

Ibrahimova S.

THERE IS A PLACE FOR EVERYONE IN EDUCATION:
THE IMPORTANCE OF AN INCLUSIVE APPROACH IN
PRESCHOOL EDUCATION STRENGTH 69

Atamanyuk S., Kirichenko O., Kubatko A.

BALANCED DIET FOR ATHLETES WHO ENGAGE IN
SPORTS AEROBICS 75

Binnatova Sh.

FEATURES OF MATHEMATICAL DEVELOPMENT OF
PRESCHOOL CHILDREN WITH DISABILITIES 79

Ismailova R.

ADAPTATION STRATEGIES IN AN INCLUSIVE
EDUCATIONAL ENVIRONMENT 84

PHILOLOGICAL SCIENCES

Samadova M.

TURKISH ORIGIN WORDS IN THE SLAVIC
LANGUAGES 89

Abisheva V., Yarkaev M.

ON THE ISSUE OF SHAPING THE MEDIA CULTURE OF
YOUTH 92

PHYSICAL SCIENCES

Antonov A.

TIME TRAVELS FOR PEOPLE ON EARTH ARE ALREADY
PHYSICALLY AVAILABLE 96

Abbasov V.

QUANTUM ENTANGLEMENT AND STRING
THEORY.....108

POLITICAL SCIENCES

Dr Oleksandr Veretilnyk

JAISH AL-ADL: AN ANALYSIS OF ITS ACTIVITIES,
IDEOLOGY, AND IMPACT ON IRAN'S NATIONAL
SECURITY 112

TECHNICAL SCIENCES

Karimov K., Mammedova Z., Dadashova N.

RISK FACTOR IN ECONOMIC FORMATION FOR
DEVELOPMENT OF OIL AND GAS RESOURCES (ON THE
EXAMPLE OF AZERBAIJAN) 119

CHEMICAL SCIENCES

ANTI-CORROSION AND ANTIBACTERIAL TESTS OF QUATERNARY SALTS BASED ON PYRIDINE-CONTAINING AMIDES AND UREAS

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Abstract

The tests have shown that the synthesized salts [1] 3-(N-1-naphthylcarboxamido)-N-benzylpyridinium chloride, 3-(N-2-naphthylcarboxamido)-N-benzylpyridinium chloride, 3-(N-2-naphthylcarboxamido)-N-allylpyridinium bromide and 3-(N-(3-quinolyl-N-benzylquinolilium chloride carboxamido)pyridyl)-N-benzylpyridinium chloride exhibit significant anti-corrosion activity compared to the industrial inhibitor KI-1.

3-(N-phenylcarboxamido)-N-benzylpyridinium chloride, 3-(N-1-naphthylcarboxamido)-N-benzylpyridinium chloride and 3-(N-2-naphthylcarboxamido)-N-benzylpyridinium chloride were investigated for antibacterial and fungicidal activity.

The Firefly software package was used to calculate the most energetically favorable conformations for the compounds 3-(N-phenylcarboxamido)-N-benzylpyridinium chloride, 3-(N-1-naphthylcarboxamido)-N-benzylpyridinium chloride, 3-(N-2-naphthylcarboxamido)-N-benzylpyridinium chloride, and 3-(N-(2-pyridyl)carboxamido)pyridyl-N,N-dibenzylpyridinium chloride, 3-(N-(4-pyridyl)carboxamido)pyridyl-N,N-dibenzylpyridinium chloride, and 3-(N-(3-quinolyl-N-benzylquinolilium chloride)carboxamido)pyridyl-N-benzylpyridinium chloride. It is shown that compounds with the highest anti-corrosion ability have a more planar fragment, as a result of which the protected metal surface increases. For these same compounds, the calculation of the energies of the VZMO and HVMO, as well as their dipole moments, was carried out. A correlation was established between the corrosion inhibition coefficient γ and the energy difference ΔE and their derivative ΔN (the fraction of electrons transferred). An exponential form of these correlations was proposed.

Keywords: corrosion inhibitors, quaternary ammonium salts, N-arylnicotinamides, quaternized and diquaternized salts, quaternized salts based on nicotine-containing ureas.

Materials and methods

Corrosion tests of salts in 3M hydrochloric acid were carried out by the massometric method, using steel samples of 08 kp and using 3 g·l⁻¹ of synthesized salts for inhibition. The duration of the tests at 40°C was 2 h, at 60°C – 1 h and at 80°C – 0.25 h. The results of the experiments are presented in the corresponding tables.

Some synthesized salts were tested for possible antibacterial and fungicidal effects against *Staphylococcus aureus* (S. aureus), *Escherichia coli* (E. coli), *Pseudomonas aeruginosa* (P. aeruginosa) and *Candida* (C. albicans). The test results were compared with the most effective pyridinium salt, 4-(2-(2-methylbenzylidenehydrazyl)-1-(3-phenylpropyl)pyridinium bromide, previously studied, and ceftazidime, a pharmacological drug with a broad spectrum of antibacterial activity. The results of the studies are presented in Table 7.

Results and discussion.

The method of anti-corrosion protection of metals, based on the use of corrosion inhibitors, i.e. chemical

compounds, "which, being present in the system in sufficient concentration, reduce the rate of corrosion of metals", has been known for many centuries [3]. However, only in the middle of the twentieth century. scientific ideas about the mechanism of action of inhibitors were formed, and then the first successes in their synthesis appeared. The search for such a method is due to the great damage caused by corrosion, not only in technological or economic terms [4]. No less dangerous is the deterioration of the environmental situation caused by the ingress of corrosion products into the environment [5] or toxic reagents that are formed as a result of corrosion of chemical production equipment and pipelines [6]. Considering that in industrially developed countries, damage from metal corrosion exceeds 5% of the national product, one of the main methods of combating it - the creation and use of inhibitors - should be considered as an urgent scientific and technical task.

The action of inhibitors is associated with a change in the state of the protective surface due to adsorption or formation of poorly soluble compounds with metal cations, which reduce the area of the active

surface of the metal. The modern classification consists of oxidizers, inhibitors of adsorption, complexing and polymer types [7]. Such a division indicates the diversity of the mechanisms of action of inhibitors and the possibility of using the achievements of various fields of chemistry for protection against corrosion. Among inhibitors, an important place is occupied by organic compounds that are capable of forming with cations of the metal being protected, poorly soluble in water compounds [2, 8-10]. As a result of their interaction with the surface, ultrathin (thickness ≤ 10 nm) protective films are often formed, resistant to the effects of the corrosive environment (humid atmosphere, aqueous solutions of salts and even some acids).

In the review [12], the ability of one of the nitrogen-containing heterocyclic compounds, pyridine, to form complex compounds on the surfaces of some metals in aqueous solutions was noted. However, the effectiveness of corrosion protection using pyridine is noticeably lower than when using its derivatives containing additional amino groups, for example, in position 2 or 4. It was assumed that if there is a second reaction center in the inhibitor molecule, under certain conditions it is possible to form chelate cycles with metal cations, which significantly increases the stability of the protective layer on the surface. This possibility can be realized during the polymerization of a heterocyclic base, such as polyvinylpyridine. The strengthening of the bond with the metal is achieved not only due to the bond with the heteroatom, but also due to the π -electron interaction of the aromatic nucleus with the surface, which has often been explained by the ability of quinoline and its derivatives to form a thin, sparingly soluble film of a complex with the metal, which protects iron, copper and zinc in aqueous solutions at pH ≥ 5.0 . The protection of copper by polycyclic N-containing heterocycles has been explained in a similar way [13].

Many works are devoted to the experimental study of heterocyclic inhibitors [11, 14-17]. On the other hand, many theoretical studies are presented to determine the relationship between structural and electronic parameters and the corrosion inhibition efficiency [18, 19].

The HOMO and LUMO frontier orbitals of chemical compounds are very important in determining their ability to inhibit corrosion. Previously, a correlation was found between the corrosion rate (or the efficiency of its inhibition) and the E_{HOMO} energy, which is often associated with the electron-donating ability of the molecule. A review of the literature shows that the adsorption of an inhibitor on a metal surface can occur on the basis of donor-acceptor interactions between the π -electrons of heterocyclic compounds and vacant d-orbitals of metal surface atoms [86]. A high E_{HOMO} value of a molecule indicates its ability to donate electrons to a corresponding acceptor molecule with low energy of free molecular orbitals. An increase in the E_{HOMO} value promotes adsorption, and, consequently, an increase in the efficiency of corrosion inhibition, affecting the process of electron transfer through the adsorbed layer. Similar relationships have been found between the corrosion rate and the difference between these two energies (the energy "gap"): $\Delta E = E_{\text{LUMO}} - E_{\text{HOMO}}$ [20-22].

The HOMO energy indicates the ability of a molecule to accept electrons. The lower the E_{LUMO} value, the more likely it is that the molecule will accept electrons. Therefore, a large value of ΔE will give a low inhibitory capacity and vice versa – a decrease in the value of ΔE contributes to the effectiveness of corrosion inhibition [23]. Thus, a correlation was found for some piperidine derivatives [24], benzothiazoles, pyrimidines, quinolines [25], pyrazolepyrimidines [26], and pyridines [27].

Another way to relate the inhibition efficiency to the molecular structure parameters is to calculate the fraction of electrons transferred from the inhibitor to the metal surface. The E_{HOMO} and E_{LUMO} of the inhibitor molecule are related to the ionization potential (I) and electron affinity (A), respectively [95]. The ionization potential and electron affinity are defined as $I = -E_{\text{HOMO}}$ and $A = -E_{\text{LUMO}}$, respectively. Then the absolute electronegativity (χ) and absolute rigidity (η) of the inhibitor molecule are approximated as follows [23]:

$$\chi = \frac{I + A}{2}$$

$$\eta = \frac{I - A}{2}$$

The softness of an inhibitor molecule is expressed through the inverse stiffness:

$$S = \frac{1}{\eta}$$

The softness of an inhibitor molecule is expressed through the inverse stiffness:

$$\omega = \frac{\mu^2}{2\eta}, \text{ де } \mu - \text{ дипольний момент.}$$

By definition, this measure measures the tendency of a chemical to accept electrons. A more reactive nucleophile is characterized by a lower μ , ω value; conversely, a good electrophile is characterized by a higher μ , ω value. Absolute electrophilicity measures the stabilization energy when the system acquires an additional electron charge ΔN from the environment. Thus, the fraction of electrons transferred from the inhibitor to the metal surface, ΔN , is given by [27]:

$$\Delta N = \frac{\chi_{\text{Fe}} - \chi_{\text{inh}}}{2(\eta_{\text{Fe}} + \eta_{\text{inh}})},$$

where χ_{Fe} and χ_{inh} are the absolute electronegativity of iron and the inhibitor molecule, respectively; η_{Fe} and η_{inh} are the absolute rigidity of iron and the inhibitor molecule, respectively. In order to calculate the fraction of electrons transferred, the theoretical value $\chi_{\text{Fe}} = 7.0$ eV [27] and $\eta_{\text{Fe}} = 0$ are used, assuming that for the metal mass $I = A$ [28]. The graphs of the dependences of the corrosion rate and the degree of corrosion protection on the fraction of electrons transferred are presented in Fig. 1.6.5 and Fig. 1.6.6, respectively [27]. Значення ΔN показує перенесення електронів від молекули до поверхні металу, якщо $\Delta N > 0$ і навпаки, якщо $\Delta N < 0$ [98, 99]. Ефективність

гальмування корозії зростає із збільшенням донорної здатності молекули на металевій поверхні, якщо $\Delta N < 3,6$.

Anti-corrosion tests of quaternized amide salts.

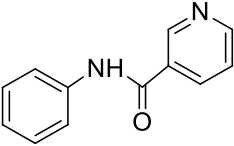
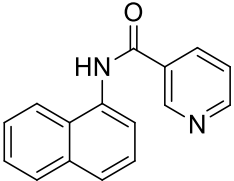
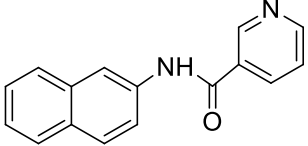
As can be seen from the data in Table 1, when going from nicotinamide **15** to N-arylnicotinamides **9-11**, their anticorrosive properties increase, especially for N-naphthylamides **10** and **11**. This dependence can be associated only with a change in the structure of the amide group, since the protonated pyridine fragment in all these amides is the same. In this regard, it can be assumed that the corrosion rate decreases both due to the adsorption of amide groups on the metal surface and due to their ability to form polymeric complexes with Fe(II) as a corrosion product [29]. Calculation [30, 31] of the geometric parameters of the most energetically favorable conformations of N-arylnicotinamides **9-11** shows that their structure remains close to the planar one from **9** to **11**, and the amide group is sterically accessible enough to create surface complexes of the chemisorbing type. This is evident from the decrease in corrosion rate with increasing temperature, for example, in the presence of amides **10** and **11**. Amide **9** probably forms unstable surface complexes due to the freer rotation of the phenyl radical around the C-N bond [32],

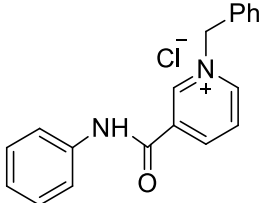
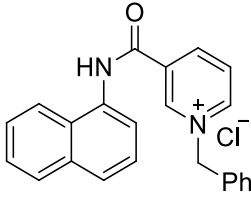
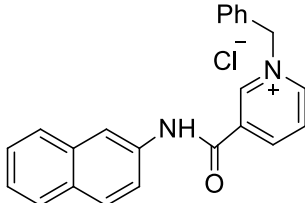
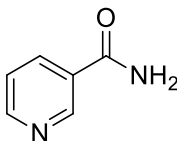
while the adsorption-blocking effect and the size of the naphthyl radicals contribute to the formation of stronger complexes and, accordingly, increase the protection of the metal surface. The best test results were obtained from compounds **13** and **14**, for which the corrosion inhibition coefficient γ at 80°C is 766 and 733, respectively [33]. For comparison, it should be noted that for the industrial inhibitor KI-1 this coefficient is 252.5 at the same temperature.

Quaternization of N-arylnicotinamides **9-11** with benzyl chloride allows creating in their structure another adsorption center – quaternary ammonium cation, which affects the electrode processes due to electrostatic adsorption [34]. The benzyl fragment in the obtained salts **12-14**, as shown by calculations of their geometric parameters [30, 31], is located above the plane of the pyridine ring and does not interfere with the adsorption of the corresponding ammonium cation on the metal surface. As in the case of amides **9-11**, the size and less free rotation of naphthyl radicals around the C-N bond in salts **13** and **14** probably contribute to the formation of stronger complexes of the chemisorbing type on the metal surface than for salt **12**, obtained on the basis of N-phenylnicotinamide **9**. This leads to a significant decrease in the corrosion rate and an increase in the degree of metal protection (see Table 1).

Table 1.

Effect of N-arylnicotinamides **9-11** and 3-(N-arylcarboxamido)-N-benzylpyridinium chlorides **12-14** on the corrosion of 08 kp steel in 3M hydrochloric acid

Compound	40°C		60°C		80°C	
	γ	Z, %	γ	Z, %	γ	Z, %
 9	4.2	76.2	3.5	71.4	3.9	74.4
 10	155.5	99.3	313.1	99.6	223.1	99.5
 11	115.5	99.1	220.4	99.5	362.5	99.7

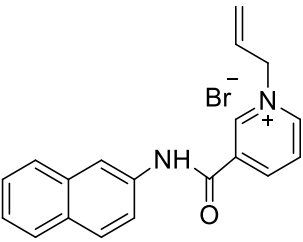
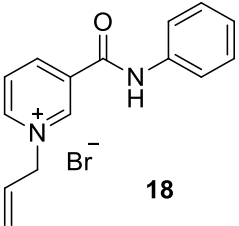
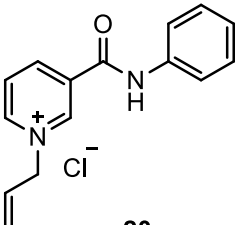
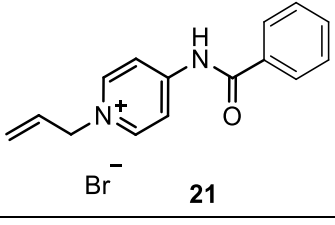
 12	19.9	95.0	12.6	92.1	9.7	89.7
 13	224.0	99.5	446.0	99.8	766.0	99.9
 14	192.5	99.5	420.0	99.8	733.0	99.9
 15	3.5	71.4	2.4	58.3	2.3	56.5

To assess the anticorrosive properties of N-alkylpyridinium halides, their effect on the corrosion of 08 kp steel in 3M hydrochloric acid at 40-80°C was studied, determining the corrosion inhibition coefficient γ and the degree of corrosion protection Z. The results of the experiments for a number of the most corrosion-retarding salts are given in Table 2, from which it follows that the more effective inhibitors are salts based on N-aryl nicotinamides (**17**, **18** and **20**). Among them, compound **17** is of interest, for which the corrosion inhibition coefficient γ increases to 354.6 when the temperature rises to 80°C. Such an increase in the protective effect in salt **17** can be explained by the effect

of chemisorption of the naphthyl radical on the metal surface, since its rotation around the C-N bond is complicated in comparison with the rotation of the phenyl radical in compounds **18** and **20**. This confirms the calculation of the geometric parameters of energetically favorable conformations of salts (**17**, **18**, and **20**), given by the method proposed in [30] and shows that the main fragment of the structure of salt **17** is closer to planar than that of salts **18** and **20**. A similar pattern is observed for 3-(N-arylcarboxamido)-N-benzylpyridinium chlorides [35, 36].

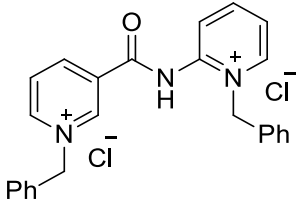
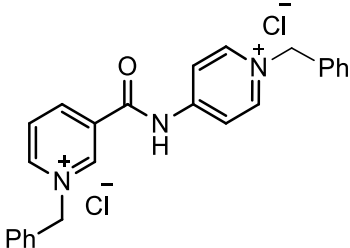
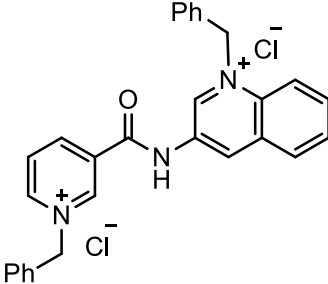
Table 2.

Effect of substituted N-allylpyridine halides on corrosion of 08 kp steel in 3M hydrochloric acid

Compound	40°C		60°C		80°C	
	γ	Z, %	γ	Z, %	γ	Z, %
 17	120.3	99.2	15.3	99.5	354.6	99.7
 18	93.7	98.9	78.3	98.7	64.5	98.5
 20	165.0	99.4	159.6	99.4	145.6	99.3
 21	64.5	98.5	84.6	98.8	100.3	99.0

The results of anti-corrosion tests of diquaternized amides are presented in Table 3.

Table 3.Effect of diquaternized amides **28-30** on corrosion of 08 kp steel in 3M hydrochloric acid

Compound	40°C		60°C		80°C	
	γ	Z, %	γ	Z, %	γ	Z, %
 28	44.0	97.7	56.3	98.2	65.3	98.5
 29	133.5	99.3	197.5	99.5	228.9	99.6
 30	113.9	99.1	206.7	99.5	326.2	99.7

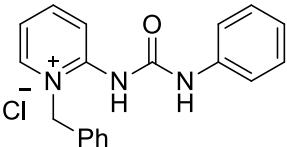
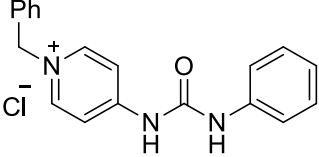
As can be seen from the table, when going from salt **28** to **30**, their anti-corrosion properties increase. It can be assumed that the conformation of the molecules during this transition changes in such a way that it contributes to maximum protection of the metal surface. This is confirmed by the corresponding calculations.

It should also be noted that compound **30**, the best performing of the salts presented here, outperforms the industrial inhibitor KI-1 by a factor of 1.3.

Anti-corrosion tests of quaternary urea-based salts.

As can be seen from the data in Table 4, the indicated salts exhibit moderate anti-corrosion activity. This is due to the free rotation of the phenyl radical around the C-N bond, which creates a small area for protecting the metal surface.

Table 4.Effect of salts **33** and **34** on the corrosion of 08 kp steel in 3M hydrochloric acid.

Compound	40°C		60°C		80°C	
	γ	Z, %	γ	Z, %	γ	Z, %
 33	65.3	98.5	89.5	98.5	130.5	99.2
 34	62.1	98.4	89.5	98.5	163.1	99.4

Calculation of conformations of synthesized quaternary salts.

The calculation was performed using the Firefly (formerly known as PC GAMESS) B3LYP/6-31G* software package, which allows finding the conformation with the minimum energy, determining the

HOMO and LUMO energies, and the charges of chemisorption centers. Thus, quaternary salts **12-14** (monoquaternized) and **28-30** (di-quaternized) were calculated. The figures below show the most energetically favorable conformations for these compounds.

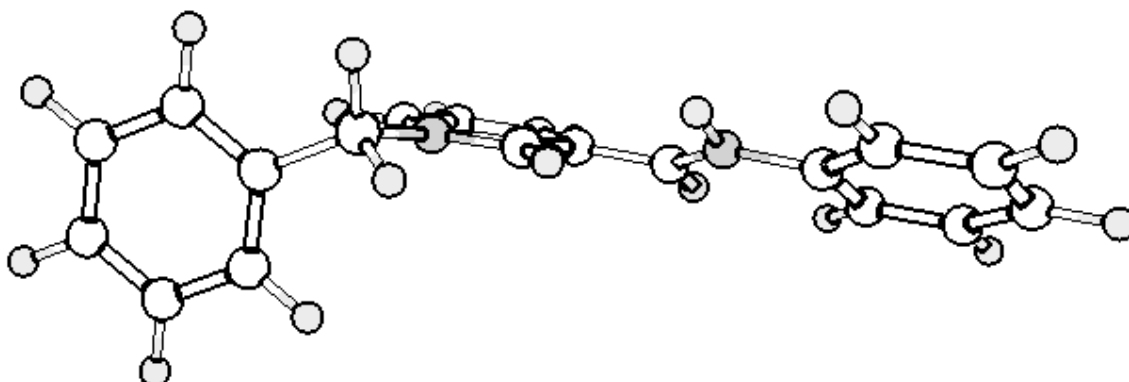


Fig. 1. The most favorable conformation of compound 12

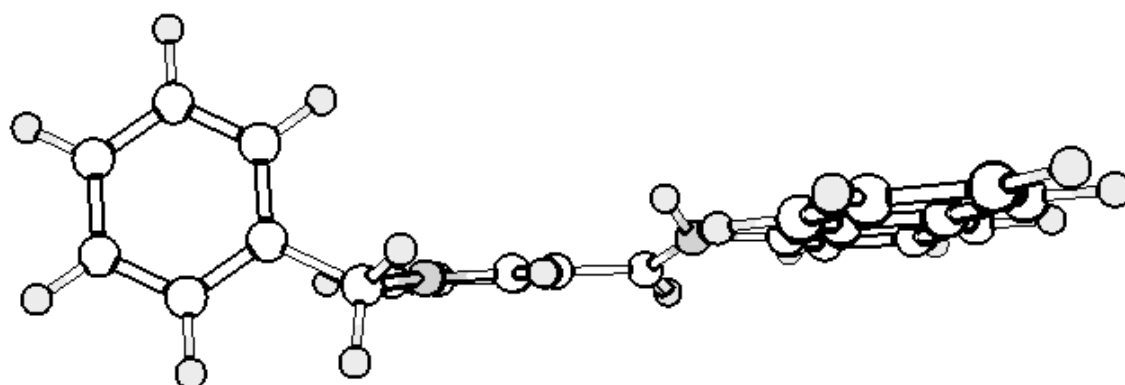


Fig. 2. The most favorable conformation of compound 13

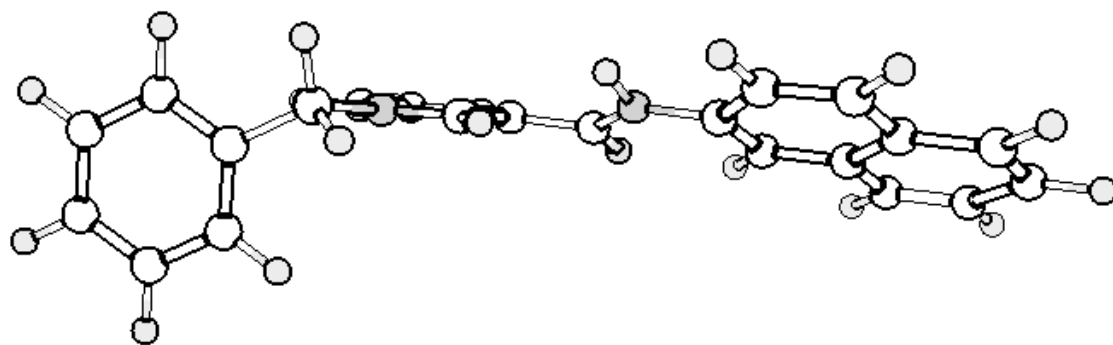


Fig. 3. The most favorable conformation of compound 14

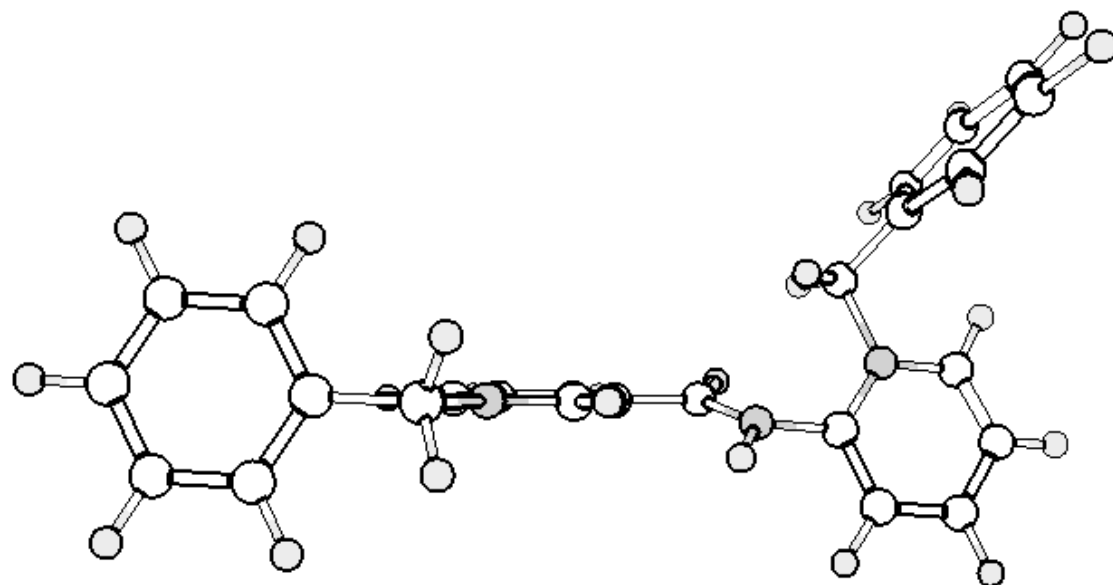


Fig. 4. The most favorable conformation of compound 28

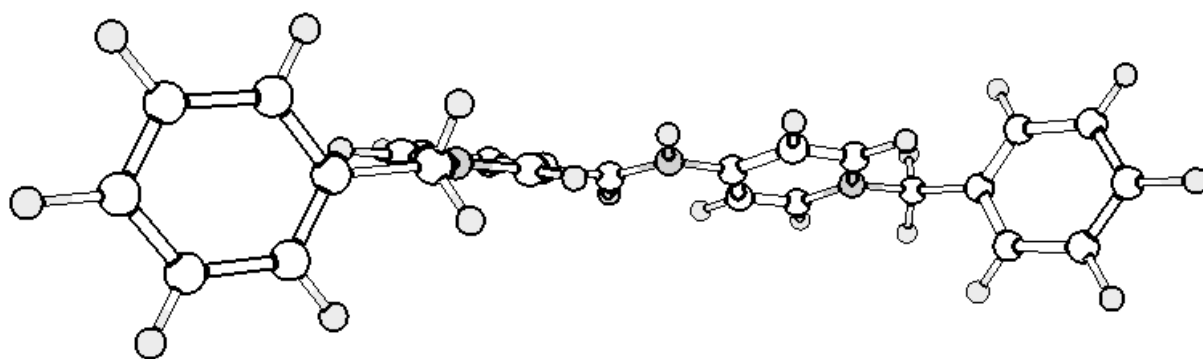


Fig. 5. The most favorable conformation of compound 29

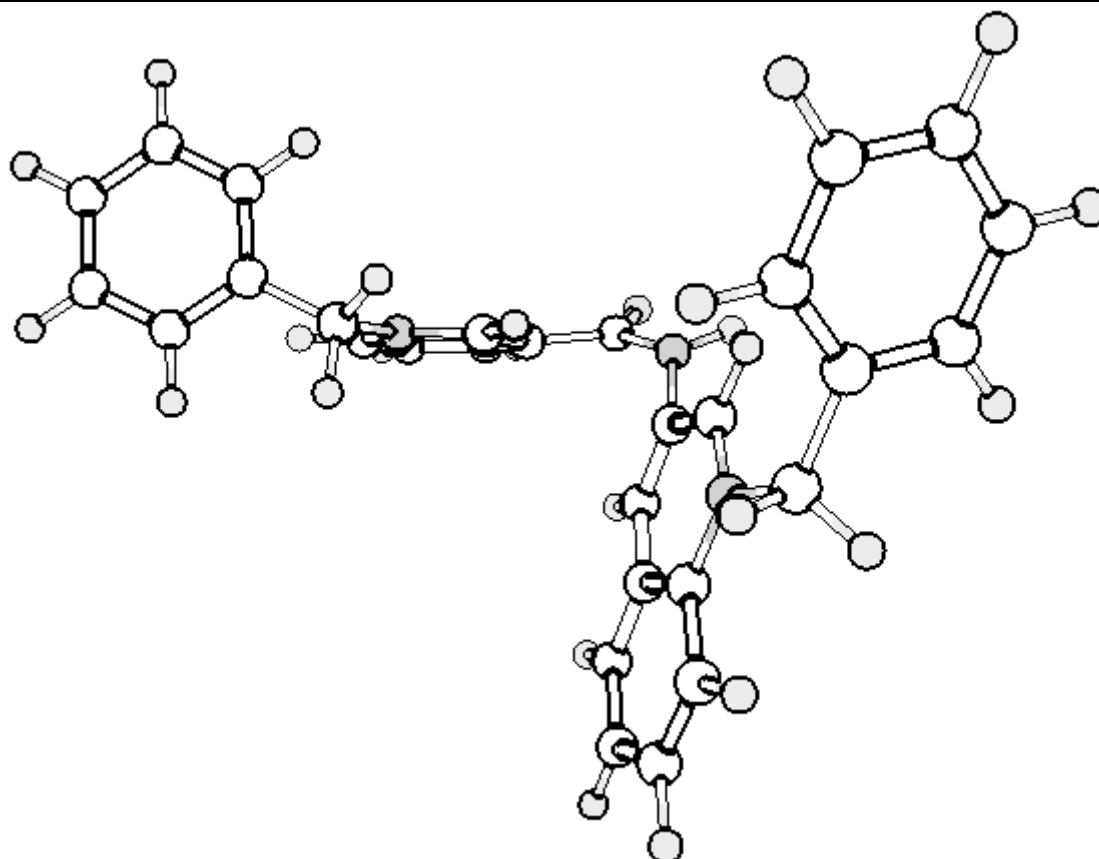


Fig. 6. The most favorable conformation of compound 30

As can be seen from the figures, monoquaternized salts have a structure close to planar, which allows them to cover a larger area of the metal surface, while the conformational arrangement of diquaternized salts does not allow two centers to be equally fixed on the metal surface and work simultaneously.

Calculations showed that the charges on the nitrogen atoms of different compounds are almost the same and are on average: for pyridinium nitrogen - -

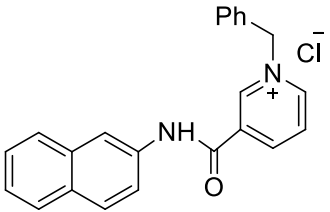
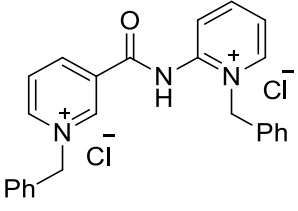
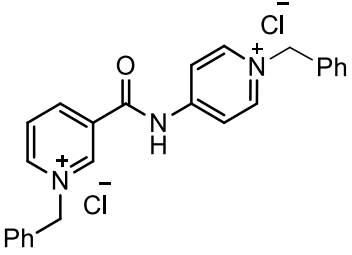
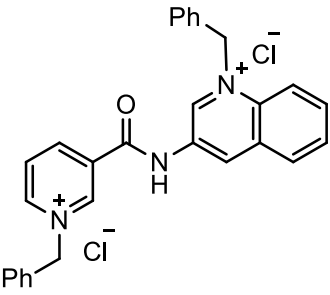
0.926, for amide nitrogen - -1.069, for pyridine (quinoline) nitrogen of diquaternized compounds - - 0.977. As can be seen, the charge of amide nitrogen is also a sorption center and can participate in fixing the molecule on the metal surface.

The program also determined the HOMO and LUMO energies, the indicators of which are presented in table 5.

Table 5.

Results of calculations of MO energies of synthesized salts

Compound	Corrosion inhibition coefficient		Energy of MO, eV		$\Delta E = E_{\text{LUMO}} - E_{\text{HOMO}}$, eV
	γ (80°C)	$[\gamma]$	HOMO	LUMO	
12	9.7	0.33	-11.0	-2.52	8.48
13	766	22.57	-10.13	-2.49	7.64

 14	733	21.6	-9.89	-2.5	7.39
 28	65.3	1.71	-14.19	-4.84	9.35
 29	228.9	6.0	-13.96	-4.77	9.19
 30	326.2	7.56	-14.33	-5.17	9.16

Previously, a correlation was found between the corrosion inhibition efficiency and the difference in LUMO and HOMO energies [27], therefore, based on

these calculations, a graph of the dependence of the reduced value of the corrosion inhibition coefficient on the energy difference $[\gamma] = f(\Delta E)$ was constructed and an approximation was performed ($K_{cor} = 0.96$).

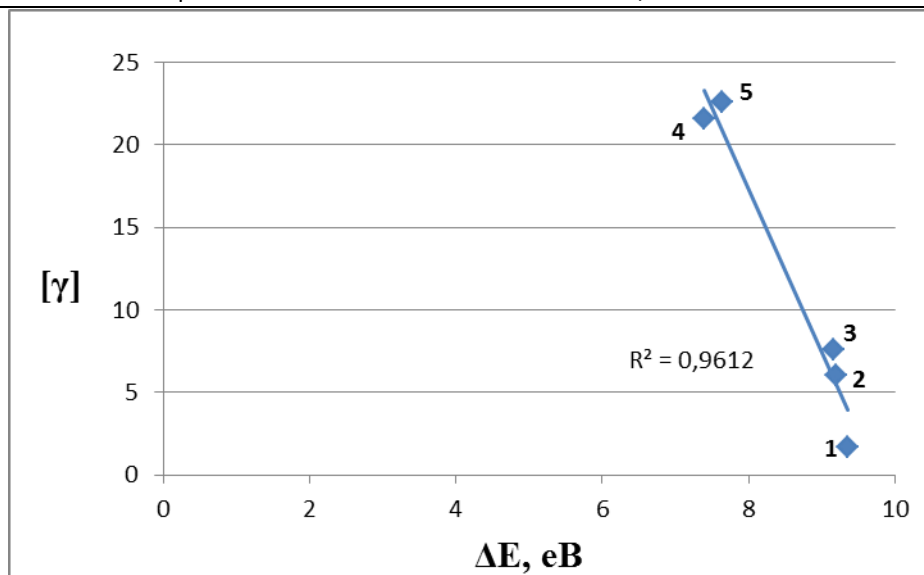


Fig. 7. Correlation between energy differences ΔE and corrosion inhibition coefficients $[\gamma]$ of diquaternized 28 (1), 29 (2), 30 (3) and monoquaternized 14 (4), 13 (5) amides.

As follows from the works [37, 38, 39], the dependence of the parameters characterizing the effectiveness of the inhibitor (corrosion rate and corrosion current density) is exponential. Therefore, ΔE was introduced into a power, a graph of the dependence $[\gamma] = f(e^{\Delta E})$ was constructed and an equation of the form was derived:

$$[\gamma] = k \cdot e^{\Delta E} + C,$$

where $k = -2.03 \cdot 10^{-5}$; $C = 2.6$; $[\gamma]$ is the reduced value of the corrosion inhibition coefficient and is equal to:

$$[\gamma] = \frac{\gamma}{M}, \quad M - \text{the molar mass of the compound.}$$

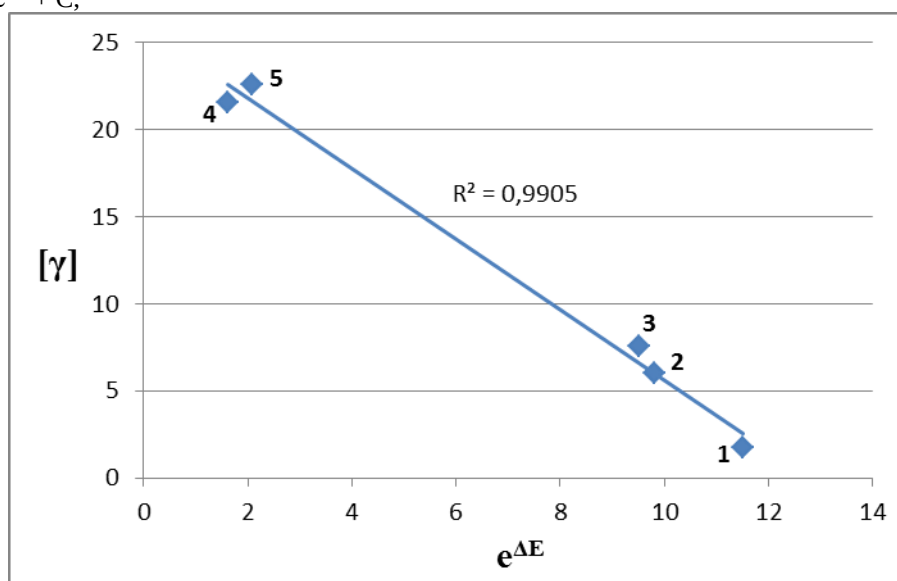


Fig. 8. Exponential correlation between energy differences ΔE and corrosion inhibition coefficients $[\gamma]$ of diquaternized 28 (1), 29 (2), 30 (3) and monoquaternized 14 (4), 13 (5) amides.

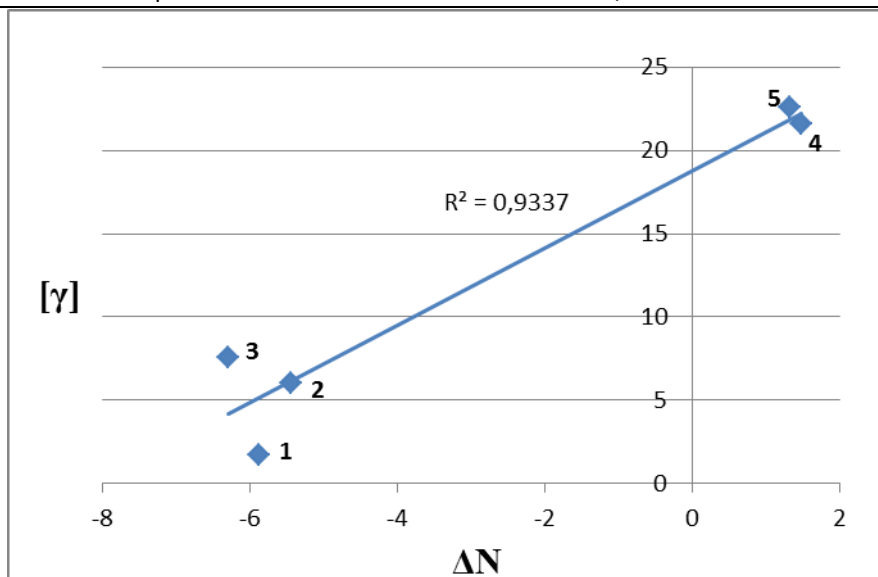


Fig. 9. Correlation between the fractions of electrons transferred, ΔN , and the corrosion inhibition coefficients $[\gamma]$ of diquaternized 28 (1), 29 (2), 30 (3) and monoquaternized 14 (4), 13 (5) amides.

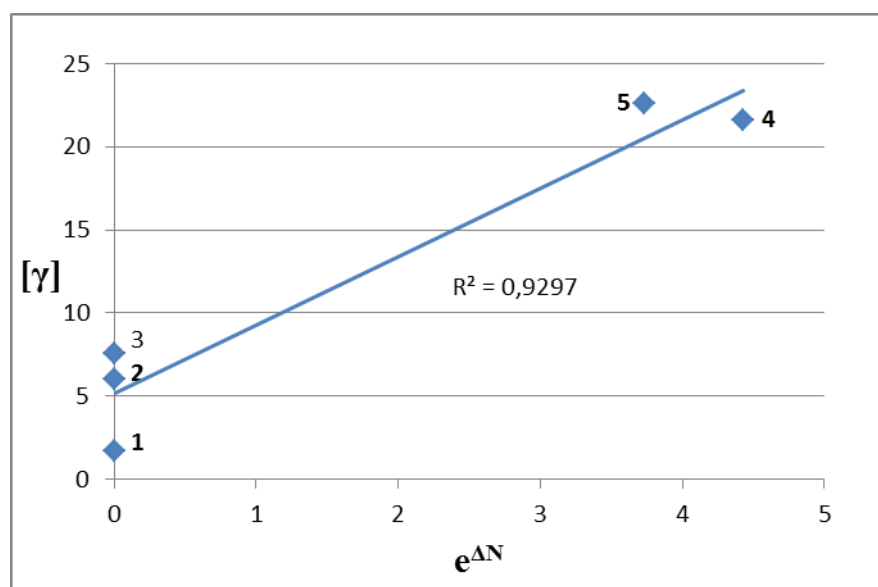


Fig. 10. Exponential correlation between the fractions of electrons transferred, ΔN , and the corrosion inhibition coefficients $[\gamma]$ of diquaternized 28 (1), 29 (2), 30 (3) and monoquaternized 14 (4), 13 (5) amides..

So, as can be seen from all the graphs, when introducing the exponential dependence, the correlation coefficient has significantly improved compared to the corresponding dependencies given in [27], for which Kcor is 71-93%.

Table 6 presents the calculated quantum-chemical parameters, such as HOMO (EHOMO) and LUMO

(ELUMO) energies, their energy difference (ΔE), dipole moment (μ), ionization potential (I), electron affinity (A), absolute electronegativity (χ), global rigidity (η), electrophilicity (ω), softness (S), electron transfer fraction (ΔN), and degree of corrosion protection (Z), for the most and least effective compounds as corrosion inhibitors.

Table 6.

Quantum-chemical parameters for compounds **14** and **28**

Parameter	Compound 14	Compound 28
E_{HOMO} , eB	-9.89	-14.19
E_{LUMO} , eB	-2.5	-4.84
$\Delta E = E_{\text{LUMO}} - E_{\text{HOMO}}$, eB	7.39	9.35
$I = -E_{\text{HOMO}}$, eB	9.89	14.19
$A = -E_{\text{LUMO}}$, eB	2.5	4.84
χ , eB	6.195	9.515
η , eB	3.695	4.675
μ , дебай	11.83	6.083
ω	18.937	3.957
S	0.27	0.214
ΔN	1.487	-5.878
Z, %	99.9	98.5

As is known, the energy of the highest occupied molecular orbital (E_{HOMO}) indicates the ability of a molecule to donate electrons to the corresponding acceptor molecules with a low energy, empty molecular orbital. At higher values of E_{HOMO} , the molecule has a greater ability to donate electrons, its adsorption properties increase, and, consequently, the effectiveness of corrosion inhibition. Thus, Table 6 shows that compound **14** has a higher E_{HOMO} value, therefore it is more effective than compound **28**.

An important parameter of the reactivity of an inhibitor molecule with respect to adsorption on a metal surface is the difference in HOMO and LUMO energies. When the ΔE value decreases, the reactivity of the molecule increases, which leads to an increase in its efficiency as an inhibitor. In our study, compounds **14** and **28** have the smallest and largest such energy difference, respectively.

The dipole moment μ is another important parameter. A high value of the dipole moment increases the adsorption between the chemical compound and the metal surface [40]. The strain energy increases with increasing μ , which allows the molecule to adsorb more easily on the iron surface. An increase in μ indicates an increase in the volume of the inhibitor molecule, which increases the contact area between the molecule and the metal surface and enhances the corrosion inhibition ability. In our study, the μ value of compound **14** is almost twice as high as that of **28**.

Absolute stiffness and softness are important properties for measuring molecular stability and reactivity. It is obvious that chemical stiffness indicates resistance to deformation or electronic polarization. A stiff molecule has a large energy difference, a soft one has a small one. As a rule, the inhibitor with the lowest global stiffness value (and therefore with high global softness) has a high corrosion inhibition efficiency, which is observed in Table 6 for compounds **14** and **28**.

The absolute electronegativity χ describes the ability of a molecule to attract electrons to itself. According to the principle of electronegativity equalization, a molecule **28** with a high electronegativity quickly reaches

equalization and therefore has a low corrosion inhibition efficiency.

The number of transferred electrons ΔN , which shows the efficiency of corrosion inhibition as a result of electron donation, was also calculated and is given in Table 6. If $0 < \Delta N < 3.6$, the inhibitory efficiency increases due to the increase in the ability of the compounds to donate electrons to the metal surface. Thus, a high proportion of transferred electrons is associated with the better inhibitor **14**, while compound **28** has a negative ΔN value and therefore a worse efficiency.

The electrophilicity index ω indicates the ability of the inhibitor molecule to accept electrons. It is a measure of the energy stabilization of the system after accepting an additional number of electrons ΔN from the environment. In our case, compound **14** with a high electrophilicity index value (18.937) has a high inhibition efficiency compared to compound **28**, which has a low ω value (3.957).

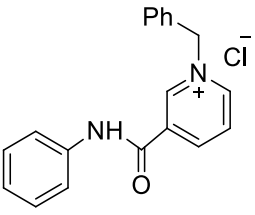
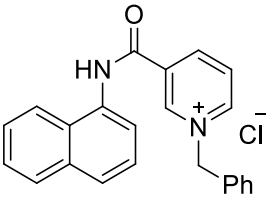
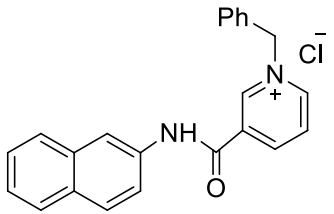
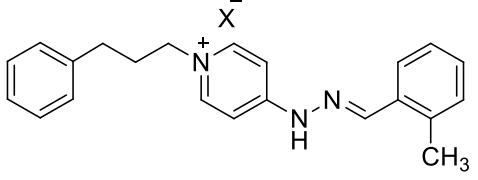
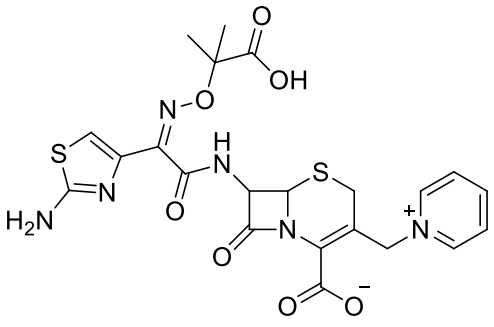
Thus, from all the above parameters it follows that compound **14** is much more effective than compound **28**, which is consistent with the experimental data.

Monoquaternized amides as antibacterial drugs.

As is known, quaternary pyridinium halides obtained by quaternization with alkyl and aryl halides have antibacterial properties. Quaternized amine derivatives have been previously investigated for their antibacterial activity [44-47]. Therefore, some synthesized salts were investigated for possible antibacterial and fungicidal activities against *Staphylococcus aureus* (*S. aureus*), *Escherichia coli* (*E. coli*), *Pseudomonas aeruginosa* (*P. aeruginosa*), and *Candida albicans* (*C. albicans*). The test results were compared with the most effective pyridinium salt, 4-(2-(2-methylbenzylidene)hydrazyl)-1-(3-phenylpropyl)pyridinium bromide **35**, previously investigated [48], and ceftazidime **36**, a pharmacological drug with a wide spectrum of antibacterial activity. The results of the studies are presented in Table 7.

Table 7.

Antibacterial and fungicidal activity of salts

Compound	Minimum bacteriostatic concentration, mg/ml			
	E. coli	P. aeruginosa	S. aureus	C. albicans
 12	125	125	125	125
 13	125	125	31.25	125
 14	62.5	62.5	62.5	62.5
 35	32	256	4	32
 36	<0.125	1	4	-

The table shows that among the salts synthesized in this work, compound 14 exhibits the best antibacterial and fungicidal activity. Compared to ceftazidime, this salt exhibits moderate activity. It should also be noted that compound 14 has 4 times better antibacterial activity against *Pseudomonas aeruginosa* (*P. aeruginosa*) than compound 35.

Conclusions

1. A method for the synthesis of mono- and di-quaternized N-arylnicotinamides using available reagents is proposed. Preparative yields are 67-87%.

2. The tests have established that the synthesized salts 13, 14, 17 and 30 exhibit significant anticorrosion activity in comparison with the industrial inhibitor KI-1.

3. Salts **12-14** were investigated for antibacterial and fungicidal activity.

4. The most energetically favorable conformations for compounds **12-14** and **28-30** were calculated using the Firefly software package. It was shown that compounds with the highest anticorrosion activity have a more planar fragment, as a result of which the protected metal surface increases. For these same compounds, the HOMO and LUMO energies, as well as their dipole moments, were calculated. A correlation has been established between the corrosion inhibition coefficient γ and the energy difference ΔE and its derivative ΔN (the fraction of electrons transferred). An exponential form of these correlations has been proposed.

References:

1. Koshchii I., Klimko Yu., Vasilkevich O. *Norwegian Journal of development of the International Science*, No 149/2025, pp. 4-6.
2. Кузнецов Ю.И. *Успехи химии*. / Ю.И. Кузнецов. – 2004.
3. Теддер Дж. Промышленная органическая химия. / Теддер Дж., Нехватал А., Джубб А. – М.: Мир, 1977. – 670 с.
4. А.с. 280162 СССР, МКИ C23F11/04. Способ защиты металлов от кислотной коррозии.
5. А.с. 557793 СССР, Антимикробный препарат. Бюл. изобр. 1977, №18.
6. Стандарт ISO 8044-1989.
7. Кузнецов Ю.И. Защита металлов / Ю.И. Кузнецов. – 2002. 122 с.
8. Kuznetsov Yu.I. Organic Inhibitors of Corrosion of Metals. / Yu.I. Kuznetsov. – New York: Plenum. – 1996.
9. Sastri V.S. Corrosion Inhibitors. Principles and Applications. Wiley, Chichester; New York, 1998.
10. Reviews on Corrosion Inhibitor Science and Technology. Vol. 3. (Eds A.Raman, P.Labine). NACE International, Houston, 2004.
11. Baba H. Corros. Sci. / H. Baba, T. Kodama. – 1999. 1987 p.
12. Кузнецов Ю.И., Подгорнова Л.П. Коррозия и защита от коррозии. (Итоги науки и техники). Изд-во ВИНТИ. Москва, 1989. С. 132.
13. Луковиц И. Электрохимия / И. Луковиц, А. Шабан, Е. Кальман, **39**, 197 (2003).
14. S.A. Awad, K.M. Kamel. *J. Electroanalytical Chemistry and Interfacial Electrochemistry*, Vol. 24, No. 1, 1970, pp. 217-225.
15. S. A. Awad, K. M. Kamel, Z. Abd El-Hadi and H. A. Bayumi. *J. Electroanalytical Chemistry and Interfacial Electrochemistry*, Vol. 199, No. 2, 1986, pp. 341-350.
16. F. M. Mahgoub, B. A. Abdel-Nabey and Y. A. El-Samadisy. *Materials Chemistry and Physics*, Vol. 120, No. 1, 2010, pp. 104-108.
17. T. Zhao, G. Mu. *Corros. Sci.*, Vol. 41, No. 10, 1999, pp. 1937-1944.
18. D. Wang, S. Li, Y. Ying, M. Wang, H. Xiao and Z. Chen. *Corros. Sci.*, Vol. 41, No. 10, 1999, pp. 1911-1919.
19. P. Udhayakala, T. V. Rajendiran and S. Gunasekaran. *J. Computational Methods in Molecular Design*, Vol. 2, No. 1, 2012, pp. 1-15.
20. W. Li, X. Zhao, F. Liu, J. Deng, B. Hou. *Mater. Corros.*, 2009, **60**, 287.
21. R. Hasanov, M. Sadikoglu, S. Bilgic. *Appl. Surf. Sci.*, 2007, **253**, 3913.
22. M.A. Amin, K.F. Khaled, S.A. Fadel-Allah. *Corros. Sci.*, 2010, **52**, 140.
23. H. Wang, X. Wang, H. Wang, L. Wang, A. Liu. *J. Mol. Model.*, 2007, **13**, 147.
24. Y. Karzazi, M. El Alaoui Belghiti, A. Dafali, B. Hammouti. *J. Chem. Pharm. Res.*, 2014, **6(4)**: 689-696.
25. I. Lukovits, E. Kálmán, F. Zucchi. *J. Corros. Sci. Sec. Vol. 57*, **1**, 2001.
26. N.A. Wazzan, F.M. Mahgoub. *Open J. Physical Chemistry*, 2014, **4**, 6-14.
27. V.S. Sastri, J.R. Perumareddi. *Corros. Sci. Sec. Vol. 53*, **8**, 1997, 617-622.
28. M.J.S. Deward, W. Thiel. *J. Am. Chem. Soc.*, 1977, **99**, 4899-4907.
29. Allan J.R., Baird N.D., Kassiyk A.L. // *J. Thermal. Anal.* 1979. V. 16. P. 79-90.
30. Stewart J.J.P. // *J. Mol. Modeling*. 2007. V. 13. №12. P. 1173-1213.
31. Stewart J.J.P. MOPAC 2009 program. *Col. Spr. Stewart Computational Chemistry*. 2009.
32. Tan S.H. *Organic corrosion inhibitors*. / S.H. Tan. – Australia: Murdoch University. – 1991.
33. Pysanenko D.A., Klymko Yu.E., Dubska S.V. *Chemistry and chemical technology*. Lviv, 2011, 94-95.
34. Решетников С.М. *Ингибиторы кислотной коррозии металлов*. / С.М. Решетников. – Л.: Химия, 1986. – 142 с.
35. Писаненко Д.А., Клишко Ю.Е., Лихницкий К.В. // *Журн. прикл. химии*. 2011. Вып. 8. С. 1384-1386.
36. Писаненко Д., Клишко Ю., Лихницкий К., Дубська С. *Львівські хімічні читання*, 2013, 11.
37. S. Martinez, I. Stagliar. *J. Mole. Struct. (Theochem)*, 2003, **640**, 167-174.
38. A. Aouniti, K.F. Khaled, B. Hammouti. *Int. J. Electrochem. Sci.*, 8 (2013) 5925-5943.
39. D. Wahyuningrum, S. Achmad, Y.M. Syah, Buchari, B. Bundjali, B. Ariwahjoedi. *J. Electrochem. Sci.*, 3 (2008), 154-166.
40. X. Li, S. Deng, H. Fu, T. Li. *Electrochim. Acta.*, 2009, **54**, 4089.
41. N.O. Obi-Egbedi, I.B. Obot, M.I. El-Khaiary, S.A. Umoren, E.E. Ebenso. *Int. J. Electrochem. Sci.*, 2011, **6**, 5649.
42. E.E. Ebenso, D.A. Isabirye, N.O. Eddy. *Int. J. Mol. Sci.*, 2010, **11**, 2473-2498.
43. F. Bentiss, M. Lagrenée. *J. Mater. Environ. Sci.*, 2011, **2**, 13-17.
44. T. Thorsteinsson, M. Masson, K.G. Kristinsson, M.A. Hjalmarsdottir, H. Hilmarsson, T. Loftsson. *J. Med. Chem.* 2003, **46**, 4173-4181.
45. Z.A. Vnitskikh, Y.V. Shklyayev, T.F. Odegova, Y.S. Chekryshkin, A.G. Tolstikov, N.V. El'chishcheva, B.Y. Syropyatov. *J. Khim. Farm. Zh.* 2006, **40**, 19-22.

46. I.G. Ovchinnicova, O.V. Fedorova, G.L. Rusinov, M.N. Zueva, G.G. Mordovskoi. *Khim. Farm. Zh.* 2003, **37**, 17-19.
47. J.R. Burke, P.A. Frey. *J. Org. Chem.* 1996, **61**, 530-533.
48. V. Alptuzun, S. Parlar, H. Tasli, E. Erciyas. *Molecules*. 2009, **14**, 5203-5215.

ECONOMIC SCIENCES

ANALYSIS OF PUBLIC SATISFACTION WITH PUBLIC SERVICE PERFORMANCE AT JATISRONO DISTRICT OFFICE (CASE STUDY ON THE COMMUNITY IN JATISRONO DISTRICT, WONOGIRI REGENCY)

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Abstract

Public satisfaction with public services is one of the main indicators in assessing the effectiveness of government performance in providing quality services. This study aims to analyze the influence of service quality, service facilities, and employee performance on public satisfaction in Jatisrono District. The research method used is quantitative with an approach based on Structural Equation Modeling-Partial Least Squares (SEM-PLS). The research sample consists of 150 respondents, who are residents of Jatisrono District that have received public services. The research findings indicate that service quality has the most significant influence on public satisfaction, followed by employee performance and service facilities. Service quality, which includes reliability, responsiveness, assurance, empathy, and tangible aspects, plays a crucial role in increasing public satisfaction. Additionally, adequate service facilities, such as comfortable waiting areas and good accessibility, also have a positive impact on public satisfaction. Employee performance, which reflects professionalism, responsiveness, and the ability to complete tasks effectively, also makes a significant contribution to public satisfaction.

The implications of this study suggest that increasing public satisfaction can be achieved by improving overall service quality, enhancing service infrastructure, and increasing employee competence and professionalism. The Jatisrono District Government needs to strengthen the service system by standardizing service procedures, utilizing technology in public services, and developing training programs for employees to ensure optimal service delivery. This study contributes to the development of public service policies, particularly in improving the effectiveness and efficiency of services based on community needs. Future research is recommended to expand the study area and include additional variables, such as the role of leadership or organizational culture, to provide a deeper understanding of the factors influencing public satisfaction with public services.

Keywords: Public Satisfaction, Service Quality, Service Facilities, Employee Performance, SEM-PLS

INTRODUCTION

Public service is one of the essential elements of government functions aimed at improving community welfare. According to Grönroos (1984), public service quality is not only measured by the availability of services but also by how these services are perceived by the community. Jatisrono District, as part of Wonogiri Regency, has implemented various community empowerment programs. However, challenges related to effectiveness and efficiency in service delivery continue to affect public satisfaction with the services provided.

Data from the Wonogiri Regency Statistics Agency (BPS, 2023) indicates that only 65% of the population in Jatisrono District is satisfied with public services. This low satisfaction rate is attributed to several factors, including lack of coordination among stakeholders, inadequate facilities, and low employee competence. A study by Parasuraman, Zeithaml, and Berry (1985) through the SERVQUAL model also emphasizes that service quality can be assessed through five key dimensions: reliability, responsiveness, assurance, empathy, and tangibles.

Public service quality is closely linked to the success of community empowerment programs. Zeithaml et al. (1990) stated that high-quality services can enhance community participation and build trust in the government. However, local studies indicate that public services in Indonesia often face challenges regarding transparency and accountability (Nugroho, 2021). In the context of Jatisrono District, ineffective public service delivery impacts the success of community empowerment initiatives. For instance, inadequate service facilities, such as cramped waiting areas and outdated technology, have become major public complaints. This finding aligns with Kotler and Keller (2016), who argue that physical facilities are crucial in shaping customers' perceptions of service quality. Without adequate facilities, public perceptions of government professionalism decline, resulting in lower satisfaction and trust in government institutions.

Employee performance plays a vital role in determining public service quality. Robbins and Judge (2017) highlight that employee motivation and competence directly impact their performance in service delivery. A study by Susanti et al. (2020) found that 70%

of the public were dissatisfied with government employees' attitudes, particularly their lack of friendliness and responsiveness in handling complaints. This underscores the urgent need for continuous employee training and competence development. In Jatisrono District, some government employees show a lack of initiative in resolving community issues. This problem is exacerbated by an unbalanced workload and the lack of incentives to improve performance. According to Herzberg (1968), work motivation can be enhanced through appropriate rewards, both financial and non-financial. Thus, a performance-based incentive system should be implemented to encourage better employee engagement and service delivery.

Adequate infrastructure is a prerequisite for delivering high-quality public services. Bitner's (1992) study on "servicescapes" emphasizes that the physical environment significantly influences customer experiences. In Jatisrono District, service facilities such as waiting rooms, accessibility for persons with disabilities, and technology infrastructure need improvement to better meet the public's needs. A survey conducted by the Public Service Survey Institute (2022) found that 40% of Jatisrono residents complained about poor service facility conditions. Common complaints included uncomfortable waiting areas and limited access to service information. Such conditions negatively impact public perceptions of government professionalism and hinder efforts to build a service-oriented government culture.

Public satisfaction is a primary indicator of public service success. Oliver (1980) explains that satisfaction occurs when the public's expectations are met or even exceeded by the services received. Tjiptono (2014) supports this concept by stating that public satisfaction can foster loyalty and active participation in government programs. In Jatisrono District, low public satisfaction reflects a gap between expectations and service reality. The Gap Analysis Model developed by Parasuraman et al. (1985) can be used to identify these discrepancies and provide strategic recommendations for service improvement. Bridging this gap is essential for enhancing public trust and engagement with government services.

This research is relevant in identifying the factors that influence public satisfaction, particularly in Jatisrono District. By understanding the relationship between employee performance, service quality, and facilities, this study aims to provide strategic recommendations for local government improvements. This study aligns with the national development agenda, which emphasizes responsive, transparent, and inclusive public services (Ministry of Administrative and Bureaucratic Reform, 2023). Improving public services requires a holistic approach, including:

1. Enhancing employee performance through regular training and performance-based rewards.
2. Upgrading public service facilities to ensure accessibility and efficiency.
3. Implementing responsive services tailored to community needs.

THEORETICAL BASIS FRAMEWORK OF THINKING AND HYPOTHESIS

A. Theoretical Basis

1. Employee Performance

Employee performance is defined as the work outcomes achieved by an individual based on assigned tasks and responsibilities within an organization. According to Robbins and Judge (2017), employee performance is influenced by motivation, competence, perception of job roles, and a supportive work environment. In public service, employee performance reflects the ability to provide responsive, accurate, and community-centered services. Optimal performance is demonstrated through efficiency in task completion, user satisfaction, and overall organizational productivity (Mathis & Jackson, 2011).

Employee performance serves as a crucial indicator of an individual's success in carrying out organizational duties. It emphasizes the alignment between individual and organizational goals, where work behavior, achievement of results, and adaptability play essential roles. Work behavior reflects the attitudes and actions of employees in performing daily tasks, while achievement of results focuses on the tangible outputs produced according to predetermined targets. Adaptability signifies an employee's ability to adjust to changes in policies, procedures, or technology within the workplace (Mangkunegara, 2009).

Employee performance plays a fundamental role in organizational success by driving productivity, motivating peers, supporting decision-making, and improving public service quality. High-performing employees contribute to organizational efficiency and serve as role models for their colleagues. Their performance evaluations provide critical data for policy decisions related to promotions, training, and rewards. In public service, strong employee performance ensures better service delivery, fostering trust and satisfaction among citizens.

Several theories explain employee performance and its underlying factors. Expectancy Theory (Vroom, 1964) suggests that employees are motivated when they believe their efforts will result in valuable rewards. Herzberg's Two-Factor Theory (1959) highlights motivation and hygiene factors, where recognition and responsibility enhance performance, while salary and work environment prevent dissatisfaction. Equity Theory (Adams, 1965) emphasizes fairness, stating that employees compare their efforts and rewards with those of colleagues, influencing their motivation. Reinforcement Theory (Skinner, 1938) suggests that performance can be shaped through positive reinforcement for desired behaviors and reduced negative consequences for undesired behaviors.

Performance evaluation is essential for assessing employee contributions to an organization. According to Mangkunegara (2009), effective evaluations consider quantity and quality of work, discipline, innovation, and teamwork. A strong evaluation system ensures that employees meet organizational expectations while continuously improving their competencies. In public service, performance assessment should focus on both individual achievements and the extent to which employees fulfill community needs and strengthen public trust in government institutions. By implementing continuous training, offering incentives,

and fostering a supportive work environment, organizations can optimize employee contributions and enhance overall service quality.

2. Service Quality

Service quality refers to the level of excellence in service delivery that meets or exceeds customer expectations. According to Parasuraman, Zeithaml, and Berry (1988), service quality is determined by five key dimensions: reliability, responsiveness, assurance, empathy, and tangibles. Kotler and Keller (2016) further highlight that service quality also includes ease of access, speed in problem resolution, and consistency in service delivery. In the public sector, high-quality service enhances public trust in government institutions (Zeithaml et al., 1990).

Service quality is assessed based on customer perceptions of how well a service meets their expectations. Grönroos (1984) classifies service quality into technical quality, which refers to the outcome of the service (such as speed and accuracy), and functional quality, which relates to how the service is delivered (such as employee communication and behavior). High service quality plays a crucial role in increasing customer satisfaction, building organizational reputation, ensuring business sustainability, and strengthening customer relationships.

Several theoretical models explain service quality. The SERVQUAL model (Parasuraman, Zeithaml, & Berry, 1988) defines it through reliability, responsiveness, assurance, empathy, and tangibles. Oliver's (1980) Customer Satisfaction Theory suggests that service quality influences customer satisfaction, which in turn affects loyalty. Grönroos (1984) emphasizes the importance of customer experience in evaluating service quality, while the Expectancy-Confirmation Theory states that service quality is determined by how well the received service aligns with initial expectations.

In the public service sector, service quality is essential for enhancing public trust and institutional credibility. Zeithaml et al. (1990) suggest that service quality in public administration can be improved through transparency, accessibility, consistency, and innovation. Providing clear and accessible information, ensuring equal service standards for all citizens, and integrating technology for efficient service delivery are crucial strategies for improving public service quality.

3. Facility

Service facilities encompass all infrastructure and resources that support the delivery of public services. Bitner (1992) introduced the concept of "servicescapes", emphasizing the critical role of the physical environment in shaping customer perceptions of service quality. Lovelock and Wirtz (2016) highlighted that well-designed service facilities not only enhance customer experience but also improve employee efficiency. In this context, service facilities include comfortable waiting areas, accessibility for people with disabilities, modern technology, and clear service information.

Service facilities are an integral part of an efficient service system. Grönroos (1984) categorized them into core facilities, which are directly used by customers

(such as waiting areas and service counters), and supporting facilities, which enhance customer comfort (such as parking spaces and restrooms). Properly designed service facilities contribute to customer experience, operational efficiency, social inclusion, organizational reputation, and employee productivity.

Several theories explain the role of service facilities. Bitner's Servicescapes Theory (1992) describes how the ambient environment, spatial layout, and visual elements impact customer perceptions. Parasuraman, Zeithaml, and Berry's SERVQUAL Model (1988) recognizes tangibles as a key dimension of service quality. Davis's Technology in Service Theory (1989) underscores the role of modern technology in improving service speed and convenience, while Oliver's Customer Satisfaction Theory (1980) asserts that well-maintained facilities directly influence customer satisfaction.

Ideal service facilities should include comfortable physical spaces, accessibility for all customers, modern technology, clear service information, cleanliness, and security. In public service, proper facilities ensure equitable, efficient, and responsive service delivery. Key implementations include digital service integration, innovative facility design, employee training, routine facility evaluation, and capacity expansion in high-demand areas. Improved service facilities positively impact organizations by enhancing customer loyalty, strengthening institutional reputation, increasing operational efficiency, and improving employee well-being. Investing in service facilities not only benefits customers but also creates a more effective and professional work environment.

4. Public Satisfaction

Public satisfaction refers to the level of happiness or contentment felt by society after receiving public services. According to Oliver (1980), public satisfaction results from comparing expectations with the reality of services received. Tjiptono (2014) states that public satisfaction enhances loyalty and active participation in government programs. Furthermore, it reflects the effectiveness of services in meeting societal needs, ultimately improving the government's positive image (Kotler & Armstrong, 2018). Public satisfaction is a subjective evaluation of service quality compared to expectations. Zeithaml et al. (1990) identified key factors influencing satisfaction, including service quality, perceived value, and prior expectations. Kotler and Keller (2016) added that public satisfaction not only indicates service success but also serves as a key measure of government program sustainability and effectiveness.

Public satisfaction functions as an indicator of service quality, helping assess whether public services meet societal expectations. High satisfaction fosters loyalty to the government, reflected in support for policies and programs. It also encourages active participation in social, political, and economic activities. Furthermore, a high level of satisfaction strengthens the government's image as responsive, transparent, and professional while serving as a foundation for continuous service improvements. Several theories explain

public satisfaction, including the Expectation-Disconfirmation Theory (Oliver, 1980), which states that satisfaction results from the comparison between initial expectations and received services. Perceived Value Theory (Zeithaml, 1988) highlights that satisfaction is influenced by the perceived benefits relative to costs. The Customer Satisfaction Theory (Parasuraman, Zeithaml, & Berry, 1988) emphasizes five service quality dimensions: reliability, responsiveness, assurance, empathy, and tangible aspects. Additionally, the Loyalty Theory (Kotler & Keller, 2016) explains that consistent satisfaction fosters loyalty, positively impacting social stability and government program success, while Cognitive Dissonance Theory (Festinger, 1957) describes dissatisfaction arising from discrepancies between expectations and actual experiences.

Several factors influence public satisfaction, including service quality, accessibility, transparency, efficiency, and communication. To enhance satisfaction, governments can conduct regular satisfaction surveys, adopt digital innovations for improved accessibility, train employees for professional service delivery, provide effective feedback channels, and manage public expectations through education. The impacts of public satisfaction include increased public trust in the government, greater social stability, more efficient resource allocation, and a stronger government reputation as a provider of quality services.

B. Framework of Thought

The scheme/description in this research is as follows:

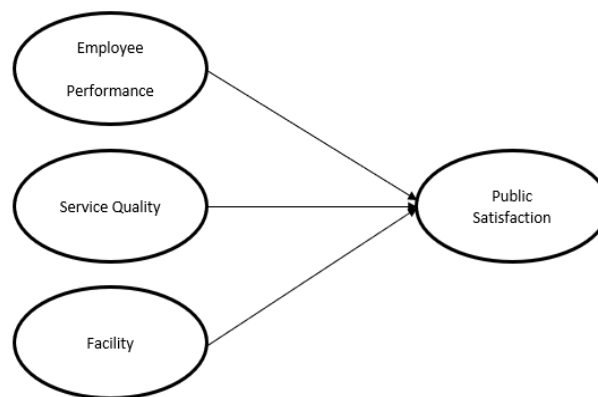


Figure 1
Thought Framework

Independent variables: Employee Performance, Service Quality, Facility

Dependent variables: Public Satisfaction

C. Hypothesis

The following hypotheses are proposed along with detailed explanations and supporting research:

Hypothesis 1 (H1): Employee Performance Positively Affects Public Satisfaction

Employee performance plays a crucial role in shaping public satisfaction with service delivery. Performance indicators such as competence, responsiveness, friendliness, and efficiency contribute to the overall perception of service quality. Competent employees possess the necessary skills and knowledge to provide accurate and effective services, ensuring that public needs are met efficiently. Responsiveness reflects the employees' ability to address concerns, answer inquiries promptly, and resolve issues effectively, which enhances public trust and confidence in the service system. Friendliness in service delivery fosters a welcoming and positive atmosphere, making individuals feel respected and valued. Efficiency ensures that services are delivered swiftly and accurately, minimizing waiting times and reducing potential frustration.

When employees perform their duties professionally and efficiently, the public perceives the service as high quality, leading to increased satisfaction. A study by Prayoga (2018) found that employee performance significantly influences public satisfaction, with higher performance levels correlating to greater satisfaction.

The study emphasized that training programs, motivation, and work ethics contribute to improving employee performance, which in turn enhances public perception of service quality. Therefore, optimizing employee performance through continuous professional development, performance evaluations, and service-oriented training can be an effective strategy to improve public satisfaction.

Hypothesis 2 (H2): Service Quality Positively Affects Public Satisfaction

Service quality is a fundamental determinant of public satisfaction, encompassing aspects such as clarity of information, ease of access, and service reliability. Clear and transparent information ensures that the public understands service procedures, requirements, and expected outcomes, reducing confusion and frustration. Accessibility refers to the ease with which individuals can obtain services, including factors like location, operating hours, digital service availability, and assistance for people with disabilities. Reliable services mean that the government or institution consistently delivers on its promises, ensuring that public expectations are met or even exceeded.

When service quality is high, the public perceives the system as efficient, trustworthy, and user-friendly, leading to a positive service experience. A study by Kartika and Siagian (2024) examined service quality at the Population and Civil Registration Office of Batam City and found that well-structured services significantly enhanced public satisfaction. Their findings highlight the importance of continuous improvements

in service delivery, such as integrating digital solutions, simplifying bureaucratic procedures, and implementing feedback mechanisms. Institutions that prioritize service quality improvement tend to foster greater public trust and long-term satisfaction, ultimately enhancing their reputation and credibility.

Hypothesis 3 (H3): Service Facilities Positively Affect Public Satisfaction

Service facilities are essential in creating a comfortable and supportive environment for individuals seeking public services. Facilities include physical infrastructure such as waiting areas, seating arrangements, air conditioning, cleanliness, and availability of essential equipment. A well-organized service facility ensures smooth and efficient service delivery, reducing public discomfort and waiting times. Additionally, the use of digital systems, such as automated queue management and self-service kiosks, can significantly improve the efficiency of service provision.

Comfortable and well-maintained facilities contribute to a positive public experience, making service interactions more pleasant and reducing potential dissatisfaction. A study by Harfika and Abdullah (2017) examined service facilities at the General Hospital of Southwest Aceh Regency and found a strong correlation between facility quality and patient satisfaction. The study emphasized that hospitals with modern, well-equipped, and hygienic facilities experienced higher patient satisfaction rates, demonstrating the importance of a conducive service environment. To improve service facilities, institutions should regularly assess and upgrade infrastructure, incorporate technology for seamless service interactions, and ensure that service environments remain clean, organized, and accessible to all individuals, including those with disabilities. By prioritizing facility enhancements, public institutions can create a more efficient and satisfactory service experience, ultimately increasing public trust and engagement.

RESEARCH METHOD

This research focuses on analyzing public service delivery in Jatisrono District, Wonogiri Regency, with a particular emphasis on the impact of employee performance, service quality, and service facilities on community satisfaction. The study aims to identify key factors influencing public satisfaction and provide strategic recommendations to improve service delivery. The research employs a quantitative approach, utilizing surveys, interviews, and direct observations to collect comprehensive data from both service users and government employees responsible for service implementation.

The study investigates three independent variables—employee performance, service quality, and service facilities—and their influence on the dependent variable, community satisfaction. Employee performance is assessed based on competence, responsiveness, professionalism, and adherence to service standards. Service quality is measured through indicators such as transparency, accessibility, and the reliability of services. Service facilities include infrastructure elements such as waiting areas, accessibility for people with disabilities, and technological support for efficient

service delivery. Community satisfaction is evaluated based on their perceptions of service effectiveness, efficiency, fairness, and overall comfort when accessing public services.

The research relies on both primary and secondary data sources. Primary data is obtained through structured questionnaires distributed to 150 respondents, consisting of residents who have accessed public services in Jatisrono District. The study also includes interviews with government employees to gain insights into the challenges and improvements needed in service delivery. Additionally, field observations are conducted to assess the quality of service facilities and interactions between employees and the public. Secondary data is collected from official documents, statistical reports, academic research, and government regulations related to public service quality and community satisfaction.

The sample for this study is determined using the Slovin formula, ensuring a representative selection of respondents from the local community. The research employs a probability sampling method with a simple random sampling technique, allowing equal opportunity for all eligible community members to be selected. This approach enhances the reliability of the findings and ensures that the results can be generalized to a broader population within Jatisrono District.

Data analysis is conducted using the Structural Equation Modeling-Partial Least Squares (SEM-PLS) method, which is suitable for examining complex relationships between latent variables. The analysis process includes evaluating the measurement model (outer model) to test the reliability and validity of research indicators. It also involves assessing the structural model (inner model) to examine the strength of relationships between variables using path coefficient tests, determination coefficient (R^2), predictive relevance (Q^2), and effect size (f^2). Hypothesis testing is performed through bootstrapping, where statistical significance is determined based on t-statistics and p-values. A significant relationship is indicated when the t-statistic is greater than 1.96 and the p-value is below 0.05.

By conducting this study, the research aims to provide valuable insights into the effectiveness of public service delivery at the district level. The findings are expected to contribute to policy recommendations for improving public service management, enhancing employee performance, optimizing service quality, and upgrading service facilities. Additionally, the study seeks to support the development of a more transparent, efficient, and community-centered public service system in Jatisrono District. Ultimately, the research aspires to foster greater public trust in local government institutions and promote continuous improvements in service delivery for the well-being of the community.

RESULT AND DISCUSSION

A. The characteristics of the respondents

The characteristics of the respondents are an important aspect in understanding the profile of the community that provides assessments on service quality, service facilities, community satisfaction, and employee performance in Jatisrono District. By analyzing

the respondent characteristics, the researcher can gain a clearer picture of the respondents' backgrounds and how these differences may influence their perceptions of public services. A total of 150 respondents were selected as samples for this study. The sample consists of

various community groups with differences in gender, age, education level, and occupation. The respondent characteristics are presented in the following table:

Table 1.**The characteristics of the respondents**

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	70	46.7%
	Female	80	53.3%
Age	< 20 years	10	6.7%
	20 - 30 years	45	30.0%
	31 - 40 years	50	33.3%
	> 40 years	45	30.0%
Education Level	Elementary/Junior High	20	13.3%
	High School	60	40.0%
	Diploma/Bachelor	65	43.3%
	Postgraduate	5	3.4%
Occupation	Civil Servant	30	20.0%
	Entrepreneur	40	26.7%
	Private Employee	35	23.3%
	Housewife	25	16.7%
	Other	20	13.3%

B. Validity Test

The validity test was conducted using the Pearson Product Moment Correlation method by comparing the calculated r value with the table r value at a significance

level of 5% ($\alpha = 0.05$). With a sample size of 150 respondents, the table r value used as the validity threshold is 0.159. An indicator is considered valid if the calculated r value is greater than the table r value. The results of the validity test for each variable are as follows:

Table 2**Validity Test Results**

Variable	Indicator	Calculated r	Table r (0.159)	Description
Service Quality	KP1	0.721	0.159	Valid
	KP2	0.689	0.159	Valid
	KP3	0.754	0.159	Valid
Service Facilities	FP1	0.732	0.159	Valid
	FP2	0.695	0.159	Valid
	FP3	0.743	0.159	Valid
Public Satisfaction	KM1	0.781	0.159	Valid
	KM2	0.758	0.159	Valid
	KM3	0.768	0.159	Valid
Employee Performance	KPeg1	0.769	0.159	Valid
	KPeg2	0.735	0.159	Valid
	KPeg3	0.752	0.159	Valid

Source: Processed Data (2025)

The validity test in this research was conducted to ensure that each indicator in the questionnaire truly measures the concept or variable being studied. Validity is a crucial aspect in quantitative research, because if an instrument is not valid, the research results could be biased or not reflect the actual conditions.

The results of the validity test show that all the indicators in this study have a Pearson Product Moment correlation (calculated r) greater than the table r (0.159) at a significance level of 5% with 150 respondents. This means that each indicator in the questionnaire has a significant relationship with the total score of the variable it measures. Therefore, it can be concluded that:

- All statements in the questionnaire are valid because the Pearson Product Moment correlation shows that each indicator has a significant correlation

with the total score of its variable (calculated r > table r).

- No indicator needs to be removed or revised because all indicators meet the validity standards. This indicates that the research instrument used is well-constructed and appropriate for measuring the studied variables.

- The research instrument can be used in further data analysis stages, as each item in the questionnaire has proven to measure the concept being studied accurately and precisely.

- Construct validity has been met, meaning the questionnaire not only measures the correct variables but also captures the underlying dimensions of those concepts well.

C. Reliability Test

After the instrument was declared valid, the next step was to conduct a reliability test using Cronbach's Alpha method. A variable is considered reliable if the

Cronbach's Alpha value is greater than 0.70. The reliability test aims to determine the extent to which the research instrument can provide consistent results when used under different conditions and at different times. The results of the reliability test can be seen in the following table:

Table 3

Reliability Test Results		
Variable	Cronbach's Alpha	Description
Service Quality	0.812	Reliable
Service Facilities	0.791	Reliable
Public Satisfaction	0.823	Reliable
Employee Performance	0.806	Reliable

Source: Processed Data (2025)

Reliability is an important aspect in quantitative research used to measure the consistency of an instrument in producing stable and dependable data. A reliable instrument will provide similar results if used under different conditions or at different times. Therefore, the reliability test aims to determine how consistent the instrument used in the study is when tested on the same population.

In this study, the reliability test was performed using the Cronbach's Alpha method, which is one of the most commonly used techniques for measuring reliability. A variable is considered reliable if its Cronbach's Alpha value is above 0.70. The results of the reliability test show that all variables in this study have a Cronbach's Alpha value above 0.70, which means that the research instrument used has a high level of reliability. This indicates that each indicator in the questionnaire has shown good internal consistency in measuring the intended variables. Therefore, several conclusions can be drawn from the results of this reliability test:

- The research instrument is trustworthy and has a good level of consistency, meaning that if this research were repeated with a different sample or under

different conditions, the results would still show a similar pattern.

- No revisions are necessary for the research instrument, as all variables have met the established reliability standards, and it can be used in further data analysis.

- A reliable instrument enhances the validity of the research because if an instrument has high reliability, the research results can be trusted more and have a lower measurement error rate.

D. Hypothesis Test Results

Based on the results of testing using Structural Equation Modeling - Partial Least Squares (SEM-PLS), it was found that all the independent variables in this study, namely service quality, service facilities, and employee performance, have a significant effect on public satisfaction. The hypothesis testing results indicate that each independent variable contributes to improving public satisfaction, although with varying levels of influence. The following table summarizes the results of hypothesis testing in this study:

Table 5.7.

Hypothesis Testing Results					
Hypothesis	Relationship Between Variables	Path Coefficient (β)	T-Statistic	P-Value	Description
H1	Service Quality $\rightarrow$ Public Satisfaction	0.520	8.765	0.000	Accepted (Significant)
H2	Service Facilities $\rightarrow$ Public Satisfaction	0.310	4.920	0.000	Accepted (Significant)
H3	Employee Performance $\rightarrow$ Public Satisfaction	0.410	6.453	0.000	Accepted (Significant)

Source: Processed Data (2025)

Based on these results, further analysis can be conducted on each hypothesis as follows:

1. The Effect of Service Quality on Public Satisfaction (H1)

The analysis results show that service quality has a positive and significant effect on public satisfaction, with a path coefficient of 0.520, a T-Statistic value of 8.765, and a P-Value of 0.000. This value indicates that service quality is the factor with the greatest influence on public satisfaction compared to other variables.

This finding supports the theory proposed by Parasuraman, Zeithaml, and Berry (1988) in the

SERVQUAL model, which states that service quality consists of five main dimensions:

- Reliability: Consistency in providing accurate and dependable service.
- Responsiveness: The ability to provide quick service and respond to customer needs.
- Assurance: The competence and professional attitude of service personnel in building customer trust.
- Empathy: The ability to understand customer needs and provide attention.

- Tangibles: The quality of physical facilities, equipment, and personnel appearance in providing service.

Thus, the better the service quality provided by public service agencies, the higher the level of public satisfaction. If services are delivered promptly, accurately, and according to public expectations, public satisfaction will increase. Conversely, if the services are slow, unprofessional, and do not meet expectations, public satisfaction will decrease.

2. The Effect of Service Facilities on Public Satisfaction (H2)

The testing results show that service facilities have a positive and significant effect on public satisfaction, with a path coefficient of 0.310, a T-Statistic value of 4.920, and a P-Value of 0.000. This indicates that the presence of adequate service facilities can enhance public satisfaction, although their effect is not as significant as service quality. This concept is supported by Bitner's (1992) theory on servicescapes, which states that the physical environment of the service (including available facilities) plays an important role in shaping the experience and perception of the public regarding the service provided. Good service facilities include:

- Availability of comfortable waiting areas with adequate seating.
- Accessibility for disabled individuals to ensure inclusiveness of the service.
- Adequate infrastructure such as orderly queues, clean service rooms, and clear and accessible service information.
- Use of modern technology such as apps or information systems that can speed up the service process.

With adequate facilities, the public feels more comfortable receiving services, thereby increasing their satisfaction. On the other hand, poor facilities, such as cramped waiting rooms, disorganized queues, or lack of clear information, can lead to public dissatisfaction. Therefore, investing in improving service facilities is an important strategy in enhancing public satisfaction with public services.

3. The Effect of Employee Performance on Public Satisfaction (H3)

The analysis also shows that employee performance has a positive and significant effect on public satisfaction, with a path coefficient of 0.410, a T-Statistic value of 6.453, and a P-Value of 0.000. This indicates that the better the performance of employees in providing services, the higher the level of public satisfaction.

This finding supports the theory proposed by Robbins and Judge (2017), which states that employee performance is influenced by factors such as motivation, competence, perception of job roles, and a supportive work environment. In the context of public services, optimal employee performance reflects the effectiveness of the organization in providing fast, accurate, and responsive services according to public needs. Employees with high competence, professionalism, and a positive service attitude will provide a more positive experience for the public, thus increasing their satisfaction.

Factors that can enhance employee performance in public service include:

- Training and development of employee competencies to provide better service.
- Providing motivation and incentives for employees with good performance.
- Improving performance evaluation systems to ensure employees work professionally.
- Implementing a work culture focused on public service.

On the contrary, employees who are less competent, unresponsive, or unprofessional will provide negative experiences for the public, ultimately decreasing their satisfaction. Therefore, improving employee performance through various human resource development programs is a key factor in increasing public satisfaction.

CONCLUSION AND SUGGESTIONS

A. Conclusion

Based on the results of the study, it can be concluded that public satisfaction with public services in Jatisrono District is significantly influenced by service quality, service facilities, and employee performance. These three variables have a positive relationship with public satisfaction, meaning that the better the service quality, service facilities, and employee performance, the higher the level of public satisfaction with the services provided.

1. Service Quality as the Dominant Factor

The research findings show that service quality has the greatest influence on public satisfaction (path coefficient 0.520, T-Statistic 8.765, P-Value 0.000). This proves that service quality is the main aspect determining the level of public satisfaction. The public places more value on the reliability of the service, timeliness, the ability of employees to provide solutions, as well as friendliness and professionalism in service. Therefore, improving service quality should be the primary focus in efforts to increase public satisfaction.

2. Service Facilities Play a Role in Enhancing Public Comfort

Service facilities also have a significant effect on public satisfaction (path coefficient 0.310, T-Statistic 4.920, P-Value 0.000). Adequate facilities, such as comfortable waiting areas, good accessibility, orderly queue systems, and the use of technology in services, greatly support the effectiveness of service delivery and provide a better experience for the public.

3. Employee Performance as a Determining Factor for Public Service Success

Employee performance also has a significant effect on public satisfaction (path coefficient 0.410, T-Statistic 6.453, P-Value 0.000). This indicates that the competence, professionalism, and attitude of employees in providing services greatly affect the public's perception of the quality of the services received. Employees who work effectively, are friendly, and responsive will increase public satisfaction, while employees who are unresponsive or unprofessional can reduce public satisfaction.

4. The Importance of Synergy in Enhancing Public Satisfaction

From the findings of this study, it can be concluded that improving public satisfaction does not rely on just one factor, but is the result of synergy between service quality, service facilities, and employee performance. Therefore, improvements in all of these aspects need to be made together so that public services can run more optimally and meet the public's expectations.

B. Suggestions

Based on the research results and conclusions obtained, several suggestions can be made to improve public satisfaction with public services in Jatisrono District. To improve public service satisfaction in Jatisrono District, several measures should be taken. First, service quality can be enhanced by establishing clearer service standards, providing regular training for employees, and conducting periodic satisfaction surveys. Additionally, service facilities should be upgraded by ensuring comfortable waiting areas, better accessibility for people with disabilities, and increased use of technology, such as online registration and digital queues. Employee performance can be improved through a reward and punishment system, promoting work discipline, and fostering a culture of excellent public service. Involving the public in evaluating employees is also essential. To address existing challenges, the government should recruit additional personnel, enhance technological utilization, and provide more training to employees. Public understanding of service procedures should be improved through better communication. Finally, further research should expand the scope to include more districts, employ qualitative research methods for deeper insights, and incorporate additional factors like organizational culture and leadership into future studies. These steps will contribute to the development of more professional, transparent, and responsive public services in the region.

C. Research Limitations

The limitations of this research include several factors that may affect the generalizability and depth of the findings. First, the study is limited by the geographic scope, as it only focuses on the public service satisfaction in Jatisrono District, which may not reflect the experiences of other regions. The sample size, while sufficient, may not fully capture the diversity of the population, potentially leading to biases in the results. Additionally, the research relies on self-reported data from surveys, which may be subject to social desirability bias or inaccurate responses. The study also lacks qualitative data from interviews, which could provide deeper insights into the respondents' experiences and perspectives. Lastly, the research does not account for external factors, such as political or economic influ-

ences, that may impact public service satisfaction. Future studies should address these limitations by expanding the sample size, including more diverse regions, incorporating qualitative methods, and considering external variables that could affect the results.

References:

1. Alma, B. (2020). *Manajemen Pemasaran dan Pemasaran jasa | Perpustakaan*. Alfabeta, Bandung. http://digilib.itbwigalumajang.ac.id/index.php?p=show_detail&id=3905
2. Aryani, Y., Andari, W., & Suhindarto, S. (2020). Pengaruh Teknologi Informasi dan E-Commerce terhadap Perdagangan Indonesia ke Negara ASEAN. *Jurnal Ekonomi Indonesia*, 9(1), 53–66. <https://doi.org/10.52813/jei.v9i1.30>
3. Dharmesta, B. S., & Irawan. (2014). *Manajemen Pemasaran Modern*. In *Liberty, Yogyakarta*. Liberty, Yogyakarta.
4. Dharmesta, B. S. (2014). *Manajemen Pemasaran cetakan ke 10*. BPFE-UGM, Yogyakarta.
5. Feigenbaum, A. V. (2016). *Kendali Mutu Terpadu* (3rd ed.). Penerbit Erlangga.
6. Gitosudarmo, I. (2019). *Manajemen Pemasaran. Management Pemasaran*.
7. Griffin, J. (2016). *Customer Loyalty: Menumbuhkan & Mempertahankan Kesetiaan Pelanggan* (Terjemahan). Erlangga, Jakarta.
8. Hasan, A. (2018). *Marketing dan Kasus-kasus* (Cetakan 1). Media Pressindo, Yogyakarta.
9. Kotler, P., & Keller, K. L. (2021). *Manajemen Pemasaran*. (Global Edition (ed.); 16th ed.). Penerbit Erlangga, Jakarta,.
10. Laksana, F. (2018). *Praktis Memahami Manajemen Pemasaran*. Graha Ilmu, Yogyakarta.
11. Lovelock, C. (2016). *Pemasaran Jasa Perspektif Indonesia* (Jilid 1.). Erlangga, Jakarta.
12. Oliver, R. L. (2016). Satisfaction: A Behavioral Perspective on the Consumer: A Behavioral Perspective on the Consumer (2nd ed.). In *Routledge, Oxfordshire [England]*. Routledge, New York.
13. Peter, J. P., & Olson, J. C. (2018). *Perilaku Konsumen dan Strategi Pemasaran* (9th, Buku 2 ed.). Salemba Empat Jakarta.
14. Sani, A. (2021). Analisis Kualitas Pelayanan Publik Di Poliklinik Gigi Rumah Sakit Umum Daerah (RSUD) Bangka Tengah. *Jurnal Bestari*, 1(2), 38–52.
15. Schiffman, L. G., & Kanuk, L. L. (2016). *Consumer Behavior* (8 (ed.)). . Prentice Hall, New Jersey.
16. Tjiptono, F. (2019). *Strategi Pemasaran, Prinsip & Penerapan*. Andi Offset, Yogyakarta.

ENHANCING RURAL TOURISM THROUGH DIGITAL MARKETING: ANALYZING TOURIST BEHAVIOR IN TEMBI TOURISM VILLAGE

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Abstract

Tourism plays a significant role in Indonesia's economy, with village-based tourism emerging as an alternative that promotes local culture and economic empowerment. One such destination is Tembi Tourism Village in Yogyakarta, which offers authentic Javanese cultural experiences. However, despite its potential, rural tourism faces challenges in adopting digital marketing effectively. This study examines the impact of digital marketing strategies on tourist engagement and visit intentions, with perceived challenges as a moderating factor.

A quantitative approach was used, collecting data from 245 respondents who had engaged with Tembi's digital content. Data were analyzed using Structural Equation Modeling (SEM) with SmartPLS 4.0. Results show that digital marketing positively influences tourist engagement, which in turn significantly affects visit intention. Additionally, digital marketing has a direct effect on visit intention. However, perceived challenges negatively moderate this relationship, indicating that barriers such as financial constraints and limited digital literacy weaken the impact of digital marketing on attracting visitors.

The study highlights the importance of optimized digital marketing strategies in enhancing rural tourism's online presence and engagement. Practical recommendations include improving digital content quality, enhancing infrastructure, and increasing community training in digital marketing to maximize the tourism potential of Tembi Tourism Village.

Keywords: Digital Marketing, Tourist Engagement, Visit Intention, Rural Tourism, Perceived Challenges, Tembi Tourism Village

INTRODUCTION

Tourism is one of the key sectors contributing significantly to Indonesia's economy, both at the national and local levels. According to the Ministry of Tourism and Creative Economy (2023), the tourism sector contributed approximately 4.1% to Indonesia's GDP in 2023, highlighting its critical role in economic development. In recent years, the concept of village-based tourism or tourism villages has gained increasing popularity as an alternative that offers unique experiences for tourists while simultaneously fostering local economic empowerment. Tourism villages not only showcase natural beauty but also highlight culture, traditions, and direct interaction with local communities, which aligns with the concept of sustainable tourism development (UNWTO, 2022). One of the fastest-growing tourism villages in Indonesia is Tembi Tourism Village, located in Bantul, Yogyakarta. This village is well known for its rich Javanese culture, community-based homestays, and various tourism activities such as batik making, farming, and traditional art performances (VisitingJogja, 2023).

With the rapid advancement of digital technology, marketing strategies in the tourism industry have also undergone significant transformation. Digital marketing has become a crucial tool in increasing the visibility of tourist destinations and attracting more visitors. According to Kotler et al. (2021), digital marketing en-

compasses various strategies such as social media marketing, content marketing, influencer partnerships, search engine optimization (SEO), and website optimization. These strategies are essential in modern tourism promotion as they allow destinations to reach a wider audience, provide real-time and visually engaging content, and influence tourists' decision-making processes (Chaffey & Ellis-Chadwick, 2020). Social media platforms such as Instagram, TikTok, YouTube, and Facebook have proven highly effective in tourism promotion, particularly among younger travelers who rely on digital content for trip planning (Buhalis & Law, 2019). A study by Statista (2023) reported that 67% of global travelers use social media as a primary source of travel inspiration, indicating its significant impact on consumer behavior.

Despite the increasing importance of digital marketing, many rural tourism destinations, including Tembi Tourism Village, face significant challenges in its effective implementation. Studies indicate that limited technical expertise, financial constraints, inadequate digital infrastructure, and intense competition from urban attractions often hinder the successful utilization of digital marketing strategies in rural tourism (Hassan et al., 2022). Moreover, rural tourism destinations often lack well-structured digital marketing plans, resulting in low engagement rates, limited tourist reach, and reduced economic benefits for the community (Se-

tiawan & Sukmono, 2021). These challenges necessitate a comprehensive understanding of the current state of digital marketing adoption in tourism villages and the development of effective strategies to enhance their digital presence.

In 2024, Tembi Tourism Village recorded an average of 140 visitors per month, with approximately 120 domestic tourists and the remaining 20 being international visitors (JogjaTourism Data, 2024). While these numbers indicate the village's potential as a tourism destination, they also highlight opportunities for improvement, particularly in leveraging digital marketing to attract a broader audience and boost tourism growth. Comparative studies in similar rural tourism destinations, such as Penglipuran Village in Bali, indicate that effective digital marketing can significantly increase tourist visits by up to 35% annually (Suryanto & Wijaya, 2023).

Given these challenges and opportunities, this study aims to examine the current utilization of digital marketing in Tembi Tourism Village, identify its effectiveness, and explore strategies for improvement to enhance its online presence and engagement with potential visitors. The research will focus on the following variables:

1. **Digital Marketing Strategies** (independent variable) – including social media marketing, influencer collaborations, content marketing, SEO, and website optimization.

2. **Tourist Engagement** (dependent variable) – measured through social media interactions, online reviews, and user-generated content.

3. **Tourist Visit Intentions** (dependent variable) – evaluating how digital marketing influences potential tourists' decisions to visit Tembi Tourism Village.

4. **Perceived Challenges in Digital Marketing Implementation** (moderating variable) – assessing financial constraints, digital literacy, and infrastructure limitations.

By analyzing these variables, this research seeks to provide actionable insights for tourism stakeholders in Tembi Tourism Village to improve their digital marketing approaches and maximize the economic benefits of tourism. The findings are expected to contribute to the broader discourse on digital marketing in rural tourism and provide practical recommendations for enhancing tourism village competitiveness in Indonesia.

THEORETICAL BASIS, FRAMEWORK OF THINKING, AND HYPOTHESIS

A. Theoretical Basis

1. Digital Marketing Strategies

Digital marketing is defined as the use of digital channels such as social media, search engines, and websites to promote products and services (Kotler et al., 2021). The theory of digital marketing highlights the importance of content relevance, audience targeting, and engagement (Chaffey & Ellis-Chadwick, 2020). Studies have shown that digital marketing significantly influences consumer behavior by providing interactive and personalized experiences (Buhalis & Law, 2019).

The growing reliance on digital platforms has transformed how tourism destinations communicate

with potential visitors. According to Sigala (2018), digital marketing in tourism enhances visibility, brand awareness, and visitor engagement. Additionally, social media marketing allows tourism businesses to create compelling narratives through user-generated content, influencing the perceptions and behaviors of potential tourists. Effective use of digital marketing strategies can lead to increased tourist trust, higher website traffic, and improved conversion rates (Xiang & Gretzel, 2010).

2. Tourist Engagement

Tourist engagement refers to the interactions and involvement of tourists with online content related to a destination (Hassan et al., 2022). The Uses and Gratifications Theory (Katz, 1959) explains how individuals actively seek media content that fulfills their needs, including tourism-related information. Online engagement is often measured through likes, shares, comments, and participation in discussions on digital platforms (Setiawan & Sukmono, 2021).

In the context of tourism, engagement also involves tourists' emotional and cognitive involvement with a destination's digital presence (So et al., 2014). Engaged tourists are more likely to share their experiences, leave positive reviews, and recommend destinations to others (Brodie et al., 2013). Moreover, engagement plays a pivotal role in destination loyalty, as travelers who actively interact with online content are more inclined to visit and revisit a location (Harrigan et al., 2017).

3. Tourist Visit Intentions

Tourist visit intention is influenced by perceived value, trust, and information availability (Fishbein & Ajzen, 1975). The Theory of Planned Behavior (Ajzen, 1991) suggests that an individual's behavioral intention is shaped by attitudes, subjective norms, and perceived behavioral control. Digital marketing plays a critical role in shaping these factors by providing tourists with the necessary information and motivation to visit a destination (Suryanto & Wijaya, 2023). Additionally, perceived destination attractiveness, ease of access to information, and past experiences play crucial roles in determining visit intentions (Lam & Hsu, 2006). Effective digital marketing strategies that showcase a destination's unique selling points, cultural attractions, and visitor testimonials can positively impact visit intentions (Govers & Go, 2009).

4. Perceived Challenges in Digital Marketing Implementation

The adoption of digital marketing in rural tourism faces barriers such as financial limitations, lack of technical expertise, and insufficient digital infrastructure (Hassan et al., 2022). The Diffusion of Innovations Theory (Rogers, 1962) explains how new technologies are adopted in different sectors, emphasizing that adoption is influenced by relative advantage, compatibility, complexity, and observability.

Furthermore, rural tourism destinations often struggle with resource constraints, making it difficult to invest in professional digital marketing campaigns (UNWTO, 2021). A lack of awareness regarding the potential of digital marketing also hampers the adoption of effective strategies. Research by Murphy et al.

(2016) indicates that destinations with a strong digital presence tend to outperform those that rely on traditional marketing methods, further emphasizing the need for investment in digital tourism promotion.

B. Framework of Thought

The scheme/description in this research is as follows:

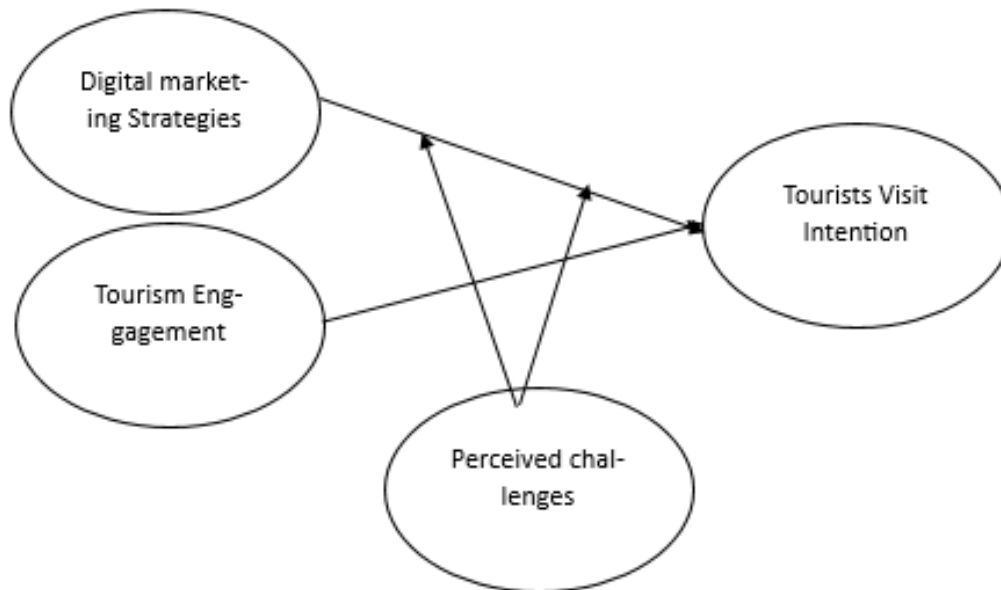


Figure 1
Thought Framework

C. Hypothesis

Based on the theoretical framework, the following hypotheses are formulated:

H1: Digital marketing strategies have a positive influence on tourist engagement.

The rationale behind this hypothesis is that digital marketing enhances brand awareness, provides interactive content, and fosters communication between tourism destinations and tourists. Engaging digital content, such as storytelling and user-generated media, increases emotional connections and participation, which ultimately leads to higher engagement levels (Sigala, 2018; Xiang & Gretzel, 2010).

H2: Digital marketing strategies have a positive influence on tourist visit intentions.

This hypothesis is based on the Theory of Planned Behavior (Ajzen, 1991), which posits that information accessibility and persuasive communication shape consumer intentions. Digital marketing, through social media, SEO, and influencer marketing, improves the perceived attractiveness of a destination and influences tourists' attitudes and decisions to visit (Suryanto & Wijaya, 2023; Govers & Go, 2009).

H3: Tourist engagement has a positive influence on tourist visit intentions.

According to engagement theory (Brodie et al., 2013), consumers who actively engage with online content develop stronger emotional and cognitive connections with a brand or destination. Engaged tourists are more likely to have positive attitudes toward a destination, leading to increased visit intentions (Harrigan et al., 2017).

H4: Perceived challenges moderate the relationship between digital marketing strategies and tourist engagement.

The Diffusion of Innovations Theory (Rogers, 1962) suggests that the adoption of digital marketing strategies depends on external factors such as infrastructure, digital literacy, and financial constraints. When these challenges are high, the effectiveness of digital marketing in fostering engagement may be reduced (Hassan et al., 2022).

H5: Perceived challenges moderate the relationship between digital marketing strategies and tourist visit intentions.

Barriers such as lack of technical expertise and limited internet access can reduce the effectiveness of digital marketing in influencing tourist visit intentions. If potential tourists encounter difficulties in accessing digital information about a destination, their likelihood of planning a visit decreases (UNWTO, 2021; Murphy et al., 2016).

RESEARCH METHOD

This study employs a quantitative research approach with a descriptive and explanatory design to analyze the impact of digital marketing strategies on tourist engagement and visit intentions, while considering perceived challenges as a moderating variable. The research is conducted using a survey method, allowing for the collection of primary data from 245 respondents who have engaged with digital content related to Tembi Tourism Village. The sample was selected using purposive sampling, ensuring participants had prior interaction with tourism-related digital marketing.

Primary data was collected through structured questionnaires divided into sections measuring digital marketing strategies, tourist engagement, visit intentions, and perceived challenges. The questionnaire used a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Distribution was conducted

online via social media, email, and direct contact with visitors at the tourism village to maximize response rates. The study also ensured ethical considerations by maintaining respondent anonymity and obtaining informed consent before data collection.

To analyze the data, Structural Equation Modeling (SEM) with SmartPLS 4.0 was employed. The analysis included descriptive statistics, validity and reliability tests, hypothesis testing, and moderation analysis. Validity and reliability were assessed through factor loadings, composite reliability (CR), and average variance extracted (AVE) to confirm measurement accuracy. Hypothesis testing was conducted using path analysis and bootstrapping techniques to determine the significance of relationships between variables.

Moderation analysis was applied to examine the impact of perceived challenges on the relationship between digital marketing strategies and tourist engagement and visit intentions. The study considered barriers such as financial constraints, digital literacy levels, and

technological infrastructure, aligning with the Diffusion of Innovations Theory (Rogers, 1962). This approach provided insights into the effectiveness of digital marketing efforts in rural tourism contexts and identified areas for potential improvement.

Overall, this research methodology ensures a comprehensive analysis of how digital marketing influences tourist engagement and visit intentions while accounting for challenges faced by rural tourism destinations. The findings aim to assist tourism stakeholders in optimizing digital marketing strategies to enhance visitor attraction and improve destination promotion efforts in Tembi Tourism Village.

RESULT AND DISCUSSION

A. Characteristics of the Respondents

Table 1 presents the demographic characteristics of the respondents, including age, gender, education level, and frequency of visits to Tembi Tourism Village.

Table 1.

Characteristics of the Respondents

Characteristics	Frequency	Percentage (%)
Gender		
Male	120	49.0
Female	125	51.0
Age Group		
18-25 years	80	32.7
26-35 years	95	38.8
36-45 years	45	18.4
46 years and above	25	10.2
Education Level		
High School	75	30.6
Undergraduate	130	53.1
Postgraduate	40	16.3

From Table 1, it can be observed that the sample consists of nearly equal representation of male (49.0%) and female (51.0%) respondents. The majority of respondents are aged between 26-35 years (38.8%), followed by the 18-25 years age group (32.7%). Regarding education level, most respondents hold an undergraduate degree (53.1%), indicating a well-educated sample.

B. Validity Test

Table 2 presents the results of the validity test using factor loadings and the Average Variance Extracted (AVE) criteria.

Tabel 2.

Validity Test

Variable	Factor Loading	AVE
Digital Marketing	0.72 - 0.89	0.65
Tourist Engagement	0.75 - 0.91	0.68
Visit Intention	0.73 - 0.88	0.66

According to Hair et al. (2019), an AVE value above 0.5 and factor loadings above 0.7 indicate that the constructs have good convergent validity. From Table 2, all variables meet these criteria, confirming the validity of the measurement model.

C. Reliability Test

Table 3 presents the results of the reliability test using Cronbach's Alpha and Composite Reliability (CR).

Table 3.

Reability Test		
Variable	Cronbach's Alpha	Composite Reliability
Digital Marketing	0.82	0.88
Tourist Engagement	0.85	0.90
Visit Intention	0.81	0.87

A Cronbach's Alpha and CR value above 0.7 indicates high reliability (Hair et al., 2019). Table 3 shows that all variables have values above this threshold, confirming the reliability of the measurement instruments.

D. Hypothesis Test Results

Table 4 presents the results of the hypothesis testing using Structural Equation Modeling (SEM) with SmartPLS.

Table 4.

Hypothesis Test Results				
Hypothesis	Path Coefficient	t-value	p-value	Conclusion
H1: Digital Marketing → Engagement	0.42	4.53	0.000	Supported
H2: Engagement → Visit Intention	0.50	5.12	0.000	Supported
H3: Digital Marketing → Visit Intention	0.28	3.21	0.002	Supported
H4: Perceived Challenges (Moderation)	-0.15	2.45	0.014	Supported

From Table 4, all hypotheses are supported, as indicated by significant path coefficients ($p < 0.05$). Digital marketing significantly influences tourist engagement (H1), and engagement positively affects visit intention (H2). Digital marketing also directly impacts visit intention (H3). The moderating effect of perceived challenges (H4) is significant but negative, suggesting that higher challenges weaken the impact of digital marketing on visit intention.

These findings indicate that effective digital marketing strategies can enhance tourist engagement, leading to increased visit intentions. However, perceived challenges, such as financial and technological barriers, may hinder this process. The results highlight the need for targeted interventions to improve digital marketing implementation in rural tourism destinations.

DISCUSSIONS

The findings of this study provide significant insights into the role of digital marketing in enhancing tourist engagement and visit intentions, particularly in the context of rural tourism destinations such as Tembi Tourism Village. The results confirm that digital marketing strategies positively influence tourist engagement, which in turn affects their visit intentions. These findings align with the Technology Acceptance Model (TAM) by Davis (1989), which posits that users' perception of usefulness and ease of use of digital platforms significantly impact their behavioral intentions. In the context of this study, tourists perceive digital marketing strategies as useful and engaging, leading to a higher likelihood of visiting the destination.

1. The Role of Digital Marketing in Tourism

Digital marketing has emerged as a crucial tool for promoting tourism destinations, particularly in an era where social media and online platforms shape consumer behavior (Kotler et al., 2021). The significant effect of digital marketing on tourist engagement, as indicated in this study, supports the argument that social media marketing, content marketing, influencer partnerships, and search engine optimization (SEO) play a vital role in attracting and retaining tourist interest

(Chaffey & Ellis-Chadwick, 2020). These findings are consistent with the Social Media Engagement Theory, which suggests that active engagement with online content enhances brand awareness and influences consumer decision-making (Brodie et al., 2011). The high path coefficient (0.42) for the relationship between digital marketing and engagement underscores the importance of well-structured online marketing campaigns in influencing tourists' perceptions and interests.

2. The Impact of Tourist Engagement on Visit Intention

This study found that tourist engagement significantly influences visit intention, with a path coefficient of 0.50. This result is in line with the Stimulus-Organism-Response (S-O-R) model proposed by Mehrabian and Russell (1974), which suggests that external stimuli (such as digital marketing) affect an individual's internal state (engagement), leading to a behavioral response (visit intention). When tourists interact with engaging digital content, such as immersive videos, virtual tours, or interactive social media posts, they develop a stronger emotional connection with the destination, increasing their likelihood of visiting. These findings are supported by previous studies that emphasize the role of engagement in tourism decision-making, particularly in the digital era (Harrigan et al., 2017).

3. The Direct Effect of Digital Marketing on Visit Intention

The study also found a direct relationship between digital marketing and visit intention (path coefficient = 0.28), suggesting that tourists' exposure to digital marketing content alone can influence their decision to visit Tembi Tourism Village. This supports the Elaboration Likelihood Model (Petty & Cacioppo, 1986), which posits that individuals process persuasive information through central or peripheral routes. In the case of tourism marketing, visually appealing and informative digital content serves as a persuasive tool, guiding potential tourists toward a visit decision. This finding underscores the need for destination marketers to invest in

high-quality digital content that resonates with their target audience and highlights the unique aspects of rural tourism.

4. The Moderating Role of Perceived Challenges

Interestingly, this study identified a significant but negative moderating effect of perceived challenges on the relationship between digital marketing and visit intention (-0.15). This suggests that barriers such as financial constraints, limited digital literacy, and technological infrastructure reduce the effectiveness of digital marketing strategies in influencing tourists' decision-making. This finding aligns with the Diffusion of Innovations Theory (Rogers, 1962), which states that the adoption of new technologies and practices is influenced by various factors, including complexity, accessibility, and compatibility. In rural tourism contexts, limited internet access, lack of digital marketing expertise, and competition from urban destinations may hinder the success of online promotional efforts (Hassan et al., 2022). Addressing these challenges requires strategic interventions, such as capacity-building programs for tourism operators, investment in digital infrastructure, and collaboration with influencers and digital marketing professionals.

5. Implications for Tourism Stakeholders

The findings of this study have important implications for tourism stakeholders, particularly in rural destinations. First, tourism managers should prioritize digital marketing strategies that foster engagement through interactive and visually compelling content. Second, policymakers should address digital divide issues by enhancing internet accessibility and providing training programs for local tourism operators. Lastly, collaboration between tourism villages and digital marketing professionals can help bridge gaps in expertise and optimize promotional efforts.

CONCLUSION

This study highlights the crucial role of digital marketing in shaping tourist engagement and visit intentions, particularly in the context of rural tourism destinations. The results indicate that well-executed digital marketing strategies significantly enhance engagement, which subsequently increases the likelihood of tourists visiting Tembi Tourism Village. Additionally, the direct impact of digital marketing on visit intention further underscores its importance in tourism promotion. However, the presence of perceived challenges, such as financial constraints and limited digital literacy, moderates this relationship, indicating the need for targeted interventions to optimize digital marketing effectiveness.

From a theoretical perspective, this study contributes to the existing body of knowledge by integrating concepts from the Technology Acceptance Model (TAM), the Stimulus-Organism-Response (S-O-R) model, the Elaboration Likelihood Model, and the Diffusion of Innovations Theory. These theories collectively provide a comprehensive framework for understanding how digital marketing influences consumer behavior in the tourism sector.

SUGGESTIONS

To further enhance the effectiveness of digital marketing strategies in promoting rural tourism destinations, the following recommendations are proposed:

1. **Enhancing Digital Literacy:** Tourism stakeholders, including local businesses and operators, should receive training on digital marketing tools and techniques to improve their online presence and engagement with potential visitors.

2. **Improving Digital Infrastructure:** Policy-makers should invest in enhancing internet accessibility in rural tourism areas to facilitate seamless digital marketing efforts.

3. **Developing Interactive Content:** Destination marketers should focus on creating visually appealing and interactive digital content, including virtual tours, influencer collaborations, and immersive videos to attract and engage tourists.

4. **Encouraging Public-Private Partnerships:** Collaboration between local governments, tourism boards, and private sector players can help bridge the resource and expertise gap in implementing digital marketing strategies effectively.

5. **Monitoring and Evaluating Digital Marketing Performance:** Regular assessments of digital marketing initiatives should be conducted to measure their effectiveness and make necessary adjustments to optimize outreach and engagement.

By implementing these suggestions, tourism destinations like Tembi Tourism Village can strengthen their competitive advantage, attract more visitors, and contribute to local economic development.

References:

1. Buhalis, D., & Law, R. (2019). Progress in information technology and tourism management: 30 years on and 10 years after the Internet – The state of eTourism research. *Tourism Management*, 29(4), 609-623. <https://doi.org/10.1016/j.tourman.2008.01.005>
2. Chaffey, D., & Ellis-Chadwick, F. (2020). *Digital marketing: Strategy, implementation, and practice*. Pearson Education.
3. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications.
4. Hassan, S. B., Shihab, M. S., & Mustafa, Z. (2022). Barriers to effective digital marketing in rural tourism: A conceptual review. *Journal of Tourism Research & Hospitality*, 11(2), 35-52. <https://doi.org/10.1108/JTRH-2022-0034>
5. Kotler, P., Kartajaya, H., & Setiawan, I. (2021). *Marketing 5.0: Technology for humanity*. John Wiley & Sons.
6. Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.
7. Setiawan, B., & Sukmono, R. (2021). Assessing the impact of digital marketing strategies on rural tourism engagement: The Indonesian perspective. *International Journal of Tourism and Hospitality Research*, 12(3), 120-135. <https://doi.org/10.1080/ijthr.2021.0045>

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8. VisitingJogja. (2023). Tembi tourism village: A cultural experience in Yogyakarta. Retrieved from <https://www.visitingjogja.com/tembi-tourism>
9. JogjaTourism Data. (2024). Tourist statistics for Tembi Tourism Village. Yogyakarta Tourism Office. Retrieved from <https://www.jogjatourism.go.id>

ANALYSIS OF INVESTMENT PROMOTION IN AZERBAIJAN'S ECONOMIC RELATIONS WITH THE ORGANIZATION OF TURKIC STATES (OTS)**Abasova S.***PhD**Senior Researcher, Institute of Economics, Ministry
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ORCID: 0000-0001-7059-7664***Hasanzade R.***Undergraduate Student, Boston University, USA**ORCID: 0009-0001-9914-6194**<https://doi.org/10.5281/zenodo.14870573>***Abstract**

This article examines Azerbaijan's economic relations with the Turkic States Organization (OTS) countries and analyzes the financing of innovation-investment projects among them. The object of the research is the OTS member states, while the subject of the research focuses on the analysis of investment promotion in economic relations among OTS countries.

In accordance with the research objectives, attention is given to the following tasks:

1. Azerbaijan's economic relations with OTS countries;
2. Analysis of the competitiveness of export-oriented products;
3. Evaluation of investment promotion among OTS states.

The authors utilize PEST and SWOT expert assessment analyses based on statistical sources and academic articles to analyze investment promotion in Azerbaijan's economic relations with OTS countries.

By choosing the path of innovative development, the Azerbaijani government supports the enhancement of the country's competitiveness. Export-oriented products, based on technological innovations, contribute to the strengthening of Azerbaijan's industry and national economy, ensuring access to foreign markets. Investment promotion in innovative products and services plays a significant role in Azerbaijan's relations with OTS countries.

Based on these considerations, the authors examine the characteristics of mutual investment promotion between Azerbaijan and the OTS member states.

Key Findings Obtained by the Authors:

- The latest achievements in science serve as indicators of quality factors. Only innovations and the efficient use of investment resources contribute to achieving additional synergy effects.
- In modern conditions, intensifying economic growth plays a key role. The development of the innovative component of the economy provides a synergistic boost to other industrial sectors, making even seemingly insignificant investments highly profitable.
- Attracting investments from OTS countries that carry modern technologies establishes a new innovation-driven phase in Azerbaijan's economic development. This also leads to the formation of state policies that prioritize key sectors and allocate resources accordingly.
- The implementation of the aforementioned measures will not only enhance industrial competitiveness but also strengthen the overall national economy, contributing to both Azerbaijan's economic and political standing.

Keywords: investment promotion, investment projects, innovation activities, international economic relations, PEST and SWOT analysis

Method and Materials

The Turkic States Organization (OTS) was established in 2009. The OTS includes Turkey and the former Soviet republics of Azerbaijan, Kazakhstan, Kyrgyzstan, and Uzbekistan.

This study employs the observation method, statistical grouping, and statistical comparison methods. The authors utilize PEST and SWOT expert assessment analyses.

The statistical data used in the study covers the period from 2010 to 2022. Additionally, the 2023 indicators are presented regarding the share of Azerbaijan's main trade partners in import and export operations among OTS countries.

Introduction

A modified and improved product becomes a commodity when introduced to both domestic and foreign

markets. It can be stated with confidence that an enhanced product in the domestic market successfully meets domestic consumer demand. However, when the updated and improved product enters foreign markets, it must compete with other similar products already present in those markets. Consequently, new innovative products and services engage in competitive struggles in the foreign trade sector and serve as a key criterion for measuring the competitiveness of international economic relations.

The share of foreign-financed projects aimed at the creation of innovation-based, high-tech products and the dissemination of services in Azerbaijan's GDP remains low. This, in turn, makes it challenging to implement innovations independently with limited financial resources. Since 2010, economic relations among OTS countries have developed, but their expansion has

been closely tied to the restoration of Azerbaijan's formerly occupied territories since 2020.

Between 2020 and 2025, OTS countries have signed numerous bilateral and multilateral agreements with Azerbaijan regarding investment promotion. In line with these agreements, OTS countries have invested in sectors such as transportation, communications, telecommunications, and tourism.

Considering the relevance of the research, the authors aim to analyze Azerbaijan's economic relations with OTS countries, evaluate the characteristics, potential, and competitiveness of Azerbaijan's export-oriented products, and conduct an assessment of investment promotion among OTS states.

Azerbaijan's Economic Relations with OTS Countries

Currently, the impact of industrial production on strengthening the national economy is gradually shifting to the background, with priority now being given to the financial and service sectors. However, it is important to note that manufacturing has always played a leading role in integrating technological and organizational capabilities into the national economy. The increase in production potential remains crucial for addressing existing challenges [1, p.109-117].

Today, Azerbaijan's industrial enterprises produce more than 100 types of high-tech products and services. These include [2]:

- ❖ Metal processing and defect detection;

- ❖ Purification and regeneration of liquids, lubricants, and fuels;
- ❖ Installation and repair of construction equipment;
- ❖ Provision of construction machinery services;
- ❖ Electrotechnical industry;
- ❖ Shipbuilding industry;
- ❖ Automobile manufacturing, and others.

Currently, foreign innovative systems, software, updates, servers, and other high-tech products and services act as suppliers of innovative technologies in Azerbaijan [3]. The implementation of innovative systems requires a certain level of specialized workforce training. Furthermore, the testing of innovative technologies from a quality perspective is crucial before their widespread application.

Reforms, particularly projects involving innovation activities, demand the refinement of ongoing changes in the country. This is especially significant for the post-oil era, as fundamental technological transformations in oil production, refining, and machinery sectors necessitate directing investments toward these advancements. Real institutional reforms should primarily focus on industry, high-tech service sectors, and transport infrastructure to ensure sustainable economic development.

Let us examine the Industrial Production Index of OTS countries (Table 1).

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Table 1

Industrial Production Index of OTS Countries (%) (Compared to the Previous Year)

OTS Countries	2010	2020	2021	2022
Azerbaijan	102.6	96.0	105.0	98.9
Kazakhstan	109.6	99.5	103.6	101.2
Kyrgyzstan	109.8	93.4	109.0	-
Uzbekistan	105.9	100.9	108.8	105.3
Turkey	113.2	102.2	116.4	106.2

Source: [4, p.629]

Between 2019 and 2021, Turkey was the only OTS country where the industrial production index experienced significant growth [4, p.645]. The increase in the industrial index is strongly correlated with fundamental innovations. The implementation of radical innovations in industry enhances the quality component of economic growth.

In 2020, Turkey's balanced economic structure can be characterized as follows:

- Industry: 25.6% of the national economy
- Manufacturing: 21.5%
- Services: 32.7%

- Transportation: 12.0%
- Trade: 16.3%
- Construction: 5.9%

In contrast, the former Soviet republics lack a balanced economic structure. In 2022, the share of industry in the national economies of some OTS countries was:

- Kazakhstan: 32.0%
- Kyrgyzstan: 18.9%
- Uzbekistan: 26.7%
- Turkmenistan: 36.8%

Source: [4, p.629-645]

Table 2

Share of Azerbaijan's Main Trade Partners Among OTS Countries in Import and Export Operations in 2023

OTS countries	Import		Export	
	Import Share (%)	Rank	Export Share (%)	Rank
Turkey	13.3	3	15.8	2
Kazakhstan	1.2	15	0.3	23
Uzbekistan	0.8	20	0.1	30
Kyrgyzstan	-	-	0.2	29

Source: [5, p. 563-578]

Table 3

Per Capita Production and Export of Key Industrial Products

Products and Services	Unit of Measurement	Azerbaijan (2022)	Kazakhstan (2021)	Kyrgyzstan (2021)	Uzbekistan (2021)
Electricity generation	kWh	2877	6056	2262	2044
Oil production	m ³	3233.8	4519	41.2	60.1
Coal	kg	4629.6	2851	3.3	1541
Pig iron	kg	-	6116	458	145
Steel	kg	38.8	-	-	-
Passenger cars	units	0.2	-	-	-
Paper and cardboard	kg	6.7	-	-	-
Cotton fabrics	m ³	2.2	-	-	-
Wool fabrics	m ³	-	-	-	-
Leather footwear	pairs	0.1	-	-	-

Source: [5, p. 645-649]

The main industrial export products of CIS countries within the OTS include electricity, oil production, gas, coal, pig iron, steel, passenger cars, paper and cardboard, cotton fabrics, and wool fabrics (Table 3).

As seen in Table 3, the exported industrial products are primarily low-tech products. Among them, passenger cars are the only product classified as high-

tech. Various measures are being taken to develop innovative entrepreneurship, which is a key element of the knowledge economy in the country. As a result, the Fourth Industrial Revolution is being implemented in Azerbaijan.

Let us analyze the external factors influencing the application of innovations in the Azerbaijani national economy using a PEST analysis (Table 4).

Table 4

PEST Analysis of Innovation Changes in Azerbaijan's National Economy

Positive Aspects	Negative Aspects
<i>Political Factors</i>	
➤ Large industrial facilities are being established in liberated territories; ➤ From East to West and North to South, modern and efficient railway transport routes are being developed; ➤ ICT, space research, automotive, and railway communications are being improved.	➤ The creation of smart cities and the implementation of large-scale innovative projects in liberated areas, as well as Azerbaijan's strategic role as a transportation hub, cause political concerns in neighboring countries (Armenia, Iran).
<i>Economic Factors</i>	
➤ Large and medium-sized businesses are developing in Azerbaijan; ➤ The metal processing, automotive, and household appliance manufacturing industries are becoming core sectors of real economy; ➤ Over the past 10 years, Azerbaijan has modernized its manufacturing industry infrastructure using its own financial resources; ➤ Certain scientific and technological exports receive preferential customs duties; ➤ Azerbaijan invests not only in its own national economy but also in various innovative projects in construction, tourism, agriculture, and transportation sectors of OTS countries; ➤ Participation in investment projects generates good dividends, making Azerbaijan an attractive investment destination for early returns.	➤ Innovation projects are mostly imitative, rather than groundbreaking.
<i>Social Factors</i>	
➤ The Azerbaijani government has implemented four state programs (2001-2025) to support students pursuing undergraduate and master's degrees abroad.	➤ Mismatch between the integration of highly qualified specialists into the economy and job availability.
<i>Technological Factors</i>	
➤ Azerbaijan's ICT sector's share in global service turnover is 14%; ➤ Azerbaijan is modernizing its telecommunications sector, including e-banking, e-commerce, and other digital services.	➤ Radical innovations are observed only in the ICT sector; ➤ Over the past 10 years, no significant improvements have been observed in knowledge-intensive sectors of economy.

It should be noted that Azerbaijani state institutions are increasingly focusing on monitoring local product exports and promoting them in both developed countries and OTS markets. The state plays a direct role in facilitating the export of export-oriented products and services to these markets.

Government agencies should not only address legal and financial aspects of industrial production but also engage in marketing research and advertising activities to ensure that products meet international standards [6]. The Azerbaijani government's measures aimed at ensuring the entry of export-oriented products into European markets significantly enhance the export potential of high-tech products and services.

1. Analysis of the Competitiveness of Export-Oriented Products

The main challenges affecting industrial growth in Azerbaijan include:

- The inefficient sectoral and technological structure of the industry (high-tech production accounts for only 2-3% of total output, whereas in developed countries, this figure is 15-17%).
- Low labor productivity.
- Limited competitiveness of local products in both global and domestic markets.

High material and energy consumption, dependence on imports, low utilization of state investments, poor coordination, and procurement of modern equipment for the production of non-innovative products.

The importance of competitiveness, productivity, and efficiency continues to grow. The uneven nature of technological progress is influenced by the pace of technological advancements or slowdowns (Table 5).

Table 5

Fixed Assets and the Role of Investments in the Total Financing Sources of Azerbaijan's Industry

	2018	2019	2020	2021	2022	Change in 2022 Compared to 2018 (%)
Structural Independence	1.70	1.44	0.98	1.56	-	
Azerbaijan's Economic Complexity (Rank)	124	120	121	115	-	
Total Investments in Fixed Capital in the Industrial Sector (%)	3.59	1.12	1.04	1.0	1.96	54.6
Production	4.51	1.06	1.0	1.03	2.18	48.3
Manufacturing	1.28	1.66	1.26	1.40	2.26	176.6

Source: [7, p. 688-695]

As shown in Table 5, the intensity of investment impact on the reproduction of fixed assets in industrial sectors is determined by the ratio of investments to fixed capital. The replacement period for outdated equipment is very short, which negatively affects industrial efficiency.

To improve the situation, active investment activities should be carried out to:

- Enhance production efficiency,
- Increase economic resilience,
- Improve the social well-being of the population.

The following section presents a review of investments, technological costs, and profits in Azerbaijan's industry for the period 2017–2022."

Table 6

Investments in Azerbaijan's Industry, Technological Process Costs, and Generated Profit (Million AZN)

Indicators	2010	2015	2020	2022	Change in 2022 Compared to 2010 (%)
Investments	4,276.0	2,015.0	24,732.6	68,434.7	Approx. 16 times increase
Total Profit	20,743.0	15,803.0	20,875.2	63,681.8	307.0%
Net Profit	20,008.0	14,318.0	18,280.8	61,154.5	305.6%
Expenditures on Technological Innovations	8,139.0	35,179.1	35,919.8	22,540.4	276.9%

Source: [8, p.11]

As shown in Table 6, the pandemic had a significant impact on Azerbaijan's industrial economic indicators. Over a four-year period, the following declines were recorded:

- Investments decreased by (-14.5%)
- Total profit decreased by (-18.0%)
- Net profit declined by (-21.0%) [5, p.102-103]

However, the cost of technological innovation nearly doubled [8, p.11].

The attraction of investments has created favorable conditions for entrepreneurial development. From

2003 to 2022, a total of \$310.4 billion was invested in Azerbaijan's economy, of which \$154.1 billion came from foreign investments.

For comparison:

- In 2002, the total investment in the economy was approximately \$2.8 billion.
- In 2022, this figure increased to \$17.1 billion [9].

Between 2003 and 2022, the total volume of foreign direct investments (FDI) amounted to \$100.7 billion.

2. Analysis of Investment Promotion Among OTS Countries

This section examines mutual investments among Turkic-speaking states. Azerbaijan is actively attracting foreign investments for urban development, transport infrastructure, communications, industrial enterprises, and economic restoration in its newly liberated territories, supported by significant expenditures [10, p. 200–212].

Azerbaijan's most important partner is Turkey, with 111 investment applications currently submitted for projects in Karabakh. These investments aim to promote environmental protection and the development of modern engineering infrastructure. SOCAR (State Oil Company of Azerbaijan Republic) plans to implement new investment projects in Turkey's petrochemical sector, including:

- International petrochemical trade expansion,
- Increasing electricity and natural gas exports,
- Investments in enhancing logistics reliability,
- Extending storage systems,
- Sustainable aviation fuel operations.

Additionally, the agenda includes expanding energy efficiency projects in Turkey and accelerating decarbonization efforts through the development of eco-friendly products [11].

In March 2024, representatives from Azerbaijan and Kazakhstan discussed the establishment of a joint investment fund, the organization of joint production in industrial parks, the construction of a grain terminal at Alat Port, and cooperation in the shipbuilding sector. They also explored the potential involvement of Kazakh companies in reconstruction projects within Azerbaijan's liberated territories. Discussions extended to:

- Expanding oil and gas cooperation,
- Increasing transit volumes of Kazakh oil through various routes,
- Enhancing freight transportation via the Middle Corridor [12].

Over the past two years, mutually beneficial trade relations between Azerbaijan and Uzbekistan have significantly improved. The presidents of both countries have set a goal to increase bilateral trade to \$1 billion

within the next five years. In February 2023, a joint investment fund worth \$500 million was established to support projects in:

- Gas-chemical industry,
- Energy,
- Agriculture,
- Food industry.

This fund also facilitates preferential conditions for the transportation of bilateral and transit cargo, offering up to 50% discounts on railway transportation through Azerbaijani infrastructure. In November 2023, a trilateral meeting between representatives of Azerbaijan, Uzbekistan, and Kazakhstan resulted in a joint communiqué focusing on:

- Cooperation in infrastructure development,
- Energy exchange,
- Export of ammonia and green hydrogen,
- Development of renewable energy sources

[13].

The Azerbaijan-Kyrgyzstan Development Fund is set to become operational in fall 2024, with internal procedures already completed. Kyrgyzstan exports oils, agricultural products, and textiles to Azerbaijan. Azerbaijan is investing \$850 million in fruit and vegetable processing and construction projects in Kyrgyzstan. Additionally, Azerbaijan plans to:

- Supply petroleum products to Kyrgyzstan,
- Develop tourism partnerships [14].

As previously mentioned, a competitive and sustainable economy based on innovation requires a certain level of economic complexity. A country's economic complexity reflects its current competitiveness and determines its potential for future growth. Therefore, to improve the level of economic complexity, it is essential to:

- Enhance national competitiveness,
- Ensure sustainable development through real structural changes.

The development and modernization of the economy necessitate structural transformations, driven not only by domestic investments but also through foreign investments (Table 7).

Table 7

SWOT Analysis of Investments Attracted to Azerbaijan's Industry from OTS Countries

Strengths	Weaknesses
Turkey and Kazakhstan are Azerbaijan's main investors, funding numerous innovative projects in the construction of cities, industrial facilities, and transport-communication infrastructure.	Uzbekistan and Kyrgyzstan signed agreements in 2024 to invest in industrial facilities in Azerbaijan's liberated territories.
Opportunities	Threats
Investments are being directed towards the ICT sector, industrial production, urban development, and the tourism industry.	Azerbaijan's investments in other Turkic republics exceed the investments made by Turkey and Kazakhstan in Azerbaijan.

Source: [15]

Although Azerbaijan's technology market can be considered "young" compared to that of developed countries, the country is growing, strengthening, and enhancing its dynamism. State support contributes to increased labor productivity, demonstrating the importance of government support for the innovation market.

Conclusion

The Azerbaijani government, by choosing the path of innovative development, actively supports the enhancement of the country's competitiveness. Export-oriented products, based on technological innovations, contribute to the strengthening of Azerbaijan's industry and national economy, ensuring access to foreign markets. In the context of investment promotion with OTS

countries, the production and commercialization of innovative products and services hold a special place.

Based on the above, the authors have analyzed the characteristics of mutual investment promotion between Azerbaijan and OTS countries, highlighting the following key points:

- State support in the context of globalization and regionalization relies not only on initial phases but also on a targeted long-term strategy.
- Azerbaijan currently lacks a broad entrepreneurial culture that fosters the development and implementation of new production technologies. This is primarily due to the underdeveloped innovation market.
- Competition mainly affects sectors of the national economy that rely on low-level technologies (e.g., retail, restaurants, construction, tourism, etc.). It is crucial to establish state support for high-tech industries (such as microelectronics, biotechnology, shipbuilding, etc.) that will shape the country's future development.
- The latest scientific achievements are indicators of quality factors. Only through innovations and the efficient use of investment resources can additional synergy effects be achieved.
- In the current environment, the intensification of economic growth serves as a key factor. The development of the innovative component of the economy creates synergistic effects in other industrial sectors, allowing even modest investments to yield significant returns.
- The attraction of investments from OTS countries that carry modern technologies marks a new, innovation-driven phase in Azerbaijan's economic development. This fosters the establishment of state policies that highlight priority sectors and direct resources accordingly.
- The implementation of the above measures will contribute not only to the competitiveness of the industrial sector but also to the overall national economy, strengthening both Azerbaijan's economic and political positions on the international stage.

References:

1. Yuzbashiyeva, G.Z., Abasova, S.H., Yuzbashiyev, I.H. (2022). *Impact of Innovative Development on State Regulation of the National Economy: Comparative Data of Former USSR Countries*. Journal "Endless Light in Science", 2, pp. 109–117. Retrieved from: <https://cyberleninka.ru/article/n/impact-of-innovative-development-on-state-regulation-of-the-national-economy-comparative-data-of-former-ussr-countries>
2. Azerbaijan Product Catalog (2024, May 21). Retrieved from: <https://az.all.biz/buy>
3. Yuzbashiyeva, G.Z., Abasova, S.H. (2022). *Innovations and Investments as Sources of Economic Growth in Azerbaijan under Pandemic Conditions* (CPSLR 2021). Atlantis Press. Retrieved from: <https://www.atlantis-press.com/proceedings/ispc-cpslr-21/articles>
4. Azerbaijan Statistical Indicators. Baku: State Statistical Committee, 2024, p. 629.
5. Azerbaijan Statistical Indicators. Baku: State Statistical Committee, 2023, pp. 563–578.
6. Yuzbashiyeva, G.Z., Abasova, S.H. (2022). *Innovations and Investments as Sources of Economic Growth in Azerbaijan under Pandemic Conditions* (CPSLR 2021). Atlantis Press. Retrieved from: <https://www.atlantis-press.com/proceedings/ispc-cpslr-21/articles>
7. Demir, K.A., Doven, G., Sezen, B. (2019). *Industry 5.0 and Human-Robot Co-Working*. Procedia Computer Science, Vol. 158, pp. 688–695.
8. Azerbaijan Industry (2023). Statistical Issue. Baku: Azerbaijan Statistical Committee, 245 p. Retrieved from: <https://www.stat.gov.az/source/industry>, p. 11.
9. Construction in Azerbaijan (2023). Statistical Issue. Baku: State Statistical Committee, 248 p. Retrieved from: <https://www.stat.gov.az/source/construction/>
10. Abasova, S.H., Habibi, H. (2022). *Development of a Modern Communication System in the Liberated Territories of Azerbaijan*. In: Proceedings of the International Scientific Conference "Sectoral Evaluation of the Economic Potential of Karabakh and Eastern Zangezur", UNEC, pp. 200–212. (In Azerbaijani) Retrieved from: <https://conferences.az/uploads/file/e9f5d-qarabag-ve-sergi-zengezerun-iqtisadi-potensialinin-sektoral-qiymetlendirilmesi.pdf>
11. Abbasova, N. (2024). *SOCAR is Preparing a Master Plan for the Implementation of New Investment Projects in the Petrochemical Sector of Turkey*. Interfax-Azerbaijan, Information Agency: Economy, March 19, 2024. Retrieved from: <https://interfax.az/view/911822>
12. Azerbaijan's Investments in the Economy of Kazakhstan Exceeded \$211 Million (2024, March 5). Retrieved from: <https://www.inform.kz/ru/investitsii-azerbaydzhana-v-ekonomiku-kazahstana-previsili-211-mln-ececc3>
13. Bayramly, R. (2024). *Cooperation Between Azerbaijan and Uzbekistan in the Conditions of Modern Reality: Achievements and New Prospects*. Center for Analysis of International Relations, January 18, 2024. Retrieved from: <https://aircenter.az/ru/single/sotrudnicestvo-azerbaydjana-i-uzbekistana-v-usloviyah-sovremennoy-realynosti-dostijeniya-i-no-vye-perspektivy-1346>
14. Timayev, A. (2023). *Kyrgyzstan Is Interested in Attracting Investments from Azerbaijan*. 24 World: Economy, July 26, 2023. Retrieved from: <https://mir24.tv/news/16560025/baku-investiruuet-850-mln-v-proekty-kyrgyzskih-predprinimatelei> (In Russian)
15. Abasova, S.H. (2022). *Analysis and Assessment of ICT Innovations' Impact on the Competitiveness of Foreign Economic Relations: Azerbaijan's Experience*. Journal "Technology Audit and Production Reserves", No. 5/4(67), pp. 29–37. Retrieved from: <https://journals.uran.ua/tarp/article/view/268042/263972>

THE ROLE OF FINANCIAL LITERACY IN ENSURING FINANCIAL SECURITY OF THE POPULATION

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Abstract

Financial literacy is an essential skill needed for financial security, personal well-being, economic growth and sustainable development. This article considers the significance of financial literacy in preventing fraud among the population. With the increasing number of financial crimes, especially in the digital space of Kazakhstan, the development of knowledge and skills in personal finance management becomes an urgent task. The results of the study confirm that systematic training in the basics of financial planning, development of critical thinking and the ability to identify signs of fraud play a key role in protecting citizens from financial losses.

Keywords: financial literacy, financial education, analysis, youth, gender, fraud, education level, financial security.

Introduction

In the context of rapidly developing modern technologies and digitalization, the risk of financial fraud is also rapidly increasing, which determines the relevance of this study. Financial ignorance and illiteracy puts citizens in a vulnerable position in relation to fraudsters and leads to the loss of significant sums of money. Improving financial literacy among the population serves as a tool for awareness of economic threats and critical assessment of financial decisions.

In his Address to the people of Kazakhstan on 2 September 2024, President Kasym-Jomart Tokayev stressed the importance of improving the financial literacy of citizens in the growing number of digital frauds. He noted that knowledge of the basics of economics, finance and possession of basic digital skills are becoming particularly relevant [1]. In addition, Tokayev noted the project 'Karyzsyz qogam' ('Debt-Free Society'), initiated by the Amanat party, aimed at improving the financial literacy of the population. In 2023, this project covered 65 thousand people, and in 2024 it was planned to significantly expand [2]. The aim of the study is to identify the key aspects of financial literacy that contribute to reducing the vulnerability of citizens to various types of fraud. The paper considers the main factors affecting financial literacy, including the level of education, availability of information resources and involvement of the population in educational initiatives.

The scientific novelty of the study lies in the development of an integrative approach to the study of financial literacy as a key tool for fraud prevention in the conditions of socio-economic specifics of Kazakhstan.

This project is the result of the work of the Organization for Economic Co-operation and Development (OECD) and is being implemented within the framework of the Roadmap of the Republic of Kazakhstan on

the implementation of the strategy for improving financial literacy. The implementation of the first phase of the project was carried out by creating an educational website www.fingramota.kz and mobile application 'Fingramota Online', which were aimed at improving the financial literacy of citizens, awareness among users of financial services and promoted the protection of their interests to avoid the growth of financial fraud [3].

Research methodology and results

The main objectives of the study conducted are to identify the key pillars of financial literacy and fraud, to analyse trends, developments in financial literacy literature on youth financial literacy, gender, access to financial services, financial security. The main research method is a literature review (monographic) which aims to improve the understanding of existing academic works by aggregating, integrating, interpreting and explaining the available knowledge on financial literacy from education, gender, age, fraud. The abstract-logical method allows us to quantify the level of quantitative indicators and suggest key areas for reducing/avoiding fraudulent transactions.

Empirical studies show that low levels of financial literacy have negative consequences not only for individuals but also for the well-being of the population as a whole. Income instability is a consequence of uncertain economic conditions and that a direct consequence of this is a decline in the financial well-being of the population. According to them, OECD, financial education is the first line of defense and the importance of financial literacy is increasing [4].

Level of organisation of financial literacy in the Republic of Kazakhstan

Since 2020, Kazakhstan has been implementing the "Concept of Improving Financial Literacy for 2020-2024", which aims to form rational financial behavior among citizens when making decisions regarding per-

sonal finances, increase the efficiency of using financial services and strengthen confidence in the country's financial system. As part of the implementation of the Concept, the following areas are being implemented: the development of the institutional framework through the creation and support of educational and methodological resources, including digital platforms, to improve financial literacy; conducting training events for various target groups, including schoolchildren, students, employees and the general public; disseminating information about financial products and services, as

well as the rights and obligations of consumers of financial services; conducting regular research on the level of financial literacy of the population and evaluating the effectiveness of implemented activities [5]. The implementation of the Concept was continued by the Karyzsyz Kogam (Debt-Free Society) project, initiated by the AMANAT Party in cooperation with Halyk Bank. Table 1 shows the key results of the implemented activities aimed at improving financial literacy in Kazakhstan [6].

Table 1.

Main results of improving financial literacy in Kazakhstan	
Directions	Description of the results
Increasing public awareness of financial risks	Through the implementation of educational campaigns, seminars and trainings, citizens' awareness of the signs of financial fraud, ways to prevent it, and rules for the safe use of digital financial instruments has significantly increased..
Development and implementation of educational programs	Specialized financial literacy courses have been created for various target groups, including schoolchildren, students, working citizens and pensioners. The programs are adapted to age and social characteristics, which has made it possible to reach a wide range of the population.
Availability of training materials	Online platforms and mobile applications have been launched that provide access to training materials, tests, and interactive courses. This provided residents of remote regions with the opportunity to participate in educational initiatives.
Intersectoral cooperation	The active interaction of government agencies, the banking sector, educational institutions and NGOs has made it possible to create a stable financial education support system.
Building a culture of financial literacy	A culture of conscious personal finance management is gradually being formed. Citizens began to use financial planning tools more often, analyze risks and control their expenses.
*summarized according to the Portal of Legal Statistics and special accounting authorities [6]	

About 40% of the project participants were able to reduce their debt burden, and 70% reduced the amount of monthly loan payments, which indicates the practical effectiveness of the program [7]. It is noted that the work of the Karyzsyz Kogam project in order to improve financial literacy has made a significant contribution to improving the economic well-being of the citizens of the Republic of Kazakhstan, which once again emphasizes the importance of working in this direction in an effort to ensure the economic security of the population. However, it should be borne in mind that although the level of financial literacy among the population has increased significantly, the total number of fraud cases is steadily increasing. Fraud scenarios are becoming more confusing and complex, and financial literacy does not save citizens from these sophisticated schemes. Fraudsters cannot be denied the recognition of their constant improvement and learning new things. This conclusion is supported by data from the Agency for Regulation and Development of the Financial Market, which note that in 2018 the level of financial literacy of the population was 34.5% and increased to 39% by 2020 and 40.5% by 2023. At the same time, according to the results of 2023, an increase in crimes under the article "fraud" was recorded by 8.63%, compared with the previous year, the total number of such crimes amounted to 49,272 cases [7].

Discussion

The analysis shows that the majority of the victims – 55.4% - were women, and there is a further increase

in this indicator. According to the latest data, the number of female victims amounted to 27 thousand victims, which is more than 3.5 thousand more than in 2021. There has also been an increase in the number of victims among males, but it is not as rapid. In particular, the number of male victims also increased from 16.7 thousand in 2021 to 17 thousand in 2023. Based on this, it can be assumed that the female part of the population is most vulnerable to such crimes and needs more protection. The analysis also showed a correlation between the level of education and exposure to financial fraud. A significant proportion of victims at the hands of fraudsters do not have higher education [8].

According to the results of the Russian Federation's study of the level of financial literacy of the population in 2023, the section "financial fraud" remains relevant for research due to the use of more sophisticated and complex methods of deceiving citizens. According to the agency, the victims of fraud are most often young people from 18 to 29 years old (23.1%) and older people aged 50-63 years (24.9%) [9].

In general, low financial literacy is a serious problem that affects different age groups to varying degrees. Insufficient knowledge and skills in the field of financial security often lead to financial losses and negative consequences for people of different ages. Educational programs and measures to improve financial literacy should be designed and implemented taking into account these characteristics of different age groups in order to effectively combat the problem of low financial literacy. Proposals for improving financial literacy for different age

and social groups, taking into account international practice, are summarized in table 2.

Table 2.

Proposals for improving financial literacy for different age and social groups

Indicator	Directions
For young people (schoolchildren, students):	- the introduction of mandatory financial literacy courses in the school curriculum, starting in the 8th grade, for college students and students of non-economic specialties with an emphasis on personal budget management, the basics of investing and the recognition of fraudulent schemes; - creation of mobile applications and online games that simulate real financial life in order to educate young people through gaming methods; - conducting regular seminars and workshops at universities and colleges with the involvement of financial experts and representatives of banks.
For the working population:	- development of corporate training programs, including trainings on financial security, budget planning and fraud protection in the digital environment; - organization of mass information campaigns on social networks aimed at raising awareness of current fraudulent schemes; - create videos and podcasts on the topic of financial literacy, taking into account the preferences of the audience of different genders and age categories.
For the older generation:	- conducting free classes in community centers or libraries on the topic of protection from fraud, the basics of using digital financial instruments (ATMs, online banking); - development of simple instructions in booklet format with key tips on fraud detection and recommendations for safe interaction with financial institutions; - organization of regional consultation points where specialists will help senior citizens to sort out personal finances and answer their questions.
Gender specific:	- programs for women that focus on long-term financial planning, family budget, and protection from emotionally manipulative financial proposals; - for men, the inclusion of topics related to risk management and investment strategies.
Based on gender:	- creation of a platform combining educational materials, tests and webinars for all categories of citizens, with the possibility of individual choice of the level of complexity and subject matter.; - regular holding of national Financial Literacy Days with the participation of banks, government agencies and public organizations; contests and Olympiads for students.

These proposals will take into account the specific needs of different population groups and make financial literacy more accessible and effective.

Conclusion

Improving financial literacy is an important tool in ensuring the financial security of citizens and reducing the risk of falling into fraudulent schemes. The development of rational personal finance management skills, knowledge of the basics of financial products and the ability to assess their risks contribute to the formation of a sustainable economic environment.

Effective improvement of financial literacy is possible through the implementation of comprehensive measures, including educational programs, information campaigns, interaction with public organizations and improvement of the legislative framework. It is important to take into account modern challenges such as digitalization and the growing number of cyber threats, which requires the introduction of new approaches to education and public awareness.

It is also necessary to consider and study in the light of the latest research trends: artificial intelligence for finance, digital finance and digital financial literacy in a special section.

References:

1. Message of the Head of State Kassym-Jomart Tokayev to the people of Kazakhstan "Fair Kazakhstan:

law and order, economic growth, public optimism" [electronic resource].- URL: https://www.akorda.kz/ru/poslanie-glavy-gosudarstvakasym-zhomarta-tokaeva-narodu-kazahstana-spravedlivyy-kazahstan-zakon-i-poryadok-ekonomicheskij-rost-obshchestvennyy-optimizm-285014?utm_source=chatgpt.com (accessed 16.11.2024).

2. The President spoke about financial literacy and digital hygiene. [electronic resource].- URL: https://24.kz/ru/news/social/item/668477-o-finansovoj-gramotnosti-i-tsifrovoj-gigiyene-vyskazalsyaprezident?utm_source=chatgpt.com (accessed 11/16/2024)

3. The AMANAT Party presented exactly these works on the implementation of the Charismatics project [electronic resource].- URL: https://www.gov.kz/memleket/entities/ardfm/press/news/details/905906?lang=ru&utm_source=chatgpt.com (accessed 12/16/2024).

4. The U.S. Commission on Financial Literacy and Education. U.S. National Financial Literacy Strategy 2020, U.S. Department of the Treasury 2020. Most recently: <https://home.treasury.gov/policy-issues/consumer-policy/financial-literacy-and-educationcommission> (publication date: November 28, 2022).

5. The concept of improving financial literacy for 2020-2024, approved by Resolution of the Government of the Republic of Kazakhstan dated May 30, 2020 No. 338. [Electronic resource].- URL: https://adilet.zan.kz/rus/docs/P2000000338?utm_source=chatgpt.com (accessed 12.11.2024).

6. Improving financial literacy of the population [electronic resource]. - URL: <https://www.fin-gramota.kz/ru> (accessed 08/29/2024).

7. The official website of the Portal of legal Statistics and special accounting authorities [electronic resource]. – Access mode: <https://qamqor.gov.kz/> – (date of access: 03/01/2024).

8. On the results of a sociological study of the level of financial literacy of the population in 2023/ Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market, 2023 [electronic resource]. – <https://www.gov.kz/memleket/entities/ardfm/press/news/details/683780?lang=ru> – (date of access: 11/18/2024).

9. The official website of the Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market [electronic resource]. – Access mode: <https://www.gov.kz/memleket/entities/ardfm?lang=ru> (accessed 11/29/2024).

EMPIRICAL ANALYSIS OF THE IMPACT OF AI ON THE EMPLOYMENT OF EMPLOYEES IN SERVICE ENTERPRISES

—Evidence from China

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Abstract

With the development of artificial intelligence technology, its replacement impact on occupation has been one of the hot topics of discussion, especially the breakthrough development of generative AI, which has caused people's further concern about "machine replacing human". As the service industry absorbs the largest employment population, whether and what impact the development and application of artificial intelligence technology will have on the employment of the service industry is an urgent question to be answered. Based on the data of listed enterprises in the service industry from 2014-2022, this study uses the difference-difference method to study the impact of the application of artificial intelligence technology on the number of employees, the skill structure of employees and the income of employees in the service industry from the enterprise level. The main conclusions of this study are as follows: First, although the high-risk occupations replaced by artificial intelligence are still mainly concentrated in the manufacturing industry, the risk of service occupations being replaced by artificial intelligence is gradually becoming prominent; Second, the application of artificial intelligence technology in service enterprises will increase the total number of employees and absorb more employment. Third, despite the increase in the number of employees, this demand is mainly reflected in the demand for high-skilled employees, and the demand for medium-low skilled employees is reduced, showing a trend of "degree-position" polarization; Finally, in terms of employee income, the application of artificial intelligence technology in service enterprises has caused a certain downward trend in employee income, which is also one of the negative effects of de-skills, leading to the decline of employees' bargaining ability on salary, resulting in income inequality.

Keywords: Artificial Intelligence; Occupation Substitution; Service Industry

1.Introduction

With the development of algorithms such as big data technology, machine learning and deep learning, artificial intelligence has made major breakthroughs and gradually been widely applied in various industries, although different industries and academic fields have different definitions of artificial intelligence. But AI is generally thought to refer to computer systems that can perform tasks that would normally require human intelligence, such as visual perception, speech recognition, decision-making, or translation. At the same time, with the continuous development of artificial intelligence technology, its impact on the labor market, especially the replacement of occupations, has been one of the hot topics.

2.Literature review

Previous research on AI job substitution has focused on manufacturing, focusing on the impact of automation technologies, such as industrial robots, on jobs. The study found that the traditional manufacturing production line repetitive mechanical operation jobs will be more easily replaced by artificial intelligence technology, automation and intelligent technology can meet the flexible production mode of automatic positioning, equipment, handling, automatic welding needs, and machine vision can achieve more rapid, efficient and accurate product quality inspection work than manual. He Qin et al. (2020) conducted empirical studies on the employment impact of manufacturing industries or

enterprises, and the main results of these studies show that the application of artificial intelligence technology will lead to a decrease in the number of manufacturing jobs. Compared with the manufacturing industry, artificial intelligence technology pays less attention to the study of employment substitution in the service industry, because it is generally believed that artificial intelligence follows the substitution order from low skill to high skill for jobs, while the automation cost of service industry jobs is higher, and its demand for creativity and emotional understanding is difficult to meet by current artificial intelligence technology. However, in fact, intelligent customer service has been widely used in the service industry, and with the rapid development of generative AI such as Chat GPT and GPT4, it has been able to complete difficult and complex tasks based on cognitive and creative skills, and the generation of code, advertising copy, illustration and short videos can be easily completed by using ChatGPT. At the same time, a report released by Goldman Sachs in 2023 predicts that with major breakthroughs in generative artificial intelligence, artificial intelligence could replace the equivalent of 300 million full-time jobs worldwide in the future, with about two-thirds of jobs in the United States and Europe facing AI automation. These affected occupations are more involved in non-technical operations such as lawyers and administrators. It can be seen that artificial intelligence technology will have a huge

impact on service industry employment, and what impact it will have is an urgent question to be answered.

The impact of artificial intelligence on employment is mainly divided into three aspects: first, the Deskilling effect brought by artificial intelligence; second, the impact of the application of artificial intelligence technology on the total employment; third, the impact of the application of artificial intelligence technology on the employment structure.

Deskilling Effects brought about by technological development have always been the focus of researchers' research. Deskilling is when workers' specialized skills are replaced by automation, or their jobs are downgraded to "low-skilled jobs that don't require complex thinking or special skills." This leads to reduced investment in human capital, cost savings, weakening the bargaining power of human capital, and resulting in income inequality. The research on De-skilling mainly focuses on the impact of technological development on employee skill structure and employee income. Research on the skill structure of employees shows that further subdivision of work as a result of technological advances leads employees to face a greater risk of De-skilling in terms of skill structure, thereby reducing their bargaining power and requiring them to learn new skills. Twenty years ago, Autor et al. (2003) analyzed the impact of computer technology on employees' skill structure, laying a foundation for today's research on the impact of new technologies such as artificial intelligence on employees' skill structure. In terms of employee income, the De-skilled effect will further exacerbate the problem of income inequality. Dong Zhiqing et al. (2014) found that skill-biased technological progress has a positive impact on the demand for highly skilled labor and the wage level. Jackson et al. (2023) found that the development of artificial intelligence would increase the demand for labor skills, thus widening the wage gap between high-skilled and low-skilled labor. However, some scholars also found that the application of artificial intelligence technology by enterprises would have a negative impact on labor wages as a whole.

In the research on the impact of artificial intelligence application on the number of jobs, there is no unified conclusion at present, and the current research mainly includes three schools: substitution effect, creation effect and comprehensive effect. The first type of research school, namely the school of substitution effect, believes that the application of new technologies such as artificial intelligence will have a huge impact on the social job market, and there will be a wave of layoffs. CAI Xiao (2022) studied the manufacturing industry and found that in most cases, artificial intelligence technology would inhibit manufacturing employment. Empirical studies on substitution effect in developed countries have also confirmed this view to some extent. Acemoglu and Restrepo (2018), through the analysis of employment data in the United States, found that if the number of robots per 1,000 people increases by 1, the employment population ratio in the United States will decrease by about 0.18-0.34 percentage points. The second school of research, the Creation effect school, is optimistic that the application of new

technologies such as artificial intelligence will create new industries and new jobs, which will lead to an overall increase in employment. There have been many technological innovations throughout history that have revolutionized society and brought great shocks to the labor market. However, in general, the trend of increasing employment can be seen in countries all over the world, because new technologies have created new occupations. By studying the level of development and the different impacts of AI technology in different countries, Roy(2019) found that while AI may eliminate some jobs, it can also create new jobs, which can have an impact on the overall labor market. The third school of research, the comprehensive effect school, points out that the impact of AI application on the number of jobs is caused by both the substitution effect and the creation effect. Therefore, the impact of the application of artificial intelligence on the number of jobs needs to consider the size of the substitution effect and the creation effect, and the final result is thus determined. Wang Wen (2023) believes that technological change will trigger employment substitution effect and creation effect, and the relative magnitude of the two determines the increase or decrease of employment. Ace-moglu and Restrepo (2020) make a similar point, arguing that intelligence will shrink the share of employment and may even lead to lower wages, but the creation of new tasks will have the opposite effect.

The application of artificial intelligence technology will have an impact on the employment structure, such as the age structure and education level distribution of the employed population. For example, for the manufacturing industry, aging has brought about labor shortage, which is not conducive to the sustainable development of the manufacturing industry, but artificial intelligence can better cope with the negative impact of aging. Meng Hao et al. (2022) found that although artificial intelligence will increase the employment demand of high-skilled labor, it will also lead to a decrease in the number of jobs for medium-skilled labor. Another study analyzed how artificial intelligence will affect the distribution of employed population among various sectors of the national economy. For example, at present, there is a large number of surplus labor force in China's primary industry and its employment proportion is higher than the proportion of output value, but artificial intelligence has promoted the trend of "advanced" employment structure.

At present, the impact of artificial intelligence on the labor market is becoming a global research focus, but the existing research has the following shortcomings: First, at present, most of the domestic and foreign research on the impact of artificial intelligence on employment focuses on the manufacturing industry, and there is no unified view on the impact of employment number, and there is a lack of relevant research on the impact of artificial intelligence on service industry employment; Second, most studies focus on employment at the macro level, while relevant studies based on firm level data are insufficient, especially those on employment structure. Finally, there is insufficient research on the degree to which service jobs are at risk of being dis-

placed by AI. Based on this, this study raises the following research questions: How does the application of artificial intelligence technology affect the employment of service enterprises in terms of the number of employees, the skill structure of employees and the income of employees?

3. Empirical analysis of the employment impact of the service industry enterprise data

3.1 Model construction

In this paper, taking "artificial intelligence" as the natural experiment, using the Difference-In-Difference method (for short, DID) is used to quantify the causal effect of AI technology in the number of employment, employment structure, employee income and other aspects. In this study, the enterprise sample is divided into two groups, namely, AI enterprises (process group) and non-AI enterprises (control group) in the scope of artificial intelligence. Set the variable *IsAIE* for proxy, that is, if the enterprise belongs to AI enterprises, the *IsAIE* value is 1, and otherwise is 0; The virtual variable *Istart*

for whether the enterprise adopts the AI policy, if the enterprise adopted the artificial intelligence policy, namely the company's annual report and artificial intelligence related keywords frequency is greater than or equal to 10, this paper assumes that the company has had an AI policy since that year, the *Istart* in this year before the year value is 0, in this year and later year value is 1. In order to study the effect of AI policies in service enterprises on the relative demand of labor, this study divides the enterprise sample into AI enterprises and non-AI enterprises, explaining that the core variable is $DID = IsAIE \times Istart$, and its coefficient reflects the effect of policy on the relative demand of labor. If the coefficient is significantly negative, it means that the adoption of the policy significantly reduces the demand for workforce.

This section refers to the research of Dachs, Bai Jun and other scholars to build the following measurement models to test the effect of AI technology in service enterprises on the number of employees, employee skill structure and employee income:

$$lnEMP_{it} = a_0 + a_1 DID_{it} + a_2 X_{it} + \lambda_i + \mu_i + \varepsilon_i \quad (1)$$

$$LOW_{it} = \beta_0 + \beta_1 DID_{it} + \beta_2 X_{it} + \lambda_i + \mu_i + \varepsilon_i \quad (2)$$

$$MID_{it} = \beta_0 + \beta_1 DID_{it} + \beta_2 X_{it} + \lambda_i + \mu_i + \varepsilon_i \quad (3)$$

$$HIGH_{it} = \beta_0 + \beta_1 DID_{it} + \beta_2 X_{it} + \lambda_i + \mu_i + \varepsilon_i \quad (4)$$

$$lnEMPS_{it} = \gamma_0 + \gamma_1 DID_{it} + \gamma_2 X_{it} + \varepsilon_i \quad (5)$$

This part uses multiple models to examine the effect of AI on the service industry. Model (1) tests the effect of using AI on the number of employees in service enterprises. $lnEMP_{it}$ is the total employees of the company in the year and takes the logarithmic, while model (2) - (4) respectively tests the effect of the AI on the skill structure of employees in service enterprises. Finally, the model (5) tests the effect of the AI on the wage in service enterprises. $lnEMPS_{it}$ takes the logarithm of employee compensation. The core explanatory variable DID_{it} is the cross term of the virtual variable, the variable X_{it} is a series of control variables, which will be explained in detail later; β_0 , β_1 and β_2 are estimated parameters, μ_i is a fixed effect of the province where the enterprise is registered, λ_i is a fixed effect of year, and ε_i is a random interference term.

The above econometric model takes the quantity of workers in service enterprises, the skill structure of employees and the income of employees as explanatory variables. To reduce the heteroscedasticity in the regression equation, each variable was treated logarithmically except for the proportion category variable.

3.2 Selection of indicators

Artificial intelligence is a very complex and wide range of fields, the definition of AI is also very vague, and no consistent and authoritative definition standard has been formed. Therefore, when selecting and determining AI related indicators, it is necessary to fully consider different application fields and purposes, follow the principles of science, system, comprehensive and reasonable, and incorporate with the current cir-

cumstances and growth trend, flexibly select and combine different keywords and indicators to fully reflect all aspects and levels of AI, so as to comprehend better and evaluate the application and impact of AI. In view of this problem, this paper summarizes and selects the appropriate key words related to AI according to the AI's definition and the literature released by researchers. The rapid development of AI, some agencies issued reports, such as tsinghua university released the development of AI report 2011-2020, the report chose the 13 key areas of AI, and explains the evolution of each technology, it summarizes the development status in the AI field, trend and future outlook, emphasized the important influence of AI on social economy, and the necessity of strengthening personnel training and international cooperation. In addition, this paper also refers to foreign reports and literature, such as AI Index Report 2021 published by Stanford University and papers published by Acemoglu. These literature and reports cover the core technologies, products, applications and implementation foundations involved in the AI industry, providing a theoretical basis for the 53 AI field features selected in this study (see the attached table for details). Finally, this study sorts out the annual reports of listed service companies from 2014 to 2022, finds out the keywords related to AI in the annual report, and counts its word frequency, and whether enterprises are involved in artificial intelligence or have major technological breakthroughs, and then determines the starting year of enterprises adopting artificial intelligence technology.

Core explanatory variables**Artificial intelligence enterprise (IsAIE):**

Through the 2014-2022 services listed companies annual report search, obtain the use of artificial intelligence related features frequency, determine whether the enterprise belongs to AI application enterprise, if adopted the strategy of artificial intelligence, and artificial intelligence related features word use frequency is greater than 10, the enterprise belongs to the AI enterprise, the IsAIE value is 1, otherwise 0.

Artificial intelligence Policy (Istart): If a company does not show intelligent behavior or no intelligent preconditions by 2022, it is defined as a non-intelligent company, and from 2014 to 2022, the value of the Istart variable is set to 0. If the frequency of enterprise AI-related feature words is greater than 10 between 2014-2022, the value of the Istart variable is set to 1 from that year and 0 before that year.

IsAIE×Istart(DID) : The focus of this chapter is that the dummy variable cross-item DID=IsAIE×Istart, which is set to determine whether the adoption of AI policies by service enterprises will have effect on their relative demand for labor. When this coefficient is significantly negative, it indicates that the service enterprise will significantly reduce the relative demand for labor; otherwise, when this coefficient is significantly positive, the relative demand for labor will increase significantly.

Explained Variable

Total employees in service enterprises (lnEMP_{it}): the total employees in the year.

Proportion of highly skilled employed (HIGH_{it}): The number of highly skilled workforce as a proportion of the total employment of the company. Base on the predecessors's methods and uses the proportion of people employed in the service industry with college degree or above as the proportion of highly skilled workforce.

Proportion of middle skilled employed (MID_{it}): The proportion of medium-skilled workforce in the total employment of the company. This paper uses the ratio of service employment in high school and secondary school education as the proportion of medium-skilled workforce..

Ratio of low-skilled employment (LOW_{it}): The number of low-skilled workers accounts as a percentage of the company's total employment.

Employee compensation (lnEMPS_{it}): According to the ILO definition, labor costs are the costs paid by an enterprise to hire workers. Since the income of senior executives of listed companies is a large part of the remuneration payable, this study intends to use the method of Wang Lei to determine the income of senior

employees ("remuneration payable" of listed companies-Total compensation for senior managerstotal remuneration) / total number of employees, which is recorded as EMPS (Employee salary).

Controlled Variable

Degree of capital deepening (LnKLRatio): In recent years, the phenomenon of capital deepening is widespread in enterprises. This phenomena has two primary causes: the first is Scientific and technological innovation, more and more enterprises use capital instead of labor. Secondly, With a rise in the number of highly skilled personnel, enterprises are more likely to adopt highly skilled employees to replace low-skilled employees, so as to improve production efficiency and competitiveness and realize the survival of the fittest. This trend allows companies to reduce employee count under the same production target. This paper references Yang Zhihai's research using the net fixed asset to employee count ratio as a proxy.

R&D investment intensity (TYratio): The number and intensity indicators of R&D projects reflect businesses' technological strength, while the expenditure of R&D projects reflects the importance and support of enterprises for technological innovation activities. This paper uses the ratio of R&D spending to operational income serves as a proxy.

The number of years the business has been in existence (lnage): The time of a company is an important indicator of its existence. The existence period of the enterprise will affect the efficiency of operation, the speed of development and the effectiveness of management.

Enterprise size (size): Since different business sizes have different technical requirements for the labor force, so the enterprise size have impact on the overall skill structure of the workforce; this section uses the logarithm of total assets as the company size proxy.

GDP (PrvGDP) of the province where the enterprise is located: It also has a certain effect on the number and skill structure of the employees, his paper uses the logarithm of the GDP of the province where the enterprise is located as the agent variable, and the unit is 100 million RMB.

3.3. Regression analysis**3.3.1. Descriptive analysis**

The data utilized in this chapter is entirely from the wind database, and the identification of AI enterprises comes from the text mining of enterprise annual reports. In the identification of service enterprises, we select according to the industries of listed enterprises, and all enterprises belong to 14 subindustries of the service industry. Furthermore, to ensure the integrity of the data, ST, ST * and delisted enterprises are excluded in this chapter.

Table1

Descriptive statistics of the variables

Variable	Sample number	Average Value	Standard Deviation	Minimum Value	Maximal Value
IsAIE	531	0.36	0.48	0	1
LOW	531	34.122	26.326	0	100
MID	531	22.077	16.428	0	98.81
HIGH	531	40.246	27.554	0	100
LnKLratio	531	12.203	1.485	4.127	19.543
PrvGDP	531	10.412	0.644	7.566	11.619
lnage	531	2.446	0.749	0	3.434
size	531	22.871	1.949	14.942	31.138
TYratio	531	7.086	9.128	0	98.39

The data collected in the sample were from enterprises from 2014 to 2022, which indicated that 531 enterprises were included in the sample, including 191 enterprises in the experimental group and 360 in the control group. From the perspective of labor skill type, the average proportion of high-skilled (HIGH), medium-skilled (MID) and low-skilled labor force (LOW) in the total employees is 34.12%, 22.07% and 40.24% respectively, it shows that the low-skilled and highly-skilled workforce in the listed service enterprises is the main personnel composition of Chinese listed enterprises at this stage.

3.3.2. Multiple collinearity test

VIF (variance inflation factor) is a measure of multicollinearity. It is an indicator used to check

whether there is multicollinearity between the independent variables in the regression model. In the multiple linear regression analysis, if there is multicollinearity between the independent variables, the parameter estimates will be unstable, and the reliability and accuracy of the regression results will be affected. The larger the VIF value is, The stronger the relationship between this independent variable and the other independent variables, that is, the more obvious the multicollinearity is. Generally speaking, if the VIF of an independent variable and the value is greater than 10, you can consider a serious multicollinearity problem between the independent variable and other independent variables. VIF test results of this chapter are present in Table 2, and the mean VIF value is 1.3, so the results can be considered more reliable.

Table2

Multiple collinearity analysis

variable	VIF	1/VIF
Size	1.570	0.639
Lnage	1.380	0.722
TYratio	1.360	0.737
LnKLratio	1.310	0.765
DID	1.170	0.856
PrvGDP	1.040	0.958
Mean VIF	1.300	

3.3.3.The effect of AI on the number of employees in service firm

First, the impact of AI application in service enterprises on the number of employees is analyzed. This section text mining of listed service industry businesses' annual reports from 2014 to 2022 is done using Python, and the starting year of artificial intelligence in 2014-2022 (Istart) is divided into experimental groups and control groups according to whether they have artificial intelligence characteristics (IsAIE). Multiple

models were regressions with Stata, and Table3 shows the particular results .

The regression results present that the estimated coefficient of the AI application level of the core explanatory variable is positive at the 10% significance level, that is, AI technology will raise the total number of workers in service enterprises. This shows that for the development of service enterprises, the adoption of AI can improve the production efficiency of employees, expand the scale of enterprises, increase corporate profits, and foster the growth of businesses.

Table3

the impact of AI on the number of employees in service enterprises				
variable	(1) Mixed regression	(2) stochastic effect	(3) fixed effect	(4) Two-way fixation effect
AI	.42*** (.01)	.162*** (.017)	.12*** (.017)	.102*** (.022)
PGDP	-.81*** (.106)	.121** (.06)	.195*** (.057)	-.041 (.062)
TRA	-.012 (.078)	.045 (.07)	.052 (.068)	.031 (.023)
EDU	.063 (.042)	.011 (.024)	.019 (.023)	.064* (.034)
INF	-.013*** (.003)	-.008*** (.002)	-.005*** (.002)	-.008*** (.002)
AFI	-.009** (.004)	-.004 (.003)	-.002 (.003)	-.012 (.017)
EZB	3.197*** (.267)	.292 (.268)	-.169 (.261)	.31*** (.053)
constant term	12.24*** (.733)	4.659*** (.563)	3.999*** (.539)	4.122*** (.634)
Observational quantity	300	300	300	300
R-squared	.797	.z	.693	.991

Note: Steady standard error in brackets: *, **and *** represent significant at the statistical levels of 10%, 5% and 1% respectively

3.3.4. The effect of AI on the skill structure of employees in service enterprises

According to the above econometric model, and two-way fixed effect regression is used. In Table4, The regression findings indicate that the influence of the core explanatory variable AI (DID) on the employment of high, medium-low-skilled levels has passed the significance level of 1%, indicating that the influence of enterprises adopting AI on the employment structure is significant. Regarding employment proportion of highly skilled workforce, the regression coefficient of DID is 13.795, indicating that for each unit increase by the AI index, the proportion of highly-skilled workforce will increase by an average of 13.795 units. Then the medium-low-skilled workforce, the regression coefficient of DID is -2.8 and -10.755, indicating that the proportion of DID will decrease by 2.8 and 10.755 units. In general, the need for highly-skilled labor rises as a result of service businesses implementing AI technology, whereas the need for medium-low-skilled labor significantly declines. This may be because, on the one

hand, the enterprises studied in this section are all listed enterprises, with high digital and intelligent development, and have certain economic strength to invest in the creation and study of novel technologies, so that they eliminate an abundance of low-medium-skilled labor; On the other hand, because the explanatory variable of skill structure in this paper is proportional type, the number of medium-low-skilled labor force of enterprises may not decrease, but the growth rate is slower than that of highly skilled labor force, the adoption of AI makes its employee structure develop towards high quality.

From control variables, capital deepening (LnKLratio) reduces the demand for highly skilled workforce with a regression coefficient of -2.923; increases the need for medium-low-skilled workforce. This may be because, a large number of low-skilled labor has shifted to services, where the "last mile" problem has been difficult to solve with lower-priced technologies, so companies are more likely to hire cheaper low-skilled labor.

Table4

the effect of AI application on the skill structure of employees in service enterprises			
variable	(1) LOW	(2) MID	(3) HIGH
DID	-10.755*** (.966)	-2.87*** (.756)	13.795*** (.997)
LnKLratio	1.382*** (.341)	1.661*** (.267)	-2.923*** (.352)
lnage	5.891*** (.679)	-1.357** (.532)	-5.167*** (.701)
size	-.247 (.354)	-1.838*** (.277)	2.042*** (.365)
PrvGDP	5.132*** (.774)	2.035*** (.606)	-7.053*** (.799)
RDSpendSumRatio	-.642*** (.053)	-.2*** (.042)	.868*** (.055)
_cons	-44.029*** (11.725)	28.384*** (9.176)	114.523*** (12.1)
Observations	2168	2168	2168
R-squared	.288	.066	.364

Note: Steady standard error in brackets: *, **and *** represent significant at the statistical levels of 10%, 5% and 1% respectively

Corporate age (lnage) increases the need for low-skilled workforce, and decreases the need for medium-skilled, highly skilled workforce. This may be the earlier the company is founded, It is more likely to be engaged in traditional service industries, which have higher intelligence costs but lower labor costs, so companies will hire more low-skilled labor.

The need for highly-skilled labor is higher in larger enterprises, the need for medium-skilled personnel is lower, and the influence on the need for low-skilled labor is ambiguous. This is because large enterprises need to introduce intelligent technologies to assist management. In order to effectively use these technologies, the participation of an abundance of highly-skilled labour is needed.

Regional economic level (PrvGDP) has raised the percentage of laborers with low to medium skill levels and reduced the proportion of highly skilled workers. This may be because China's service industry is currently in a stage of continuous expansion, absorbing a great quantity of low-skilled workforce.

R&D investment intensity (RDSpendSumRatio) has decreased the percentage of low-and medium-skilled workforce and raised the percentage of highly skilled individuals. This is consistent with what is true. Businesses that implement AI might replace a significant portion of the low- and medium-skilled work population, and the need to be recruited because the use of AI requires a great quantity of highly-skilled workforce.

3.3.5 The effect of AI on the income of employees in service enterprises

Table5

the impact of AI application on employee income of service enterprises.	
variable	Employee income
DID	-.098** (.049)
LnKLratio	-.174*** (.023)
RDSpendSumRatio	-.001 (.003)
lnage	.329*** (.066)
size	.79*** (.038)
PrvGDP	-.662*** (.237)
cons	8.174*** (2.817)
Observations	1715
R-squared	.927

Note: Steady standard error in brackets: *, and * * * represent significant at the statistical levels of 10%, 5% and 1% respectively

According to the above econometric model, the effect of the AI policy on employee wage is empirically

tested, and the two-way fixed effect regression is used. The regression results are present in Table5.

The core explanatory variable AI (DID) has a significant impact on employee income. Specifically, the adoption of AI in service companies has slightly reduced employee income levels. This may be because AI can undertake more human skills, and companies can choose to use AI to replace workers. The relative cost of AI technology has decreased, making the cost advantage of artificial intelligence technology more obvious. In this case, employees may be reluctant to ask for a big pay increase because of the fear that companies will replace their jobs with AI.

From the perspective of control variables, capital deepening (LnKLratio) reduces the income of employees. This may be owing to the enterprise's limited capital and the growth in fixed-asset investment, which will reduce the compensation and benefits of employees. The age and size of the enterprise have a positive impact on employee income, and the regression coefficients of 0.329 and 0.79 respectively, and both of them passed the test at the 1% significance level, it indicates that the longer the enterprise history and the larger the enterprise, the better and more perfect the size of the employee welfare.

3.4 Robustness test

In this chapter, a multi-period DID method was used. Regarding the choice of methods to test robustness, although the time trend chart itself is a relatively simple method to test parallel trends, it is difficult to draw the time trend map because of the variable implementation time of the AI policy in each organization. Therefore, the event study method (Event Study) was used to examine the parallel trend of multiphase DID. There are two ways to test the hypothesis that the results match parallel trends: first, compare the time trend of the mean of the dependent variable between groups; second, and add the interaction term between dummy variables and policy variable at each time point to the tested regression. In this dissertation, the second method is used for the parallel trend test and some of the data for the parallel trend test is presented Table6.

If the sample is "treatment group" and "period j before policy implementation", d_j , value 1, otherwise 0. From the table we can conclude that the regression coefficient of d_j is not significant and that the coefficients are not significantly different from those in the baseline period, confirming the assumption of parallel trends.

Table6

Robustness test of the impact of AI on the employment of service enterprises					
变量	(1) EMP	(2) LOW	(3) MID	(4) HIGH	(5) EMPS
d_1	-.029 (.055)	.263 (1.582)	-1.202 (1.4)	1.528 (1.532)	-.178 (.139)
d_2	.036 (.072)	-1.596 (1.815)	2.262 (2.104)	.091 (2.483)	.103 (.144)
d_3	.08 (.079)	-.366 (2.243)	-.752 (1.943)	1.895 (2.262)	.119 (.179)
d_4	.016 (.126)	-2.295 (2.365)	-.136 (1.506)	2.699 (2.176)	-.181 (.183)
d_5	.062 (.143)	-1.814 (2.852)	-1.412 (2.648)	2.647 (2.345)	.045 (.232)
d_6	.12 (.173)	1.816 (3.445)	-2.154 (2.669)	1.137 (2.737)	0 (.277)
d_7	-.004 (.154)	2.51 (4.657)	.615 (4.421)	-2.423 (3.347)	-.164 (.15)
d_8	-.017 (.16)	-.618 (4.716)	.082 (4.841)	.441 (3.082)	-.06 (.166)
d_9	-.437*** (.149)	-4.486 (4.008)	.303 (3.223)	2.808 (4.212)	-.163 (.231)

Note: Steady standard error in brackets: *, and *** represent significant at the statistical levels of 10%, 5% and 1% respectively

4. Research conclusions

The impact of the development of artificial intelligence technology on job substitution has become a hot research issue, but most of the current relevant studies focus on the manufacturing industry, and there is a lack of relevant research on the service industry, and secondly, there is insufficient research on the enterprise-level data. Based on the data of listed enterprises in the service industry from 2014-2022, this study uses the difference-difference method to study the impact of the application of artificial intelligence technology on the

number of employees, the skill structure of employees and the income of employees in the service industry from the enterprise level. The main research conclusions of this paper are as follows: Empirical analysis of enterprise-level data shows that listed enterprises in the service sector adopting artificial intelligence technology will expand the demand for labor, that is, hire more employees, but there is heterogeneity in labor demand for different skill levels. Specifically, enterprises increase the demand for high-skilled employees, but re-

duce the demand for low - and medium-skilled employees. In addition, the application of AI technology will have a negative impact on the income of employees in service enterprises.

5. Policy Suggestions

Based on the above findings, this study puts forward the following policy recommendations:

(1) The occupation replacement of artificial intelligence will impact more industries, and the service industry, as the industry that absorbs the most employment population, faces great challenges, especially the middle and low skilled labor force faces challenges such as repositioning, career conversion and retraining. On the one hand, the government should pay attention to it and provide adequate social security policies. At the same time, it also needs to guide enterprises to carry out various forms of retraining and job transfer plans, such as providing online learning platforms, organizing internal training courses and cooperating with educational institutions, and formulating relevant subsidy policies to support the training of enterprises.

(2) While exacerbating the polarization trend of "education degree-position", artificial intelligence may further reduce employees' income. This study finds that the crowding of labor elements by artificial intelligence makes the average salary of employees in service enterprises drop significantly. Therefore, in the context of the new "human-machine collaboration" and "human-machine symbiosis", how to protect the rights and interests of workers in salary bargaining is also the content that relevant government departments need to consider, so as to achieve human-machine win-win and avoid ineffective competition brought about by the application of new technologies.

References:

1. He qing, Li yaning, cheng yaxing. Research on the influence of artificial intelligence technology application on employment and its function mechanism[J]. China's soft science, 2020(S1): 213-222.
2. Peng Yingying, Wang Xinyu. Artificial intelligence technology for manufacturing employment Analysis of the impact effect[J]. Journal of Beijing University of Technology, 2020, 20 (05): 68-76.
3. Wang Yongqin, Dong Wen. How will the rise of robots affect China's labor market?[J]. Economic Research, 2020, 55 (10): 159-175.
4. YANG C H. How Artificial Intelligence technology affects Productivity and Employment: Firm-

level Evidence from Taiwan[J]. Research Policy, 2022, 51(6): 104536.

5. ACEMOGLU D, RESTREPO P. Robots and Jobs Evidence from US Labor Markets[J]. Journal of Political Economy, 2020, 128(6): 2188-2244.

6. Li Shuqin, Wang Haochen. The impact of AI on the manufacturing workforce in the context of aging [J]. Science and Science and Technology Management, 2021, 42 (07): 3-17.

7. Yan Xueling, Zhu Bokai, Ma Chao. Industrial Robot Use and Manufacturing Employment: Evidence from China [J]. Statistical Study, 2020, 37 (01): 74-87.

8. AUTOR D H, LEVY F, MURNANE R J. The Skill Content of Recent Technological Change: An Empirical Exploration[J]. The Quarterly Journal of Economics, 2003, 118(4): 1279-1333.

9. Dong Zhiqing, Cai Xiao, Wang Linhui. Skill premium: an explanation based on the direction of technological progress [J]. China Social Sciences, 2014, 226 (10): 22-40 + 205-206.

10. JACKSON M O, KANIK Z. How Automation that Substitutes for Labor Affects Production Networks, Growth, and Income Inequality[EB/OL]. [2023-03-28]. <https://papers.ssrn.com/sol3/papers.cfm?abstractid=3375523>.

11. Wang Linhui, Qian Yuanyuan, Dong Zhiqing. Study on the influence and bias of artificial intelligence application on labor wages [J]. Chinese Population Science, 2022, 211 (04): 17-29 + 126.

12. CAI Xiao, Huang Xumei. Will AI technology curb manufacturing employment?[J]. Business Research, 2022, 506 (06): 53-62.

13. BESSEN J. Artificial Intelligence and Jobs: The Role of Demand [M]. Chicago: University of Chicago Press, 2019: 291-307.

14. VAN ROY V, VERTESY D, DAMIOLI G. AI and Robotics Innovation: A Sectoral and Geographical Mapping Using Patent Data[R]. GLO Discussion Paper, 2019.

15. Wen Wang. Does industrial intelligence promote high-quality employment in the era of digital economy [J]. Economist, 2023, 256 (04): 89-98.

16. ACEMOGLU D, RESTREPO P. The Race between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment[J]. American Economic Review, 2018, 108(6): 1488-1542.

17. Meng Hao, Zhang Meisha. How does AI affect labor force employment demand?— Empirical evidence from the Chinese enterprise level [J]. Journal of Xi'an Jiaotong University (Social Science Edition), 2022, 41 (05): 65-73 + 93.

CONCEPTUAL FRAMEWORK OF CORPORATE GOVERNANCE

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Abstract

Corporate governance serves as a fundamental pillar in ensuring transparency, accountability, and sustainable value creation within modern corporations. This paper explores the conceptual framework of corporate governance by examining its theoretical foundations, key principles, and institutional mechanisms. Drawing upon agency theory, stakeholder theory, and institutional economics, it highlights how governance structures impact firm performance, shareholder rights, and managerial accountability. The study also considers the role of regulatory frameworks, market forces, and internal control systems in shaping governance effectiveness. Through an analytical perspective, this research underscores the necessity of corporate governance for mitigating conflicts of interest, fostering investor confidence, and enhancing long-term corporate sustainability.

Keywords: Corporate governance, Agency theory, Stakeholder theory, Accountability, Transparency, Shareholder rights, Institutional frameworks, Regulatory mechanisms

Introduction

Corporate governance is a critical construct in contemporary business and organizational management. It encompasses the mechanisms, processes, policies, and relationships through which corporations are directed, administered, and controlled. Fundamentally, corporate governance seeks to ensure that corporate entities operate in a manner that aligns with the interests of their diverse stakeholders. These stakeholders include shareholders, management, employees, customers, suppliers, financiers, regulatory authorities, and the broader community. By promoting accountability, transparency, and fairness, corporate governance fosters trust and sustainable value creation.

Corporate governance is a multifaceted concept, and its definitions vary depending on the perspective and context in which it is examined. At its core, corporate governance refers to the system by which companies are directed, controlled, and held accountable to their stakeholders. This system encompasses a combination of mechanisms, processes, and frameworks designed to ensure effective decision-making, ethical behavior, and value creation over time.

Literature Review

The concept of corporate governance has undergone significant transformation over the past century, driven by the growing complexity of global business environments and stakeholder expectations. Early governance models focused primarily on protecting shareholder rights, with Berle and Means (1932) highlighting the challenges posed by the separation of ownership and control in modern corporations. These issues became central to agency theory, as articulated by Jensen and Meckling (1976), who examined the conflicts between principals and agents and proposed mechanisms to align their interests.

In response to high-profile corporate scandals (e.g., Enron and WorldCom), significant reforms were introduced globally, including the Sarbanes-Oxley Act of 2002 in the United States. These reforms emphasized accountability, transparency, and ethical decision-making, laying the foundation for contemporary governance frameworks (Coffee, 2005).

Jensen and Meckling (1976) provided the foundational framework for agency theory, which explores the principal-agent relationship and its inherent challenges. Their work remains a cornerstone for understanding mechanisms such as performance-based incentives, independent board oversight, and regulatory compliance. Subsequent studies (Eisenhardt, 1989) refined the theory, incorporating empirical insights on how governance mechanisms mitigate agency costs.

In contrast, stewardship theory challenges the self-interest assumption of agency theory. Davis, Schoorman, and Donaldson (1997) argued that managers are inherently motivated to act in the organization's best interests, emphasizing trust, collaboration, and empowerment. Research has shown that organizations adopting stewardship-based governance often achieve higher levels of employee satisfaction and long-term sustainability (Hernandez, 2012). Freeman's (1984) seminal work on stakeholder theory expanded the scope of governance to include all entities impacted by corporate activities. Empirical studies (Donaldson & Preston, 1995) have demonstrated that integrating stakeholder perspectives enhances organizational legitimacy and long-term value creation. More recent contributions (Kolk et al., 2017) have linked stakeholder-inclusive governance to improved ESG performance.

Pfeffer and Salancik (1978) introduced resource dependence theory, emphasizing the role of governance structures in securing critical external resources. Empirical research (Hillman et al., 2009) has demonstrated how board composition and inter-organizational networks enhance resource acquisition and strategic flexibility. DiMaggio and Powell (1983) highlighted the influence of institutional norms, regulatory frameworks, and cultural contexts on governance practices. Studies have shown that governance structures often reflect regional and industry-specific conventions (Aguilera & Jackson, 2003).

Empirical research has validated the significance of core governance components, including board structure, ownership patterns, and transparency mechanisms. Studies by Bhagat and Black (2002) established a positive correlation between board independence and

firm performance. Similarly, La Porta et al. (1998) demonstrated how legal and regulatory environments shape governance practices, with stronger investor protections correlating with higher capital market development.

The advent of Industry 4.0 technologies has introduced new dimensions to governance research. Studies by Ghasemaghaei et al. (2018) highlight how big data analytics enhance board decision-making, while others (Turel et al., 2017) emphasize the need for digital literacy among directors. Environmental, social, and governance (ESG) criteria have become integral to governance research. Eccles et al. (2014) demonstrated the financial benefits of adopting sustainable practices, while studies by Friede et al. (2015) provided meta-analytic evidence linking ESG performance with superior financial returns. Recent research (Gillan & Starks, 2007) underscores the growing influence of activist investors in shaping governance practices. This trend reflects broader societal demands for transparency, diversity, and ethical accountability.

Despite substantial progress, gaps remain in understanding the interplay between governance mechanisms and emerging challenges, such as artificial intelligence, global regulatory harmonization, and crisis resilience. Future research must also explore governance

adaptations to address geopolitical and environmental uncertainties.

Methodology

A comprehensive literature review was conducted, analyzing seminal works, international standards, and regulatory frameworks. Sources included academic journals, organizational reports, and governance codes such as the OECD Principles of Corporate Governance. Theoretical insights were drawn from agency theory, stewardship theory, stakeholder theory, resource dependence theory, and institutional theory to establish a multidimensional understanding of governance practices.

Results

A widely recognized definition is provided by the Organisation for Economic Co-operation and Development (OECD), which states that corporate governance involves “a set of relationships between a company’s management, its board, its shareholders, and other stakeholders.” According to the OECD, this framework provides the structural and procedural foundation for achieving organizational objectives while enabling performance monitoring and accountability.

The OECD's definition emphasizes three critical dimensions:

Relational Aspect:	Objective Alignment:	Performance Monitoring:
It underscores the interactions and alignment between the various actors within a corporation, including management, the board of directors, shareholders, and external stakeholders.	The governance framework ensures that the organization’s goals are clearly defined and pursued in a manner that balances the interests of all stakeholders.	Effective governance incorporates mechanisms for evaluating organizational outcomes, ensuring compliance with legal, ethical, and strategic expectations.

Corporate governance operates through interconnected elements that collectively shape its structure and effectiveness. These elements can be categorized into internal mechanisms (within the organization) and external mechanisms (imposed by external forces, such as regulatory authorities or market dynamics).

Board of Directors is the central body responsible for governance. It provides oversight of management’s activities, ensures the organization adheres to its strategic objectives, and protects shareholder interests. The composition, independence, and expertise of the board significantly influence its ability to exercise unbiased judgment and make informed decisions. Best practices in governance often advocate for a mix of executive, non-executive, and independent directors to enhance diversity of thought and accountability.

Ownership Structure, patterns, such as the proportion of institutional investors, individual shareholders, or concentrated ownership (e.g., family-owned businesses), directly impact governance practices. Institutional investors often advocate for greater accountability, transparency, and alignment with long-term value creation.

Corporate governance exists within a legal and regulatory environment that establishes baseline standards for ethical conduct, reporting, and accountability. Variations in regulatory frameworks across jurisdictions influence governance practices, necessitating companies operating internationally to adapt to differing compliance requirements.

Transparency is a cornerstone of good governance. It involves the timely and accurate disclosure of information related to financial performance, strategic decisions, and risk management. Disclosure policies are designed to ensure that stakeholders, particularly shareholders, can make informed decisions regarding their engagement with the organization.

Modern corporate governance extends its focus beyond shareholders to address the interests of all stakeholders, including employees, customers, suppliers, communities, and governments. Effective engagement mechanisms, such as regular reporting, consultations, and stakeholder-inclusive decision-making, enhance trust and cooperation.

The Key elements of corporate governance are inherently interdependent. For instance, a transparent disclosure system strengthens the board’s decision-making by providing accurate information, while a well-

structured ownership pattern facilitates accountability. Similarly, regulatory compliance serves as a foundation for maintaining stakeholder trust, which is essential for long-term sustainability. By incorporating these elements into a cohesive framework, corporate governance enables organizations to achieve their objectives while fostering trust, resilience, and adaptability in an increasingly complex global business environment. This detailed understanding of its key components sets the stage for further exploration of its theoretical underpinnings and practical applications.

The theoretical framework of corporate governance is built upon several foundational theories, each providing distinct insights into its principles, objectives, and operational complexities. These theories explain the interactions between corporate entities, stakeholders, and the external environment, offering a conceptual lens to understand governance practices and challenges.

Agency Theory proposed by Jensen and Meckling (1976). Agency theory focuses on the principal-agent relationship, which arises due to the separation of ownership (principals, i.e., shareholders) and control (agents, i.e., managers). This division creates potential conflicts of interest, as the agents may prioritize their self-interests over those of the principals.

The misalignment of interests between principals and agents can result in inefficiencies, including excessive managerial compensation, suboptimal decision-making, or risk aversion. These costs can be mitigated through mechanisms such as performance-based incentives, monitoring systems, and robust contractual agreements. To align interests, corporate governance frameworks often emphasize board oversight, managerial accountability, and performance-linked remuneration. External auditors and regulatory compliance also serve as checks against agency-related inefficiencies.

Stewardship theory challenges the assumptions of agency theory by positing that managers are intrinsically motivated to act as stewards of the organization, prioritizing its long-term success over personal gain.

Unlike agency theory's focus on self-interest, stewardship theory assumes that managers derive satisfaction from organizational achievement and trust-based relationships. This intrinsic motivation reduces the need for extensive monitoring mechanisms. Organizations operating under this theory emphasize collaboration, empowerment, and mutual trust between managers and stakeholders. The role of the board shifts from monitoring to providing strategic guidance and support.

Stakeholder Theory Proposed by Freeman (1984). Stakeholder theory expands the scope of corporate governance beyond shareholders to include all entities affected by the organization's actions, such as employees, customers, suppliers, communities, and governments.

This theory asserts that long-term organizational success depends on balancing and integrating the diverse interests of stakeholders. Decisions are evaluated based on their impact on all stakeholders, not just financial performance. Governance structures incorporate

stakeholder representation, fostering inclusivity and social responsibility. Sustainability reporting and ethical practices are central to stakeholder-focused governance.

Resource Dependence Theory highlights the role of governance structures in securing critical resources required for organizational survival and growth.

Organizations depend on external entities for resources such as capital, expertise, and market access. Effective governance facilitates relationships and alliances to acquire these resources. Board composition is critical, with a focus on appointing directors who bring valuable networks, expertise, and influence. Inter-organizational collaborations, such as joint ventures and partnerships, are prioritized to strengthen resource access.

Institutional Theory emphasizes the influence of institutional norms, cultural contexts, and regulatory frameworks on governance practices. Organizations adapt their governance structures to align with the institutional environment in which they operate.

Governance practices reflect regional, cultural, and industry-specific norms. Institutional pressures may arise from formal regulations, societal expectations, or market conventions. Multinational corporations must adapt governance practices to comply with local laws and cultural standards. Institutional legitimacy becomes a critical factor, encouraging organizations to adopt practices perceived as ethical and socially acceptable.

Interrelation of Theories are not mutually exclusive but often interdependent, offering complementary perspectives on corporate governance. For instance:

Agency theory and stewardship theory highlight contrasting views on managerial behavior, informing governance designs that balance trust and control.

Stakeholder theory integrates with resource dependence theory by emphasizing collaboration with external entities to secure resources while addressing broader societal impacts.

Institutional theory serves as an overarching framework, contextualizing governance practices within specific regulatory and cultural environments.

The theoretical foundations of corporate governance provide a comprehensive understanding of its multifaceted nature. By integrating insights from agency, stewardship, stakeholder, resource dependence, and institutional theories, organizations can design governance frameworks that align with their strategic objectives, stakeholder expectations, and environmental complexities. These theories collectively serve as a guide for addressing governance challenges in an increasingly interconnected and dynamic global landscape.

Discussion

Corporate governance has evolved significantly over time to meet the demands of increasingly complex, interconnected, and dynamic business environments. From its early emphasis on protecting shareholders' rights to its modern focus on broader ethical, social, and technological considerations, this evolution reflects the changing expectations of corporations and their stakeholders.

Historical Development

- Early Stages: Shareholder-Centric Governance

In its initial phase, corporate governance primarily revolved around protecting the rights of shareholders, who were considered the primary owners of corporations. Governance structures were designed to ensure managerial accountability, minimize conflicts of interest, and maximize shareholder returns. Boards of directors were tasked with overseeing management activities and aligning them with shareholder interests.

- Shift in Focus Due to Corporate Failures

High-profile corporate scandals, such as the collapse of Enron (2001), WorldCom (2002), and Lehman Brothers (2008), exposed significant flaws in governance practices.

These failures highlighted issues such as:

- Lack of transparency in financial reporting.
- Weak oversight mechanisms.
- Ethical lapses and risk mismanagement.

In response, regulatory reforms were introduced globally, including:

- The Sarbanes-Oxley Act (2002) in the United States, which strengthened auditing standards and accountability.
- Revised corporate governance codes in Europe and Asia, emphasizing board independence and enhanced disclosure requirements.

In recent decades, the scope of corporate governance has expanded beyond traditional financial considerations to address emerging global challenges and opportunities.

Modern governance frameworks emphasize ethical decision-making as a cornerstone of sustainable business practices. Enhanced focus on risk management includes not only financial risks but also operational, reputational, and cyber risks. Governance codes increasingly advocate for creating a “culture of integrity” within organizations.

A shift from shareholder primacy to stakeholder inclusivity reflects the recognition that long-term success depends on balancing the needs of all stakeholders. Organizations now prioritize social responsibility, employee well-being, and community engagement as key governance objectives. Mechanisms for stakeholder dialogue and participatory decision-making have gained prominence.

As corporations operate across multiple jurisdictions, governance frameworks have adapted to address global regulatory diversity and complexity. Efforts to harmonize governance standards, such as those led by the OECD and International Corporate Governance Network (ICGN), aim to provide consistent guidelines for multinational entities.

The advent of Industry 4.0 has revolutionized corporate governance by integrating digital technologies, such as artificial intelligence (AI), big data, blockchain, and the Internet of Things (IoT).

Key implications of digital transformation for governance include:

- Enhanced data-driven decision-making.
- Improved transparency and real-time monitoring of operations.

- The need for boards to possess digital literacy and adapt to technological disruptions.

ESG metrics have become central to modern governance, reflecting the growing prioritization of environmental sustainability, social equity, and ethical practices.

Companies are now evaluated on their:

- Commitment to reducing carbon footprints and adopting sustainable business models.
- Efforts to promote diversity, equity, and inclusion (DEI) within the workforce.

Implementation of robust governance practices that align with global sustainability goals, such as the United Nations’ Sustainable Development Goals (SDGs).

As businesses face new challenges, corporate governance will continue to evolve. Anticipated future trends include:

Governance structures will need to address ethical considerations and accountability in the use of AI-driven decision-making systems. Boards will be tasked with ensuring that AI aligns with organizational values and legal standards.

The COVID-19 pandemic underscored the importance of governance frameworks capable of managing unforeseen crises. Future governance models are likely to prioritize agility, resilience, and proactive risk management strategies.

Stakeholders, including investors, employees, and consumers, are becoming more vocal in demanding transparent and ethical governance. Governance structures will need to adapt to these pressures by demonstrating accountability and responsiveness.

The evolution of corporate governance reflects a continuous process of adaptation to internal organizational needs and external societal demands. From its early focus on shareholder rights to its current emphasis on ethics, inclusivity, technology, and sustainability, governance frameworks have transformed to address the complexities of the modern business landscape. This ongoing evolution underscores the critical role of governance in achieving long-term organizational success and societal well-being.

Conclusion

The conceptual framework of corporate governance offers a comprehensive and multidimensional foundation for analyzing the structures, processes, and mechanisms through which corporations achieve sustainable value creation. By synthesizing insights from various theoretical paradigms such as agency theory, stewardship theory, stakeholder theory, resource dependence theory, and institutional theory corporate governance provides a nuanced understanding of the interplay between organizational control, stakeholder relationships, and external environmental factors.

This framework acknowledges the dynamic nature of governance, reflecting its adaptability to evolving societal, technological, and regulatory landscapes. Modern governance practices extend beyond traditional shareholder-centric models to encompass broader ethical considerations, stakeholder inclusivity, and sustainability objectives. By aligning strategic goals with principles of transparency, accountability,

and fairness, corporate governance ensures that corporations operate as responsible entities within the global economy.

Furthermore, the integration of emerging trends, such as digital transformation, environmental, social, and governance (ESG) metrics, and stakeholder activism, underscores the ongoing relevance of governance frameworks in addressing contemporary challenges. These advancements demonstrate the critical role of governance in fostering innovation, mitigating risks, and enhancing organizational resilience in an increasingly complex and interconnected world.

This theoretical foundation not only elucidates the principles underlying effective governance but also establishes a vital platform for examining its impact on corporate performance and capital value. Through rigorous analysis of governance mechanisms, future research can further unravel the intricate relationships between governance practices, organizational outcomes, and societal benefits, advancing both academic understanding and practical applications.

References:

1. Additional references from ESG, digital transformation, and global corporate governance literature.
2. Aguilera, R. V., & Jackson, G. (2003). The cross-national diversity of corporate governance: Dimensions and determinants. *Academy of Management Review*, 28(3), 447–465.
3. Berle, A., & Means, G. C. (1932). *The modern corporation and private property*.
4. Bhagat, S., & Black, B. (2002). The non-correlation between board independence and long-term firm performance. *Journal of Corporation Law*, 27, 231–273.
5. Davis, J. H., Schoorman, F. D., & Donaldson, L. (1997). Toward a stewardship theory of management. *Academy of Management Review*, 22(1), 20–47.
6. DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48(2), 147–160.
7. Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston: Pitman.
8. Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3(4), 305–360.
9. La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and finance. *Journal of Political Economy*, 106(6), 1113–1155.
10. Organisation for Economic Co-operation and Development (OECD). (2015). *G20/OECD Principles of Corporate Governance*.
11. Sarbanes-Oxley Act of 2002. (2002). U.S. Government Publishing Office.

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OVARIAN CANCER: A MODERN VIEW OF THE PROBLEM

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Abstract

This scientific and analytical work presents modern world and local-regional data on incidence, mortality, lethality and five-year survival rate of such a common oncological pathology as ovarian cancer. The issues of etiology and pathogenesis, modern approaches and principles of complex diagnostics, prospects for improving treatment results, as well as the prognosis are covered in detail. The epidemiological characteristics of this pathology in our republic are given in the context of the regions of the country.

Keywords: oncology, ovarian cancer, biomarkers, cancer antigen 125, human epididymis protein 4, BRCA1/2 mutation, DNA, RNA, epidemiology, incidence, mortality, lethality, five-year survival rate, prognosis.

Ovarian cancer (OC) is a malignant tumor that most often develops from the ovarian epithelium. Requirements for the pathomorphological conclusion in OC: 1) macroscopic description of the specimen separately for each ovary [size and weight, color, capsule condition, cross-sectional view, approximate ratio of cystic and solid components (in %), presence of papillary structures (if any, in % approximately), and other involved organs]; 2) tumor [total size (3 dimensions: height, width, length), location, type, invasion depth (in relation to the myometrium/endometrium border), myometrium thickness (mm), endometrium, involvement of the serous membrane of the uterus, involvement of the cervix, appendages)]; 3) other findings (presence of invasion into other organs); 4) lymph nodes (if present: size, location, size of the largest lymph node, number, number of cassettes); 5) microscopic description [primary tumor: histologic type, degree of differentiation, invasion, capsule/surface involvement, lymphovascular invasion, immunohistochemical (IHC) markers, metastases (preferably described separately): location of metastases (lymph nodes involved/number of nodes, size of largest metastasis, extension beyond lymph node)] [1].

The diagnostic criteria are as follows. Complaints and anamnesis: all patients are recommended to have a thorough collection of complaints and anamnesis; in the early stages, OC may be asymptomatic or cause minor discomfort; in the advanced stage, the disease manifests itself with non-specific symptoms: an increase in

abdominal volume, dyspeptic symptoms, weight loss, loss of appetite, pain in the abdomen or pelvis, shortness of breath, general weakness. The level of evidence for recommendations is A (the level of evidence is 1). Comment: collecting information about complaints and anamnesis details, including family history, is carried out in order to identify factors that may influence the choice of treatment tactics.

Physical examination: a thorough physical examination is recommended; it includes a recto-vaginal examination, palpation of the abdominal organs and all groups of peripheral lymph nodes, auscultation and percussion of the lungs, palpation of the mammary glands. The level of evidence for recommendations is A (the level of reliability of evidence is 1). Comment: special attention should be paid to assessing the patient's condition according to the WHO/ECOG and/or Karnofsky scale, assessing nutritional status, pain syndrome, body temperature, hemodynamics, enlarged peripheral lymph nodes, and the presence of pleurisy and ascites.

Laboratory diagnostic tests: it is recommended to perform a complete general (clinical) blood test, a general therapeutic biochemical blood test with assessment of liver and kidney function, a complete (clinical) urine test, and a study of the blood coagulation system for all patients with OC in order to assess the patient's condition, determine the patient's treatment tactics and algorithm, and assess the prognosis of the disease. The level of evidence for recommendations is C (the level of reliability of evidence is 4). Comments: A complete

blood count is performed (repeated) at least 5 days before the start of the next course of chemotherapy; in a complete general (clinical) blood test, it is advisable to assess the following parameters: hemoglobin, hematocrit, erythrocytes, mean corpuscular volume, erythrocyte distribution by size, mean corpuscular hemoglobin content, mean corpuscular hemoglobin concentration, leukocyte platelets, leukocyte formula, erythrocyte sedimentation rate; in a general therapeutic biochemical blood test with an assessment of liver and kidney function indicators - total protein, glucose, bilirubin, creatinine, urea, iron, alanine aminotransferase, aspartate aminotransferase, total bilirubin, lactate aminotransferase, alkaline phosphatase, plasma electrolytes (potassium, sodium, chlorine), in a general (clinical) urine test - determination of color, transparency of urine, its specific gravity, protein in urine, pH, glucose, ketone bodies, urobilinogen, leukocyte esterase, by hardware microscopy of epithelial cells, erythrocytes, cylinders, salt, mucus, bacteria and fungi; as part of the study of the blood coagulation system, a coagulogram (an indicative study of the hemostasis system) is assessed (fibrinogen, prothrombin (according to Quick), international normalized ratio, prothrombin time, prothrombin index, activated partial thromboplastin time, thrombin time, if indicated, additionally - antithrombin III, D-dimer, plasminogen, % activity); it is recommended that all patients undergo a study of the level of adenogenic cancer antigen CA 125 in the blood in order to identify OC and its recurrence. The level of evidence for recommendations is A (the level of reliability of evidence is 1) [1].

In the absence of morphological verification of the diagnosis, it is recommended that all patients with suspected OC undergo determination of human epididymis protein 4 (HE4) in the blood and determination of the Risk of Ovarian Malignancy Algorithm (ROMA) index in order to assess the probability of OC. The strength of the recommendations is B (the level of evidence is 2). Comment: determination of HE4 in the blood and the ROMA index does not replace the need for morphological verification of the diagnosis, but an elevated HE4 level increases the specificity of OC diagnostics; if mucinous carcinoma is suspected, it is recommended, in addition to testing the level of adenogenic cancer antigen CA 125 in the blood, to test the level of adenogenic cancer antigen CA 19-9 in the blood and test the level of carcinoembryonic antigen (CEA) in the blood serum for the purpose of differential diagnosis. The strength of the recommendations is A (the level of evidence is 2). Comment: CEA and CA19-9 may increase in mucinous OC, which allows for subsequent monitoring of the effectiveness of the treatment; for women under 40, who have a high probability of non-epithelial tumors, it is recommended to perform a study of the alpha-feto-protein level in the blood serum, a study of the level of chorionic gonadotropin in the blood, and a study of the level of inhibin B in the blood at the diagnostic stage. The level of evidence for recommendations is C (the level of reliability of evidence is 5). Comment: non-epithelial ovarian tumors predominate at a young age (detailed information is provided in the section on non-epithelial ovarian tumors). All patients with high-grade

serous and endometrioid carcinomas are recommended to undergo molecular genetic testing for mutations in the BRCA1 and BRCA2 genes in the blood or by scraping the oral mucosa and/or in biopsy (surgical) material as predictors of the disease outcome and the choice of the patient's treatment algorithm. The level of evidence for recommendations is B (the level of reliability of evidence is 2). Comment: the frequency of mutations in the BRCA1 and BRCA 2 genes in the indicated histological types of tumors is about 15%. Information about the presence of a BRCA mutation is useful for determining a higher sensitivity of the tumor to therapy with alkylating agents, platinum derivatives and poly (adenosine diphosphate-ribose) polymerase (PARP) inhibitors [1].

1. All patients with OC or suspected OC are recommended to undergo computed tomography (CT) of the chest, abdominal cavity, retroperitoneal space, and kidneys at the diagnostic stage, with or without intravenous contrast in order to determine the extent of the tumor process and plan the treatment algorithm. The level of evidence for recommendations is A (the level of reliability of evidence is 1). Comment: CT allows (a) to visualize the primary tumor, (b) to identify metastases of the disease, (c) to assess the possibility of performing an optimal cytoreductive surgery. If CT is contraindicated or insufficiently informative, magnetic resonance imaging (MRI) with intravenous contrast may be performed. If distant metastasis is suspected, positron emission tomography (PET)/CT may be performed.

2. All patients with OC or suspected OC are recommended to undergo MRI of the pelvic organs with or without intravenous contrast at the diagnostic stage in order to determine the extent of the tumor process and plan the treatment algorithm. The strength of the recommendations is A (the level of evidence is 1). Comment: MRI allows (a) to visualize the primary tumor, (b) to identify metastases of the disease, (c) to assess the possibility of performing an optimal cytoreductive surgery. In case of contraindications to MRI examination or its insufficient informativeness, as well as when it is not possible to perform MRI, CT with or without intravenous contrast is indicated. If distant metastasis is suspected, PET/CT can be performed.

3. All patients with OC or suspected OC are recommended to undergo chest X-ray at the diagnostic stage if CT of the chest is not possible. The strength of the recommendations is C (the level of evidence is 5). Comment: CT of the chest organs is more sensitive and specific in detecting metastases in the lungs and mediastinal lymph nodes.

4. All patients with OC or suspected OC are recommended to undergo ultrasound examination of the lymph nodes in the cervical-supraclavicular region, axillary, inguinal lymph nodes, ultrasound of the abdominal cavity, retroperitoneal space and pelvis at the diagnostic stage if CT/MRI/PET-CT cannot be performed in order to determine the prevalence of the tumor process and plan the treatment algorithm. The level of evidence for recommendations is B (the level of reliability of evidence is 2). Comment: Ultrasound is the simplest method for visualizing formations in the abdominal cavity, in the pelvic cavity, and secondary

lymph node damage. However, this method is significantly inferior to CT/MRI/PET-CT in terms of making a decision on the first stage of treatment. Evaluation of the effect of chemotherapy according to RECIST 1.1 criteria is also impossible based on the results of ultrasound.

5. All patients with OC or suspected OC at the diagnostic stage are recommended to undergo examination of the mammary glands in order to exclude secondary (metastatic) ovarian lesions or primary multiple malignant neoplasms. The level of evidence for the recommendations is A (the level of reliability of the evidence is 1). Comments: Women under 40 years of age undergo ultrasound examination of the mammary glands in the first phase of the menstrual cycle, if available; women over 40 years of age are recommended to undergo mammography in the first phase of the menstrual cycle, if available. Examination of the mammary glands is carried out in accordance with the principles set out in the clinical guidelines for malignant neoplasms of the mammary glands.

6. For patients with OC, diagnostic laparoscopy is recommended to clarify the extent of the process, morphologically verify the diagnosis and assess resectability, as well as in cases where the performance of optimal cytoreduction is questionable for staging or if it was not adequately performed during previous cytoreduction, as well as for morphological verification of the diagnosis if less invasive methods are not effective [1].

As noted by Zhu B. et al. [2] the incidence and mortality of gynaecological cancers (GCs) can significantly impact women's quality of life and increase the health care burden for organisations globally. The objective of study was to evaluate global inequalities in the incidence and mortality of GCs in 2022, based on The Global Cancer Observatory (GLOBOCAN) 2022 estimates. The future burden of GCs in 2050 was also projected. Data regarding to the total cases and deaths related to GCs, as well as cases and deaths pertaining to different subtypes of GCs, gathered from the GLOBOCAN database for the year 2022. Predictions for the number of cases and deaths in the year 2050 were derived from global demographic projections, categorised by world region and Human Development Index (HDI). In 2022, there were 1 473 427 new cases of GCs and 680 372 deaths. The incidence of gynecological cancer reached 30.3 per 100 000, and the mortality rate hit 13.2 per 100 000. The age-standardised incidence of GCs in Eastern Africa is higher than 50 per 100 000, whereas the age-standardised incidence in Northern Africa is 17.1 per 100 000. The highest mortality rates were found in East Africa (age-standardised mortality rates of 35.3 per 100 000) and the lowest in Australia and New Zealand (age-standardised mortality rates of 8.1 per 100 000). These are related to the endemic areas of HIV and HPV. Very high HDI countries had the highest incidence of GCs, with age-standardised incidence rates of 34.8 per 100 000, and low HDI countries had the second highest incidence rate, with an age-standardised incidence rates of 33.0 per 100 000. Eswatini had the highest incidence and mortality (105.4 per 100 000; 71.1 per 100 000) and Yemen the lowest (5.8 per 100 000; 4.4 per 100 000). If the current trends

in incidence and mortality are maintained, number of new cases and deaths from female reproductive tract tumours is projected to increase over the next two decades. In conclusion, the authors point out that in 2022, GCs accounted for 1 473 427 new cases and 680 372 deaths globally, with significant regional disparities in incidence and mortality rates. The highest rates were observed in Eastern Africa and countries with very high and low HDI, with Eswatini recording the most severe statistics. If current trends continue, the number of new cases and deaths from GCs is expected to rise over the next two decades, highlighting the urgent need for effective interventions.

OC is a leading cause of death in women worldwide, with more than 300,000 new cases and nearly 200,000 deaths globally each year [3].

Medina J.E. et al. emphasize in their work that [4], OC is a leading cause of death for women worldwide, in part due to ineffective screening methods. Unfortunately, OC is usually detected in advanced stages (stages III and IV) due to nonspecific clinical symptoms at earlier stages and the lack of an effective screening approach. Consequently, there is a clear unmet clinical need for the development of highly specific and sensitive assays to detect OC in its earliest stages. In their study, the authors used whole-genome cell-free DNA (cfDNA) fragmentome and protein biomarker [cancer antigen 125 (CA-125) and HE4] analyses to evaluate 591 women with OC, with benign adnexal masses, or without ovarian lesions. Using a machine learning model with the combined features, researchers detected OC with specificity >99% and sensitivities of 72%, 69%, 87%, and 100% for stages I to IV, respectively. At the same specificity, CA-125 alone detected 34%, 62%, 63%, and 100%, and HE4 alone detected 28%, 27%, 67%, and 100% of OCs for stages I to IV, respectively. This approach differentiated benign masses from OCs with high accuracy (AUC = 0.88, 95% confidence interval, 0.83-0.92). These results were validated in an independent population. These findings show that integrated cfDNA fragmentome and protein analyses detect OCs with high performance, enabling a new accessible approach for noninvasive OC screening and diagnostic evaluation.

Qian F. et al. [5] in their study note that OC is the fifth leading cause of cancer deaths in US women, due to its typically advanced stage at presentation. Furthermore, unlike breast or colorectal cancer, there is no proven screening method for OC to identify early disease and initiate treatment to improve survival. Family history, oral contraceptive use, parity, body mass index (BMI), and genetic variants are potentially useful in estimating lifetime risk. Along with this, because of differences in age at onset and tumour histology/grade, risk factors for OC might be different for BRCA1/2 mutation carriers than women in the general population. Penetrance of BRCA1/2 mutations is likely modified by other genetic variants and lifestyle or reproductive factors. Investigation of these factors could aid in implementation of strategies to reduce OC risk among mutation carriers. In their work, the authors point out that height and BMI are associated with higher OC risk in the general population, but whether such associations

exist among BRCA1/2 mutation carriers is unknown. The researchers applied a Mendelian randomisation approach to examine height/BMI with OC risk using the Consortium of Investigators for the Modifiers of BRCA1/2 data set, comprising 14,676 BRCA1 and 7912 BRCA2 mutation carriers, with 2923 OC cases. They created a height genetic score using 586 height-associated variants and a BMI genetic score using 93 BMI-associated variants. Associations were assessed using weighted Cox models. Observed height was not associated with OC risk (hazard ratio [HR]: 1.07 per 10-cm increase in height, 95% confidence interval [CI]: 0.94-1.23). Height genetic score showed similar results (HR = 1.02, 95% CI: 0.85-1.23). Higher BMI was significantly associated with increased risk in premenopausal women with HR = 1.25 (95% CI: 1.06-1.48) and HR = 1.59 (95% CI: 1.08-2.33) per 5-kg/m² increase in observed and genetically determined BMI, respectively. No association was found for postmenopausal women. Interaction between menopausal status and BMI was significant (pinteraction < 0.05). Our colleagues emphasize that the results of their observation of a positive association between BMI and OC risk in premenopausal BRCA1/2 mutation carriers is consistent with findings in the general population.

Jara-Rosales S. et al. [6] in their work they say that in 2020, OC ranked fourth in incidence among gynecological cancers worldwide, following breast cancer, cervical cancer, and uterine cancer. In terms of mortality, it ranked third, establishing itself as one of the most lethal gynecological cancers. A 2021 study revealed that the variability in the incidence depends on each country and region, but the mortality rate remains similar among the 185 countries included. This behavior is attributed to nonspecific symptoms and the lack of screening programs, leading to diagnoses at advanced stages with unfavorable prognoses for patients [7]. OC constitutes a group of diverse diseases, each characterized by its own morphology and biological behavior. This heterogeneity implies that different subtypes may respond differently to treatments and show variations in their progression rates [8]. It is therefore essential to recognize this diversity to effectively address the different manifestations of OC. The risk factors for OC are divided into two categories: modifiable and non-modifiable. Modifiable factors include smoking, hormone replacement therapy, and dietary elements, among others. Non-modifiable factors include heredity, mutations in the BRCA1 and BRCA2 genes, family history, Lynch syndrome, uninterrupted ovulation cycles, and the presence of endometriosis, among others [7].

Our colleagues conducted an exhaustive search was conducted to identify literature to describe the OC biology and physiopathology for new readers, in particular focused on clinical researchers. In addition, a more stringent search was performed to find studies related to the genetic components, social determinants, and comorbidities associated with OC in South America. The search was performed through PubMed and Google Scholar, using the MeSH descriptors and keywords such as “Hereditary Breast and Ovarian Cancer Syndrome”, “Latin America”, “BRCA1 Genes”,

“BRCA2 Genes”, and “Ovarian Neoplasms”. Additionally, the keywords “Obesity”, “chronic disease”, “Comorbidity”, “poverty”, “education”, “race”, “ethnicity”, “menarche”, “menopause”, “multiparity”, “urbanization”, “epidemiology”, and “risk factors” were utilized to capture relevant studies. Due the reported disparities in clinical trials and other biomedical studies, the Latin American population is greatly underrepresented in most of the cancer and genomic databases, including local investigations. For this reason, the number of identified reports according to the specific topics was very small for further analysis. The revision of the literature was conducted based on original articles, including cohort studies, case-control studies, cross-sectional studies, and experimental research investigating the risk factors for OC in the South American population, and the selected articles were published within the last 10 years, with full-text availability, and were written in English or Spanish. The authors considered studies involving women from 12 South American countries, without age restrictions, focusing particularly on those analyzing genetic components, socioeconomic determinants, and comorbidities. Considering the main goal of this work, they excluded studies focused on OC treatment, research validating laboratory tests for detecting OC-related mutations, and non-original content such as reviews, opinions, editorials, letters to the editor, and conference abstracts. Articles that did not clearly specify the region or country of interest, or those centered on education about OC risk factors, were also excluded. [6].

In the conclusions following from the study, the researchers note that based on the revised articles, it can be concluded that although there are reports on the prevalence of mutations in the BRCA1 and BRCA2 genes in South American countries, such as Chile, Colombia, Argentina, Uruguay, and Brazil, including Mexico as Hispanic, the general prevalence is close to 15-20% in women with hereditary risk factors or those diagnosed with ovarian and/or breast cancer. However, it is important to highlight that the available studies are limited. More research is needed to accurately determine the prevalence of the punctual mutation in each country, as well as those mutational signatures that could be unique for the Latin American population. In terms of the social, demographic, and economic factors that influence the incidence of OC, these vary by country, but similarities are observed in age, being more prevalent in women over 50 years old, and in women with poor education and difficulties in accessing healthcare. Similarly, the absence of studies regarding the effect of contraception and hormone replacement therapy in the Latin American population is highlighted, despite being widely studied factors in the international scientific literature. This gap in the research underscores the need to address these aspects in future research in the region. This article has several limitations, starting with the very limited number of studies published and the number of participants in each study. The revised literature covers several years of research conducted in each country; these years may represent disparities in funding for biomedical research, the num-

ber and capabilities of each research group and the possibility of enrolling patients, and the access to technological facilities. For now, it is not possible to conduct a more comprehensive analysis; however, this work may promote the interest of other researchers to collaborate in the systematic revision of current and future data. Regarding the need to improve lifestyles as a preventive measure to reduce the possibility of morbidities and the concomitant development of OC, although the literature may not be sufficient to conclusively establish a direct link between obesity and/or diabetes and the development of OC, the indirect association suggests the importance of conducting additional clinical studies. These studies could confirm or dismiss the hypothesis that obesity and diabetes could be related to the risk of developing OC, thereby providing a more solid basis for future interventions and prevention strategies [6].

Bryant A. et al. [9] provide data showing that OC is the seventh most common cancer among women and a leading cause of death from gynaecological malignancies. Epithelial OC is the most common type, accounting for around 90% of all OCs. This specific type of OC starts in the surface layer covering the ovary or lining of the fallopian tube. Surgery is performed either before chemotherapy [upfront or primary debulking surgery (PDS)] or in the middle of a course of treatment with chemotherapy [neoadjuvant chemotherapy and interval debulking surgery (IDS)], with the aim of removing all visible tumour and achieving no macroscopic residual disease (NMRD). The aim of this study was to investigate the prognostic impact of size of residual disease (RD) nodules in women who received upfront or interval cytoreductive surgery for advanced (stage III and IV) epithelial OC (EOC). To assess the prognostic impact of RD after primary surgery on survival outcomes for advanced (stage III and IV) EOC. In separate analyses, primary surgery included both upfront PDS followed by adjuvant chemotherapy and neoadjuvant chemotherapy followed by IDS. Each RD threshold is considered as a separate prognostic factor. The authors searched CENTRAL (2021, Issue 8), MEDLINE via Ovid (to 30 August 2021) and Embase via Ovid (to 30 August 2021). Our colleagues included survival data from studies of at least 100 women with advanced EOC after primary surgery. RD was assessed as a prognostic factor in multivariate prognostic models. They excluded studies that reported fewer than 100 women, women with concurrent malignancies or studies that only reported unadjusted results. Women were included into two distinct groups: those who received PDS followed by platinum-based chemotherapy and those who received IDS, analysed separately. The researchers included studies that reported all RD thresholds after surgery, but the main thresholds of interest were microscopic RD (labelled NMRD), RD 0.1 cm to 1 cm [small-volume residual disease (SVRD)] and RD > 1 cm [large-volume residual disease (LVRD)]. Two review authors independently abstracted data and assessed risk of bias. Where possible, they synthesised the data in meta-analysis. To assess the adequacy of adjustment factors used in multivariate Cox models, authors used the 'adjustment for other prognostic factors'

and 'statistical analysis and reporting' domains of the quality in prognosis studies tool.

Our colleagues also made judgements about the certainty of the evidence for each outcome in the main comparisons, using GRADE. The researchers examined differences between FIGO stages III and IV for different thresholds of RD after primary surgery. They considered factors such as age, grade, length of follow-up, type and experience of surgeon, and type of surgery in the interpretation of any heterogeneity. The authors also performed sensitivity analyses that distinguished between studies that included NMRD in RD categories of < 1 cm and those that did not. This was applicable to comparisons involving RD < 1 cm with the exception of RD < 1 cm versus NMRD. They evaluated women undergoing PDS and IDS in separate analyses. The researchers found 46 studies reporting multivariate prognostic analyses, including RD as a prognostic factor, which met inclusion criteria: 22,376 women who underwent PDS and 3697 who underwent IDS, all with varying levels of RD. While we identified a range of different RD thresholds, authors of the work mainly report on comparisons that are the focus of a key area of clinical uncertainty (involving NMRD, SVRD and LVRD). The comparison involving any visible disease (RD > 0 cm) and NMRD was also important. SVRD versus NMRD in a PDS setting In PDS studies, most showed an increased risk of death in all RD groups when those with macroscopic RD (MRD) were compared to NMRD. Women who had SVRD after PDS had more than twice the risk of death compared to women with NMRD (HR 2.03, 95% CI 1.80 to 2.29; I² = 50%; 17 studies; 9404 participants; moderate-certainty). The analysis of progression-free survival found that women who had SVRD after PDS had nearly twice the risk of death compared to women with NMRD (HR 1.88, 95% CI 1.63 to 2.16; I² = 63%; 10 studies; 6596 participants; moderate-certainty). LVRD versus SVRD in a PDS setting. When authors compared LVRD versus SVRD following surgery, the estimates were attenuated compared to NMRD comparisons. All analyses showed an overall survival benefit in women who had RD < 1 cm after surgery (HR 1.22, 95% CI 1.13 to 1.32; I² = 0%; 5 studies; 6000 participants; moderate-certainty). The results were robust to analyses of progression-free survival. SVRD and LVRD versus NMRD in an IDS setting The one study that defined the categories as NMRD, SVRD and LVRD showed that women who had SVRD and LVRD after IDS had more than twice the risk of death compared to women who had NMRD (HR 2.09, 95% CI 1.20 to 3.66; 310 participants; I² = 56%, and HR 2.23, 95% CI 1.49 to 3.34; 343 participants; I² = 35%; very low-certainty, for SVRD versus NMRD and LVRD versus NMRD, respectively). LVRD versus SVRD + NMRD in an IDS setting meta-analysis found that women who had LVRD had a greater risk of death and disease progression compared to women who had either SVRD or NMRD (HR 1.60, 95% CI 1.21 to 2.11; 6 studies; 1572 participants; I² = 58% for overall survival and HR 1.76, 95% CI 1.23 to 2.52; 1145 participants; I² = 60% for progression-free survival; very low-certainty). However, this result is bi-

ased as in all but one study it was not possible to distinguish NMRD within the < 1 cm thresholds. Only one study separated NMRD from SVRD; all others included NMRD in the SVRD group, which may create bias when comparing with LVRD, making interpretation challenging. MRD versus NMRD in an IDS setting. Women who had any amount of MRD after IDS had more than twice the risk of death compared to women with NMRD (HR 2.11, 95% CI 1.35 to 3.29, I² = 81%; 906 participants; very low-certainty). Summing up the results of the study, the authors point out that in a PDS setting, there is moderate-certainty evidence that the amount of RD after primary surgery is a prognostic factor for overall and progression-free survival in women with advanced OC. Our colleagues separated our analysis into three distinct categories for the survival outcome including NMRD, SVRD and LVRD. After IDS, there may be only two categories required, although this is based on very low-certainty evidence, as all but one study included NMRD in the SVRD category. The one study that separated NMRD from SVRD showed no improved survival outcome in the SVRD category, compared to LVRD. Further low-certainty evidence also supported restricting to two categories, where women who had any amount of MRD after IDS had a significantly greater risk of death compared to women with NMRD. Therefore, the evidence presented in this review cannot conclude that using three categories applies in an IDS setting (very low-certainty evidence), as was supported for PDS (which has convincing moderate-certainty evidence) [9].

What knowledge is available today about the specifics of OC treatment? Drug resistance is the bottleneck in OC treatment. The increasing use of novel drugs in clinical practice poses challenges for the treatment of drug-resistant OC. Although maintenance therapy with PARP inhibitors (PARPis) has prolonged progression-free survival and 5-year overall survival, unfortunately, many patients do not respond to PARPis treatment due to intrinsic or acquired resistance [10].

Wang L. et al. [11] indicate that despite receiving standard-of-care therapy (optimal cytoreductive surgery followed by adjuvant chemotherapy), most patients develop recurrent disease, which is resistant to chemotherapy, resulting in a 5-year survival rate of approximately 30-40% worldwide. Drug resistance is a formidable challenge in the treatment of OC and is the primary contributor to poor prognosis. According to the National Comprehensive Cancer Network guidelines (version 1.2023), there are many therapeutic regimens for resistant OC, including some novel agents. However, the objective remission rate is still low, and the median survival time is less than 12 months due to complicated resistance mechanisms. In resistant OC, the classical mechanisms of action of common drugs can be disrupted or altered, possibly resulting in impaired therapeutic effects. Thus, treatment regimens should not rely only on empirical options. As the number of categories of agents increases, after the development of multidrug resistance, the decision of appropriate later-line therapeutic regimens is very challenging. The authors reviewed the literature regarding various drug re-

sistance mechanisms in OC and found that the main resistance mechanisms are as follows: abnormalities in transmembrane transport, alterations in DNA damage repair, dysregulation of cancer-associated signaling pathways, and epigenetic modifications. DNA methylation, histone modifications and noncoding RNA activity, three key classes of epigenetic modifications, constitute pivotal mechanisms of drug resistance. One drug can have multiple resistance mechanisms. Moreover, common chemotherapies and targeted drugs may have cross (overlapping) resistance mechanisms. MicroRNAs (miRNAs) can interfere with and thus regulate the abovementioned pathways. A subclass of miRNAs, “epi-miRNAs”, can modulate epigenetic regulators to impact therapeutic responses. Thus, they also reviewed the regulatory influence of miRNAs on resistance mechanisms. Moreover, researchers summarized recent phase I/II clinical trials of novel drugs for OC based on the abovementioned resistance mechanisms. A multitude of new therapies are under evaluation, and the preliminary results are encouraging. Summarizing the results of the study, our colleagues emphasize that with the increasing use of novel therapeutic drugs for OC, the development of later-line treatments has been under enormous pressure. Recently, resistance to a variety of therapeutic drugs, such as PARPis, angiogenesis inhibitors, and immune checkpoint inhibitors, has been found to occur. In the past, therapeutic agents for OC have been limited, and researchers have usually described the underlying mechanism and explored therapeutic strategies for overcoming resistance based on the drug classification. However, as increasing numbers of new agents are applied in clinical practice, the resistance mechanisms of these various new drugs must be identified, and these mechanisms may be similar or even identical to those of other drugs. Thus, the classification of drug resistance should not be confined to the drug category, and all should attempt to obtain insight into classification of resistance based on molecular mechanisms. The concept of drug resistance classification provides a sound basis for further research to develop more precise reversal strategies.

Instead of simply distinguishing resistance by agent, researchers attempted to classify drug resistance by mechanism. The authors summarized four major mechanisms from the published literature: 1) abnormalities in transmembrane transport, 2) alterations in DNA damage repair, 3) dysregulation of cancer-associated signaling pathways, and 4) epigenetic modifications. In the context of the increasing number of novel agents, summary of the four resistance mechanisms of OC provides a new concept for resistance classification by molecular mechanism, not by drug category. Given the intersections between drug resistance mechanisms, this concept is likely to result in the realization of “two birds with one stone” effects on the reversal of drug resistance in OC. Furthermore, these findings are anticipated to have broad implications for the development of precise therapeutic approaches for reversing drug resistance in OC. On this basis, umbrella trials can be carried out to explore the diagnostic and therapeutic targets of the four resistance mechanisms, and this may be a direction of future researches on drug resistance in

OC [11].

As Porter J.M. et al. [12] note in their study epithelial OC (ovarian carcinoma) is the most common form of the disease and comprises multiple histological types (histotypes): high-grade serous (70% of patients), endometrioid (10%), clear cell (10%), low-grade serous ($\leq 5\%$), and mucinous ($\leq 5\%$). Ovarian carcinosarcomas - previously considered a separate disease entity - are now recognized to represent metaplastic carcinomas and account for no more than 5% of diagnoses. A wealth of evidence now demonstrates that each histotype represents a unique disease entity, each with distinct developmental origins, molecular landscapes, intrinsic chemosensitivity, survival profile, and susceptibility to targeted molecular therapeutics.

The authors emphasize that complete macroscopic resection is a key factor associated with prolonged survival in OC. That being said, patients with clear cell ovarian carcinoma and low-grade serous ovarian carcinoma represent some of the groups that benefit most from achieving complete macroscopic resection; given that these cases are unlikely to respond well to neoadjuvant chemotherapy, complete primary cytoreduction is a major priority for these patients. Endometrioid ovarian carcinoma also represents a histotype in which complete macroscopic resection is associated with marked patient survival benefit. Engagement with multiple surgical teams to improve the likelihood of resecting disease at hepatobiliary, gastrointestinal, and other anatomical sites beyond the pelvis will be key for delivering optimal outcomes for such cases that present with extensive advanced-stage disease. More work is also required to understand the impact of resecting disease outside of the pelvis and abdomen. Achievement of complete macroscopic resection across the overall OC patient population is associated with markedly prolonged survival time, though differences in the degree of survival benefit are apparent across different histotypes. Patients with clear cell ovarian carcinoma derive one of the greatest survival benefits associated with complete macroscopic resection. High-grade serous ovarian carcinoma patients demonstrate highly clinically and statistically meaningful survival benefit, but the magnitude of benefit is lower than in some of the other histotypes. The extent of benefit from complete macroscopic resection does not appear to relate solely to levels of intrinsic chemosensitivity of each histotype [12].

Now, as for this pathology in our country at the republican level. The incidence of OC in the Republic of Kazakhstan in 2023 was 6.3 per 100 thousand population (6.2 in 2022) with a growth rate of 2.1% compared to the previous year, amounting to 1,251 people in absolute numbers (1,201 women a year earlier). The proportion of cases with a diagnosis established for the first time in life, recorded by oncological organizations, was 3.4%, as in the previous year in the general population, and 6.0% among women (in 2022 also 6.0%) and 4th rank place after breast cancer, cervical cancer and endometrial cancer [13].

Above the national average, OC was established in 8 regions of the country: the city of Almaty - 10.4 (maximum indicator); Pavlodar - 9.7; Karaganda - 8.6;

Abay - 8.4; Akmola - 7.7; Kostanay - 7.6; North Kazakhstan - 7.5; West Kazakhstan - 7.2. Aktobe, Atyrau and Kyzylorda regions are on par with the national average. This indicator is lower than the national average in the remaining 9 regions: Turkestan - 2.9 (the lowest level); Mangistau - 3.5; Ulytau - 3.6; Almaty - 3.7; Zhambyl - 4.3; the city of Shymkent - 4.6; East Kazakhstan - 5.8; Zhetysu - 5.9 regions and the city of Astana - 6.2 per 100 thousand people. The mortality rate from this pathology in 2023 was 2.1, a year earlier - 2.4 per 100 thousand population. The regions where the mortality rate from OC is higher than the average in the republic (2.1 per 100 thousand population) include: Abay - 3.0 (maximum level); the city of Astana - 2.9; Karaganda and Pavlodar - 2.5; Kyzylorda - 2.4; Aktobe and the city of Almaty - 2.2. This indicator is at the same level with the national average in the East Kazakhstan region. The lowest rates were noted in Turkestan - 1.5 (minimum rate); Almaty and Atyrau - 1.6; Zhambyl - 1.7; Ulytau and Mangistau - 1.8; North Kazakhstan and Kostanay - 1.9; West Kazakhstan, Zhetysu, Akmola regions and the city of Shymkent - 2.0 per 100 thousand population [13].

The one-year mortality rate was 7.2% (7.9% in 2022). At the same time, the ratio between one-year mortality and neglect (stage IV) was quite high - 1.7 (a year earlier it was even higher - 2.1. At the same time, it should be noted that the farthest from "1" is the worst ratio between one-year mortality and neglect.

Now, regarding preventive examinations. It should be noted that during large-scale preventive examinations of the population in 2023, significantly more patients with malignant neoplasms were actively identified than in 2022. This is 25,193 patients against 23,623 patients identified in 2022, i.e. +6.6%. This is due to the further abatement of the epidemiological troubles due to coronavirus and the increased availability of preventive care for the population. The proportion of patients identified during preventive examinations increased from 62.0% to 62.4% of the total number of patients identified per year.

Of course, with in the analysis of the epidemiological situation, the indicators of early diagnostics are very important issues. In general, in terms of the amount of detected cases of cancer of all localizations, in 2023 the proportion of forms detected at early stages (0, I-II stages) increased from 66.3% to 67.9%. As for OC, the early detection of this pathology during preventive examinations increased from 40.5 to 44.8%. The number of newly diagnosed patients with OC registered with oncology organizations amounted to 1,218 people (1,173 - a year earlier). At the same time, the absolute number of cases detected during preventive examinations in 2023 was 863, in 2022 - 875; the proportion of cases detected during preventive examinations was 70.9% and 74.6%, respectively. Of these, patients with stages I-II - 387 in 2023 and 354 in 2022.

The regions where the proportion of patients with early stage I of the pathology in question is above the national average (31.0% and 9th place among all nosological forms of malignant neoplasms) include the following regions: the city of Almaty - 45.3%; (the best indicator); Zhetysu - 43.9%; the city of Astana - 42.2%;

Zhambyl - 38.5%; Kyzylorda - 35.8%; East Kazakhstan and Akmola - 35.0%; Kostanay - 33.9%; Almaty - 33.3%.

The lowest rates of early diagnosis were recorded in 11 regions. Against this background, two regions stand out - Aktobe and Turkestan, where stage I of the disease was established at only 5.2% and 6.5%, respectively (the worst rates in the republic). Next come: Mangistau - 16.0%; the city of Shymkent - 18.5%; Pavlodar - 23.3%; Abay - 23.4%; Ulytau and West Kazakhstan - 25.0%; Karaganda - 25.5%; Atyrau - 28.6% and North Kazakhstan - 30.8% of the region [13]. It should be noted that only two patients out of every five were detected in the early (I-II stages) of this pathology, making up 41.7% in the republic. The regions where the proportion of patients with OC detected at stages I-II is higher than the national average include the following regions. The best indicator is in the Zhetysu region - 51.2%. Then come two megacities - the cities of Almaty (51.6%) and Astana (50.6%); then - East Kazakhstan and Atyrau (50.0%); Akmola (48.3%); Mangistau (48.0%); Kostanay (45.2%); Zhambyl (44.2%); North Kazakhstan (43.6%); Karaganda (42.6%) regions. Low rates of early diagnosis were recorded in the following regions. Against the general background, the Aktobe region stands out negatively, where only every tenth patient was detected in the early stages of the disease - 10.3%. Then come the following regions: Turkestan (16.1%); Shymkent city (31.5%); West Kazakhstan (33.3%); Abay (34.0%); Almaty (37.0%); Ulytau (37.5%); Pavlodar (41.1%) and Kyzylorda (41.5%) regions [13].

As can be clearly seen from the above data, there is a very large spread in early diagnostic rates across the country, from good to disappointing. Of course, it is necessary to take into account migration processes and other factors that affect early diagnostic rates, but nevertheless, the results obtained give reason not to stop there, both for oncologists and gynecological oncologists, as well as for obstetricians and gynecologists, visual diagnostic doctors, and general practitioners, since improving the rates of early diagnostics of malignant tumors has remained one of the main postulates and one of the main tasks of medicine in general, and continues to be relevant today. The proportion of stage IV OC among all nosological forms of malignant neoplasms was 7.2%, and this is the 17th rank. In general, in 2023, the proportion of malignant neoplasms of stage IV in the republic for the sum of all nosologies decreased from 12.58 to 11.7% (from 4790 to 4735 patients).

As for the average national indicator of the proportion of stage IV (7.2%), Zhetysu and Mangistau regions stand out against this background - 0.0%. Then come: Kyzylorda and Zhambyl (1.9%); Atyrau (2.4%); North Kazakhstan (2.6%); the city of Almaty (3.6%); East Kazakhstan (5.0%); Pavlodar (5.5%). The city of Astana is on the same level with the average national indicator. The indicators are lower in the following regions. Abay region stands apart from all others, where every fifth patient is diagnosed in the terminal stage of the disease (21.3%). Next come: Turkestan (12.9%); Karaganda (12.8%); Ulytau (12.5%); Aktobe (12.1%);

the city of Shymkent (11.1%); Akmola (10.0%); Kostanay (9.7%); West Kazakhstan (8.3%); Almaty (7.4%) regions.

The morphological verification rate of the disease in the country was 84.3%. In 5 regions out of 20, this is a 100% figure (East Kazakhstan, Zhambyl, Ulytau regions, as well as the cities of Astana and Shymkent). The lowest figure is in the Kyzylorda region (32.1%). Next on this list are the city of Almaty (55.2%); Zhetysu (78.0%); Mangistau and Akmola (80.0%); Aktobe (91.4%); Atyrau (92.9%); West Kazakhstan (93.8%); North Kazakhstan (94.9%); Turkestan and Kostanay (95.2%); Karaganda (95.7%); Pavlodar (95.9%); Almaty (96.3%) and Abay (97.9%) regions [13].

The total number of patients with malignant neoplasms, consisting of registered in specialized oncological organizations of the republic, continued to grow and by the end of 2023 amounted to 218,186 people, with an increase of 6.0% compared to the level of the previous year (2022 - 205,822, +5.8%). The overall incidence rate of malignant neoplasms increased by 3.9%, from 1055.3 to 1096.4 per 100 thousand population. The growth of this indicator is due to both the increase in the incidence and detection of pathology, and the increase in the survival rate of cancer patients. In addition, statistical data on patients diagnosed with malignant neoplasms, who have been under observation for 5 years or more, and continue to be observed in 2023, showed that the number of patients under observation by oncological organizations in Kazakhstan for over five years continued to grow and at the end of the reporting year amounted to 117,616 people, with an increase of 6.2% (2022 - 110,790 people, +6.6%) (form. No. 7).

It is impossible to ignore such an important clinical aspect as the coverage of patients with a first-ever diagnosis of OC in the Republic of Kazakhstan with specialized treatment.

In 2023, the number of hospitalizations for all nosological forms of malignant tumors in the country's oncology organizations amounted to 108,252 cases (2022 - 101,095), with an increase of 7.1% compared to the previous year, which is associated with a constant increase in the number of cancer patients, improved standardization of oncological care, and the development of palliative and restorative services.

At the end of 2023, the absolute number of patients with OC who completed specialized treatment amounted to 697 people, continuing treatment - 387 patients. The following results were obtained in percentage terms by methods and types of treatment. The overwhelming majority of patients received complex treatment - 68.4%, only surgical treatment - 21.1%, only drug treatment - 8.3%; combined - 0.3%, chemo-radiation - 0.1%.

Next, regarding the five-year survival rate of patients. As for OC, at the end of 2023, 8229 people or 41.4 per 100 thousand of the population were registered with the dispensary (at the end of 2022 - 7864 patients or 40.3 per 100 thousand of the population, respectively); and this is the 9th rank place among all nosological forms of malignant neoplasms.

At the same time, the mortality rate of the observed contingents in 2023 was 5.0% (6.0% - in 2022).

The five-year survival rate of patients with OC was 58.2% in 2023 (57.5% - a year earlier) [13].

Summarizing the above, we can conclude that OC occupies a significant place among all existing malignant tumors of other localizations. At the same time, despite the small percentage of patients detected at stage IV, taking into account a number of factors, the indicators of early diagnostics do not allow oncologists to "sleep peacefully", since the locally advanced stage III, which significantly prevails over all stages, in addition to the prevalence itself, gives a large number of complications and locoregional metastases, and these patients are subject to aggressive complex treatment, constituting the overwhelming percentage (68.4%) among all methods of treating this pathology. The variability and veiling of symptoms, its similarity with various non-core processes (sometimes the only symptom is a gradual increase in the abdomen due to ascites), leads to the neglect of the disease. All this requires both oncologists and gynecological oncologists, and, first of all, primary health care workers, as well as obstetricians and gynecologists and visual diagnostics doctors, to increase the level of cancer alertness, inform the population about early symptoms that may indicate this pathology or the onset of proliferative changes and conduct high-tech diagnostic measures and, as a result, timely treatment. Women at risk are advised to visit specialized specialists annually and, if necessary, undergo an examination.

An epidemiological assessment of the situation with OC in our country suggests that there are sometimes significant differences between regions not only in incidence rates, but also in the parameters of early diagnosis and mortality from this pathology. In connection with the above, this pathology continues to be a serious problem in modern clinical oncology.

References:

- 1 Klinicheskij protokol diagnostiki lechenija raka jaichnikov, vključaja rak fallopievoy truby i pervichnuju peritoneal'nuju karcinomu - Odobren Obšedinennoj komissiej po kachestvu medicinskih uslug Ministerstva zdravooohranenija Respubliki Kazahstan ot 21 nojabrja 2022 goda, Protokol №174. – 39 s (In Russ.).
- 2 Zhu B, Gu H, Mao Z, Beeraka NM, Zhao X, Anand MP, Zheng Y, Zhao R, Li S, Manogaran P, Fan R, Nikolenko VN, Wen H, Basappa B, Liu J. Global burden of gynaecological cancers in 2022 and projections to 2050. *J Glob Health*. 2024 Aug 16;14:04155. doi: 10.7189/jogh.14.04155.
- 3 Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A., Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021 May;71(3):209-249. doi: 10.3322/caac.21660
- 4 Medina JE, Annapragada AV, Lof P, Short S, Bartolomucci AL, Mathios D, Koul S, Niknafs N, Noë M, Foda ZH, Bruhm DC, Hruban C, Vulpescu NA, Jung E, Dua R, Canzoniero JV, Cristiano S, Adleff V, Symecko H, van den Broek D, Sokoll LJ, Baylin SB,

Press MF, Slamon DJ, Konecny GE, Therkildsen C, Carvalho B, Meijer GA, Andersen CL, Domchek SM, Drapkin R, Scharpf RB, Phallen J, Lok CAR, Velculescu VE. Early Detection of Ovarian Cancer Using Cell-Free DNA Fragmentomes and Protein Biomarkers. *Cancer Discov*. 2025 Jan 13;15(1):105-118. doi: 10.1158/2159-8290.CD-24-0393.

- 5 Qian F, Rookus MA, Leslie G, Risch HA, Greene MH, Aalfs CM, Adank MA, Adlard J, Agnarsson BA, Ahmed M, Aittomäki K, Andrulis IL, Arnold N, Arun BK, Ausems MGEM, Azzollini J, Barrowdale D, Barwell J, Benitez J, Biłkowska K, Bonadona V, Borde J, Borg A, Bradbury AR, Brunet J, Buys SS, Caldes T, Caligo MA, Campbell I, Carter J, Chiquette J, Chung WK, Claes KBM, Collée JM, Collonge-Rame MA, Couch FJ, Daly MB, Delnatte C, Diez O, Domchek SM, Dorfling CM, Eason J, Easton DF, Eeles R, Engel C, Evans DG, Faivre L, Feliubadaló L, Foretova L, Friedman E, Frost D, Ganz PA, Garber J, Garcia-Barberan V, Gehrig A, Glendon G, Godwin AK, Gómez García EB, Hamann U, Hauke J, Hopper JL, Hulick PJ, Imyanitov EN, Isaacs C, Izatt L, Jakubowska A, Janavicius R, John EM, Karlan BY, Kets CM, Laitman Y, Lázaro C, Leroux D, Lester J, Lesueur F, Loud JT, Lubiński J, Łukomska A, McGuffog L, Mebirouk N, Meijers-Heijboer HEJ, Meindl A, Miller A, Montagna M, Mooij TM, Mouret-Fourme E, Nathanson KL, Nehoray B, Neuhausen SL, Nevanlinna H, Nielsen FC, Offit K, Olah E, Ong KR, Oosterwijk JC, Ottini L, Parsons MT, Peterlongo P, Pfeiler G, Pradhan N, Radice P, Ramus SJ, Rantala J, Rennert G, Robson M, Rodriguez GC, Salani R, Scheuner MT, Schmutzler RK, Shah PD, Side LE, Simard J, Singer CF, Steinemann D, Stoppa-Lyonnet D, Tan YY, Teixeira MR, Terry MB, Thomassen M, Tischkowitz M, Tognazzo S, Toland AE, Tung N, van Asperen CJ, van Engelen K, van Rensburg EJ, Venat-Bouvet L, Vierstraete J, Wagner G, Walker L, Weitzel JN, Yannoukakos D; KConFab Investigators; HEBON Investigators; GEMO Study Collaborators; EMBRACE Collaborators; Antoniou AC, Goldgar DE, Olopade OI, Chenevix-Trench G, Rebbeck TR, Huo D; CIMBA. Mendelian randomisation study of height and body mass index as modifiers of ovarian cancer risk in 22,588 BRCA1 and BRCA2 mutation carriers. *Br J Cancer*. 2019 Jul;121(2):180-192. doi: 10.1038/s41416-019-0492-8.

- 6 Jara-Rosales S, González-Stegmaier R, Rotarou ES, Villarreal-Espíndola F. Risk Factors for Ovarian Cancer in South America: A Literature Review. *J Pers Med*. 2024 Sep 18;14(9):992. doi: 10.3390/jpm14090992.

- 7 Stewart C, Ralyea C, Lockwood S. Ovarian Cancer: An Integrated Review. *Semin. Oncol. Nurs*. 2019;35:151–156. doi: 10.1016/j.soncn.2019.02.001.

- 8 Gaitskell K, Hermon C, Barnes I, Pirie K, Floud S, Green J, Beral V, Reeves GK. Million Women Study Collaborators Ovarian cancer survival by stage, histotype, and pre-diagnostic lifestyle factors, in the prospective UK Million Women Study. *Cancer Epidemiol*. 2022;76:102074. doi: 10.1016/j.canep.2021.102074.

- 9 Bryant A, Hiu S, Kunonga PT, Gajjar K, Craig D, Vale L, Winter-Roach BA, Elattar A, Naik R. Im-

pact of residual disease as a prognostic factor for survival in women with advanced epithelial ovarian cancer after primary surgery. *Cochrane Database Syst Rev*. 2022 Sep 26;9(9):CD015048. doi: 10.1002/14651858.CD015048.pub2.

10 DiSilvestro P, Banerjee S, Colombo N, Scambia G, Kim BG, Oaknin A, Friedlander M, Lisyanskaya A, Floquet A, Leary A, Sonke GS, Gourley C, Oza A, González-Martín A, Aghajanian C, Bradley W, Mathews C, Liu J, McNamara J, Lowe ES, Ah-See ML, Moore KN; SOLO1 Investigators. Overall Survival With Maintenance Olaparib at a 7-Year Follow-Up in Patients With Newly Diagnosed Advanced Ovarian Cancer and a BRCA Mutation: The SOLO1/GOG 3004 Trial. *J Clin Oncol*. 2023 Jan 20;41(3):609-617. doi: 10.1200/JCO.22.01549.

11 Wang L, Wang X, Zhu X, Zhong L, Jiang Q,

Wang Y, Tang Q, Li Q, Zhang C, Wang H, Zou D. Drug resistance in ovarian cancer: from mechanism to clinical trial. *Mol Cancer*. 2024 Mar 28;23(1):66. doi: 10.1186/s12943-024-01967-3.

12 Porter JM, McFarlane I, Bartos C, Churchman M, May J, Herrington CS, Connolly KC, Ryan NAJ, Hollis RL. The survival benefit associated with complete macroscopic resection in epithelial ovarian cancer is histotype specific. *JNCI Cancer Spectr*. 2024 Jul 1;8(4):pkae049. doi: 10.1093/jncics/pkae049.

13 Kaidarova DR, Shatkovskaya OV, Ongarbayev BT, Seisenbayeva GT, Azhmagambetova AE, Zhylkaidarova AZh, Lavrentieva IK, Sagi MS. Indicators of the oncology service of the Republic of Kazakhstan, 2022: statistical and analytical materials – Almaty, 2023. – 430 p.

PEDAGOGICAL SCIENCES

THERE IS A PLACE FOR EVERYONE IN EDUCATION: THE IMPORTANCE OF AN INCLUSIVE APPROACH IN PRESCHOOL EDUCATION STRENGTH

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Abstract

The article examines the process of organizing training in inclusive education in Azerbaijan, the implementation of laws adopted in this area, factors to be taken into account in organizing inclusive education in preschool institutions, types of inclusive education applied in preschool institutions, the related work of specialists working with children with disabilities involved in inclusive education, the importance of child-centered pedagogy in implementing inclusive education, determining the time of a child's involvement in inclusive education, the results of implemented state programs, as well as ways to overcome the difficulties encountered. The adopted program on inclusive education reflects the main task of working with parents of children in need of special care, active participation of the public in this area, ensuring the education of such children in disadvantaged families, meeting their spiritual needs, providing them with the opportunity to receive training together with their typical peers, and at the same time helping them to form themselves as active members of society. The article presents other problems related to inclusive education, including the implementation of special programs for children with disabilities, the cooperation of teachers with the parents of these children in inclusive groups, the usefulness of parents' participation in the learning process, the support provided to teachers by parents, etc.

Keywords: inclusive education, discrimination, disability, psycho-medical, sociological, psycho-medical, sociological, organizational, health opportunities, special care, psychologist, speech therapist, defectologist, intellectual, democratic values.

Interpretation of materials obtained during the research process.

In modern times, inclusive education means ensuring the right of persons with disabilities to education on an equal basis with other persons at all levels of education and creating an environment without barriers for their education. The aim of inclusive education is to ensure effective learning by involving children in the same school and class with their peers, regardless of their physical, mental, intellectual and other characteristics. Inclusive education prevents any form of discrimination against children, and gives children the opportunity to receive excellent education and achieve success. When children with disabilities grow up with other peers and participate in the learning process, they develop a sense of mutual understanding and respect. [2;105].

Historically, inclusive education has been defined as the inclusion of children with special needs in regular schools [Mitchell D. 2008]; [Dukes C., & Lamar-Dukes P. 2006]. The concept of "special needs" or "disability" has been a central concept in the inclusive education process, and this concept is still gaining new concepts that interpret "special needs" from different aspects. Educational research, as well as educational approaches, have gone through three main stages of evolution, which differ from each other in their specific paradigmatic structure: psycho-medical, sociological and organizational paradigms. In the early stages of education for children with disabilities, the psycho-medical paradigm was a dominant factor in attitudes and beliefs, where medical and psychological traditions were quite clear. The psycho-medical paradigm

conceptualizes difficulties arising from deficiencies in the neurological or psychological state of the child. [9;71].

Inclusive education is an educational approach that supports all students to learn together, taking into account individual and other differences, and providing appropriate support and educational services according to their needs. In inclusive education, it is important that all students learn together and that every student is expected to participate in lessons, activities and learning opportunities. Teachers should organize all activities taking into account children with typically developing and special needs; they develop plans in collaboration with other experts and organizations to best meet the needs of all children and their needs. In this context, inclusive education is not only about disabled children; it aims to include all disadvantaged children and children with special needs, such as children with different mother tongues and children from diverse socio-cultural backgrounds.

Inclusive education is achieved through knowledge and experiences gained through normalization, generalization and integration practices based on the principle of equal opportunities. On the path to inclusive education, normalization is an approach that advocates that all children with special educational needs have access to educational services that are as close as possible to those enjoyed by their peers in the general population. Inclusion is defined as placing children with special educational needs in different groups in preschool educational institutions, making necessary adjustments in the physical environment to suit their needs, and participating in

classes and group activities with minimal assistance. Inclusion broadly encompasses all disadvantaged children, including those with special educational needs.

The following factors should be taken into account when organizing inclusive education in preschool institutions:

1. Preparation of an activity plan taking into account the characteristics of the child;
2. Conducting individual and group exercises that are of great importance in improving the initiative and teamwork skills of children with disabilities;
3. Observing the child's mental state before and after the session;
4. Developing motor skills through special gymnastics, games, and tasks;
5. Achieving active participation of children in events;
6. Developing children's abilities and talents.

In preschool institutions, groups in inclusive education are also formed based on the following principle: 2/3 of the children's collective are healthy children, and 1/3 are children with disabilities.

The following types of inclusive education are applied in preschool institutions:

1. Point access;
2. Partial access;
3. Full inclusion.

In point-based inclusion, preschool children with disabilities join the group of healthy children at certain times, for example, during walks, games or festive events. In partial inclusion, preschool children with disabilities do not spend the whole day in the group, but directly participate in physical education, fine arts and music classes. In full inclusion, children with disabilities participate in the inclusive group, like their healthy peers, all day and in all classes and events. Preschool education is important for all children. It is especially useful for children with disabilities. Inclusive education in preschool institutions should be optimally organized as follows:

1. Individual sessions with specialists - psychologists, speech therapists and defectologists;
2. Walking in specially equipped spaces is created taking into account the psychophysical capabilities of children with disabilities;
3. Frontal exercises are organized for the purpose of understanding and solving social tasks;

4. Conducting joint creative and constructive tasks and games in parent-child groups;

5. Organizing festive events, excursions and trips to create a positive mood and promote emotional development;

6. Strengthening eating, daytime sleep, and self-care habits – all of these

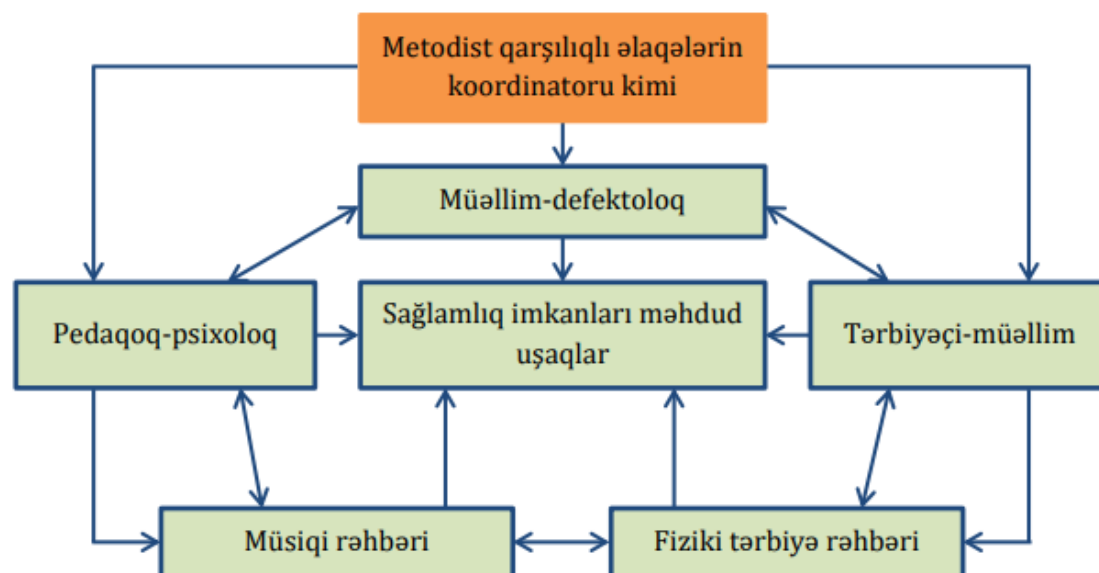
In addition to the principles on which it is based, the inclusive education approach also includes some features. Thus, the inclusive education approach requires the search for optimal opportunities to meet various requirements covering mental and physical capabilities and to take into account diversity. This approach not only responds to the interests of learners with different levels of interest and ability, but also encourages the professional development of those involved. The diversity of teaching methods also allows children to reveal their creative potential and stimulate their problem-solving skills in various ways.

In addition, inclusive education is also characterized by democratic values. Thus, inclusion implies ensuring the rights of all children to participate in education, to express their opinions, to participate in a quality educational process and to achieve certain results regardless of their personal, social and ethnic characteristics, and to provide support to children who may be subject to social exclusion, as well as those with poor attendance.

In educational institutions where inclusive education is applied, all students, including children with disabilities, have equal rights; the educational process is accessible to each child, they are provided with equal opportunities for communication; the learning process is efficiently organized, the pedagogical workers involved in the process have acquired the appropriate skills; the program takes into account the needs of each child, and families actively participate in the life of the educational institution. Thus, inclusive education can be characterized as a process in which all individuals, regardless of their physical, mental, intellectual and other characteristics, receive education in the same educational institutions as their peers. They help overcome communicative barriers. [10;15].

The following scheme shows children with disabilities involved in inclusive education.

The related work of working professionals is noted.

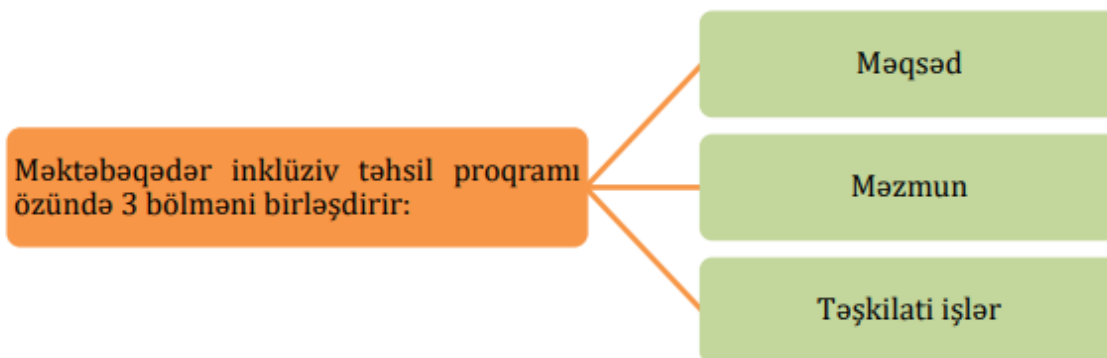


In order to identify and eliminate the learning difficulties of children with disabilities in kindergartens, the management of the preschool educational institution, psychologist, defectologist, speech therapist, educator-teacher, assistants, and parents should work together as a team. The knowledge of educators-teachers and parents in the field of inclusion should be increased by using internal resources. Both individual and collective forms of work should be used to solve learning difficulties.

An improperly organized educational environment can aggravate the condition of a child with special needs. Special attention should be paid to the development of the following qualities in students in groups with an inclusive education component:

- Development of the emotional sphere;
- Development of the cognitive sphere;
- Development of stress tolerance;
- Development of self-confidence;
- Development of a positive attitude towards the real world and the ability to accept others;
- Development of independence;
- Development of self-determination, self-improvement and motivation.

Research shows that when preschool children with special needs are included in regular groups with the necessary support, they feel a sense of belonging to the team and have many opportunities to positively interact with them because they feel a sense of belonging to the team.



The educator-teacher should consider the following when establishing the training process:

1. By giving children various tasks, including children with special needs in the same types of activities;
2. Complete tasks together with the group;

3. Using other strategic ways of participating in the collective - games, field research, etc.

The number of children in groups in a special preschool educational institution is determined as follows:

	1-3 yaşadək	3-7 yaşadək
kor uşaqlar	6	6
zəifgörən, çəpgöz və ambliopiyalı uşaqlar	6	6
kar uşaqlar	6	6
zəifəşidən uşaqlar	6	8
nitqi ümumən inkişaf etməyən uşaqlar	6	10
kəkələyən uşaqlar	-	10
nitqi fonetik cəhətdən inkişaf etməyən uşaqlar	-	12
əqli cəhətdən geri qalan uşaqlar	6	6
dayaq-hərəkət aparatının funksiyalarının pozuntuları olan uşaqlar	6	6
mürəkkəb çatışmazlıqları olan uşaqlar	-	6

Determining the time for a child to be involved in inclusive education is also a complex issue. Thus, the integration of children with mild physical and mental disabilities should begin at preschool age. It is more expedient to mass integrate children with serious vision, hearing, speech and intellectual impairments after they have undergone special training. The training of children with severe and complex (complex) disabilities is possible only in special institutions. Inclusive education should begin in special groups operating within preschool institutions. Here, children with special needs come into contact with their normal peers during extracurricular activities and gradually get used to these conditions. Then these children are integrated into a regular group. Such a transition increases the circle of communication of children with special needs and accelerates the child's development. At the same time, it creates conditions for overcoming adaptation difficulties.

60% of children with disabilities can be educated in preschool and general education institutions without any adaptation, and 80-90% with minor adaptation (e.g., teaching strategy education, child-to-child support, and environmental adaptation). There is no evidence to support the argument that all children with disabilities have the same needs. There is also no solid evidence that children with disabilities require special strategies that differ significantly from regular teaching strategies. At times, the curriculum may need to be adjusted for some children and the communication mode may be different. However, all children have the right to benefit from the same curriculum and learn with the same socially constructive approaches.[14;19] Early childhood programs should be individualized for children with disabilities. When making decisions about individualized programs for children with special needs, pedagogical teams should understand the child's relationship to the environment, the early childhood program, and other environments. Knowledge can be gained from conversations with people who regularly observe and interact with children in those settings. The

nature of those interactions (e.g., how children approach tasks, how they perform, and how the environment responds to them) is an important part of the information needed to plan programs that are beneficial to children with disabilities.

In inclusive groups, the teacher's cooperation with the parents of these children is especially important. Cooperation with parents means their participation in the teacher's assessment of the child, determining his or her developmental levels, participation in the learning process, and a systematic approach to achieving the child's next developmental goals. In fact, parental participation in the learning process is important not only for children with disabilities, but also for children without disabilities of various ages, in their acquisition of the necessary academic and life skills.

3 ways in which parental involvement in the learning process is beneficial:

1. For the teacher – building relationships with parents, moral support for the teacher, and the school environment;
2. For the child – improved behavior, attitude, intellectual development, and attendance at classes;
3. For parents – increased parental self-confidence, parental satisfaction, and their own interest in education.

Support provided by parents includes the following:

1. Providing information – parents provide complete information about their child (strengths and weaknesses, medical conditions), are in constant communication with teachers and specialists, and participate in updating the FTP that meets the needs of their child. Parents also feel that they are being listened to and that the school cares about their child;

2. Collaboration – Parents should not only provide information, but also assist the teacher in preparing classroom assignments at home in advance, in adapting the home environment to the needs of the children, and in achieving the goals in the FTP;

3. Resources – Parents can also be closely involved in helping the teacher prepare certain learning tools. Others can participate as teaching assistants and participate in the implementation of certain activities and the implementation of certain areas of the curriculum.

Support for parents includes:

1. Communication – Information about their children should be accessible to parents. They should be aware of the difficulties their children are facing and what the educational institution is trying to do to address them. The teacher should communicate with parents through various means (in-person meetings, home visits, weekly or daily reports, telephone, e-mail, text messages).

2. Education - parents feel the need to be informed about how to deal with their children with disabilities, their participation or role in the learning process. One effective way to educate parents is through guidance for parents that promotes their children's development and discussing issues that concern them.

3. Support. Sometimes parents just need to be heard and want the teacher to simply be a good listener.

To promote children's health, toys, objects, activities, and interactions with adults must be properly determined, while regulating children's nutritional desires and activities.

The educator-teacher or specialist working in the inclusive education system must also receive integrative education and have integrative knowledge. The main result of the education of children with disabilities covered by the inclusive education system is the creation of an excellent system of knowledge, skills and habits in them. [13;46] The transition to inclusive education reveals a number of psychological problems that require solutions. In addition to children with disabilities, inclusive education gives a lot to healthy children. Joint education provides healthy children with a sense of being more tolerant of the mental and physical shortcomings of their peers, and the formation of a sense of openness and readiness for mutual cooperation. In children with disabilities, inclusive education ensures the formation of a positive attitude towards their peers, adequate social behavior, full realization of potential opportunities in development and education. Timely assistance allows you to mitigate the features observed in children with disabilities, and even in some cases completely eliminate them. This ensures their socialization and integration into society.

Child-centered pedagogy is essential in implementing inclusive education. All teachers encounter children with very different background knowledge, skills, interests and learning needs. Since there is no specific pedagogy for teaching children with disabilities, teachers in inclusive settings use child-centered pedagogy to meet the needs of all children. In a more traditional setting or more teacher-centered pedagogy, the teacher stands in front of the whole class, arranges the desks in rows and columns, passes on all the knowledge to the children and tells them whether their answers are right or wrong. This is what a good and instructive teacher should be like - this is what we

are taught. Child-centered pedagogy means putting children first and focusing on their needs, skills, interests and learning styles, and the teacher playing a supportive role in the learning process. In a child-centered approach, children without disabilities also look at them with surprise and react differently when they encounter a child with disabilities in one place or another. The main reason for this is the lack of communication and cooperation between them.

As a result, they do not understand each other and do not understand what they are feeling. In order to eliminate such problems, in modern times, as a result of international cooperation and a scientific approach, general effective directions for the implementation of inclusive education have been developed as a necessary stage in the development of humanity. Currently, in many countries of the world (Great Britain, the USA, Switzerland, etc.), children with disabilities study in general schools and go to kindergartens along with other peers. The responsibility for preparing children with disabilities for education together with their peers without disabilities essentially falls more on teachers, educators and psychologists. In general, it is intended that they adapt to education more quickly and communicate effectively with children. For example, in kindergartens or educational institutions where preschool preparation is conducted, the main role of educators is to develop collectivism, work habits, behavior, ethical and moral qualities in children, to create initial ideas about the world, and to carry out other functions. In short, in the process of school preparation, the teacher prepares the child for conscious activity in accordance with the tasks set by society, both physically and morally. The most important thing for effectiveness is the behavior of the teacher. In modern times, international and local legal documents require that children in need of special care be treated not as patients, but as people with disabilities. This forms a social approach to children in need of special care. The social model creates conditions for children with disabilities to properly use all their rights in order to develop their skills. Until now, the integration of children with disabilities into society has been limited on the basis of the medical model. A medical approach to a child in need of special care means a child with disabilities, a problem in terms of the medical model. In the past, children with disabilities were viewed through the prism of their violations, forced to undergo mandatory "treatments", institutionalization, and isolation from society. Sometimes such children were even deprived of life. Today, high-tech solutions, medications, and therapy methods are more constructive (for example, hearing aids for children with hearing impairments). Within the framework of this model, children in need of special care are expected to adapt more to society and their environment. It is forgotten that these children have the right to be accepted as they are. Often, they try to integrate them into the environment they find themselves in.

Conclusion

Effective organization of training in inclusive education leads to the conclusion that the value of a person should not depend on his abilities and

achievements, because everyone has the ability to feel, think and have the right to communicate. True education can only exist in the context of real relationships. Society must understand that all people need the support and friendship of their peers. The diversity of people should help develop all areas of life, it should not be an obstacle for them, but a means of overcoming existing obstacles. The main goal of inclusive education is to serve to ensure the continuous education and development of people with disabilities.

In conclusion, it can be noted that in modern society, in order to involve people with disabilities in the effective teaching and learning process, it is necessary to carry out educational and informative work at the public level, to form public awareness, to change public opinion in an unambiguously positive direction towards people with disabilities, as well as to create a favorable and safe environment. For this, first of all, the intelligentsia of society should not demonstrate a neutral or passive position towards the assimilation of people with disabilities. The problem of people with disabilities should be perceived by those around them as a social obligation, people should not show passive tolerance towards them, and discrimination should be eliminated. If the principles mentioned above are followed, it is possible to easily achieve the involvement of people with disabilities in education and their adaptation to society. The teaching and learning environment created thanks to the joint efforts and cooperation of teachers with parents can provide sufficient support to people with disabilities, and the implementation of new teaching strategies in this direction can increase the efficiency of education, further improve the learning process, and thus improve the learning outcomes of students. The creation of teacher learning communities in educational institutions will create a foundation for more effective organization of group activities, collaboration and communication skills with individuals with disabilities.

References:

1. Məktəbəhazırlıq qruplarında inklüziv təlimin təşkili. ARTİ-2021.
2. T.Xudaverdiyeva. Inklüziv təhsildə təlimintəşkili prinsipləri: Perspektivlər və nəticələr. Azərbaycan məktəbi 2021. №3.
3. <https://arti.edu.az/2021/03/12/məktəbəhazırlıq-gruplarında-inklüziv-təlimin-təşkili-adli-metodik-vəsait-hazırlanıb/>
4. Uşaqyönümlü, demokratik məktəbəqədər təhsil (2021) https://drive.google.com/file/d/1_oE-CjMP2u5N4i9lozTXbyhquPATGQE/view.
5. Ağayev, Ş., Məmmədova, E., Əliyeva, X. (2012). "İnklüziv təhsil günün tələbidir". "Azərbaycan məktəbi" jurnalı, №4.
6. Azərbaycanda inklüziv təhsilin vəziyyətinə dair araşdırma sənədi. (2018).
7. Sağlamlıq imkanları məhdud şəxslərin təhsili (xüsusi təhsil) haqqında Azərbaycan Respublikasının Qanunu. (2001).
8. K. Məmmədova. Inklüziv təhsilin məktəbəhazırlıq qruplarında tətbiqi. «Məktəbəqədər və ibtidai təhsil», № 2.(2022).
9. Məktəbəqədər və ibtidai təhsil elmi-metodik jurnal 2020, №1 /230 10-12-2023, 20:48
10. L.Rəfiyeva. Inklüziv təhsilə cəlb olunan uşaqlarla işin aparılması. Bakı-2020. "Təhsil haqqında" Azərbaycan Respublikasının 2009 – cu il 19 iyun tarixli, 833 – IIIQ nömrəli Qanunu
11. "Uşaq hüquqları haqqında" Azərbaycan Respublikasının 19 may 1998 – ci il tarixli, 499 – IQ nömrəli Qanunu
12. "Psixoloji – tibbi – pedaqoji komissiya barədə Əsasnamənin təsdiq edilməsi haqqında" Azərbaycan Respublikası Nazirlər Kabinetinin 29 aprel 2002 – ci il tarixli, 74 nömrəli Qərarı
13. "İnteqrasiya təlimi təhsil müəssisələrində təhsilin təşkili Qaydalarının təsdiq edilməsi haqqında" Azərbaycan Respublikası Nazirlər Kabinetinin 29 may 2002 – ci il tarixli, 87 nömrəli qərarı.
14. L.Cəfərova. Məktəbəhazırlıq qruplarında inklüziv təlimin təşkili. Bakı-2021.

BALANCED DIET FOR ATHLETES WHO ENGAGE IN SPORTS AEROBICS**Atamanyuk S.***Professor, Doctor of Pedagogical Sciences, Department of Physical Culture, Olympic and Non-Olympic Sports, National University "Zaporozhye Polytechnic", Zaporozhye***Kirichenko O.***Senior Lecturer at the Department of Physical Culture, Olympic and Non-Olympic Sports, National University "Zaporozhye Polytechnic", Zaporozhye***Kubatko A.***Associate Professor, Candidate of Pedagogical Sciences, Department of Physical Culture, Olympic and Non-Olympic Sports, National University "Zaporozhye Polytechnic", Zaporozhye***ЗБАЛАНСОВАНЕ ХАРЧУВАННЯ СПОРТСМЕНІВ, ЯКІ ЗАЙМАЮТЬСЯ СПОРТИВНОЮ АЕРОБІКОЮ****Атаманюк С.І.***Професор, доктор пед. наук, зав. кафедри фізичної культури, олімпійських та неолімпійських видів спорту Національного університету «Запорізька політехніка», м. Запоріжжя***Кириченко О.В.***Старший викладач кафедри фізичної культури, олімпійських та неолімпійських видів спорту Національного університету «Запорізька політехніка», м. Запоріжжя***Кубатко А.І.***Доцент, кандидат пед. наук кафедри фізичної культури, олімпійських та неолімпійських видів спорту Національного університету «Запорізька політехніка», м. Запоріжжя*<https://doi.org/10.5281/zenodo.14870588>**Abstract**

This article examines and analyzes nutrition related to the organization of proper nutrition for athletes who engage in sports aerobics. Proper nutrition for athletes plays no less important role than the training itself. As you perform your training, keep in mind where you go. Training requires athletes in sports aerobics to expend a large amount of energy both on the training of physical requirements and on supporting the most important functions for vitality.

Анотація

У цій статті розглядаються та аналізуються питання, пов'язані з організацією правильного харчування спортсменів, які займаються спортивною аеробікою. Правильне харчування для спортсменів відіграє не менш важливу роль, ніж самі тренування. Те, як ви відпрацюєте своє тренування, залежить від того, що ви їдете. Тренування вимагає від спортсменів в спортивній аеробіці витрати величезної кількості енергії як на виконання фізичних навантажень, так і на підтримку найважливіших функцій для життєдіяльності.

Keywords: health, food regimen, sports aerobics, calories, sports menu, cheap products.**Ключові слова:** здоров'я, режим харчування, спортивна аеробіка, калорії, спортивне меню, шкідливі продукти

Харчування - це основне джерело енергії для людини. Здорове харчування – це збалансований раціон, який забезпечує нормальну життєдіяльність людини. Воно має повністю задовольняти потреби людини в енергії, пластичному матеріалі, біологічно активних компонентах та викликати у нього позитивні емоції. Здається дуже просто — задовольняй свої потреби і будеш здоровим і життєрадісним. Але справа в тому, що потреби в компонентах їжі змінюються протягом життя людини і залежать від цілого ряду факторів, з яких складається те, що називається способом життя.

Сучасному спорту притаманні інтенсивні фізичні навантаження під час тренувань та змагань, висока нервово-емоційна напруга боротьби, націленість на рекордні спортивні результати. Процес підготовки до змагань вимагає від спортсмена величезних витрат часу та включає, як правило, дво- чи триразові щоденні тренування, залишаючи

все менше можливостей для відпочинку та повного відновлення фізичної працездатності.

Зміст тренування у спортсменів, які займаються протягом одного робочого дня різноманітним навантаженням: вправи швидко-силового характеру змінюються циклічною роботою на витривалість. Інтенсивність і тривалість виконаної роботи залежить від педагогічного завдання даного тренування, мікроцикла чи періоду підготовки до змагань. Зрозуміло, що засоби та способи відновлення фізичної працездатності спортсменів повинні виходити з характеру виконуваної роботи. Одним із перших і потужних засобів відновлення є харчування, саме воно насамперед здатне розширити межі адаптації організму спортсмена до екстремальних фізичних навантажень. Однак серед фахівців не існує єдиної думки щодо стратегії та тактики харчування спортсменів, які займаються спортивною аеробікою. Постійно мінливий харак-

тер фізичного навантаження перемикає обмін речовин з одного виду (обмін білка при силовій та швидко-силовій роботі) на інший (обмін вуглеводів та ліпідів при роботі на витривалість).

Спортсмени витрачають набагато більше енергії, ніж офісні співробітники або навіть робітники на виробництві. Високі енерговитрати – не єдина причина особливих вимог до харчування спортсмена у спортивній аеробіці.

Підвищена фізична навантаження впливає на організм спортсмена в такий спосіб, що він починає працювати у більш інтенсивному «режимі». Для відновлення витраченої при тренуванні енергії, підтримки хорошої фізичної форми та правильного виконання вправ, харчування спортсменів має відрізнятися високою калорійністю, натуральністю, бути різноманітним.

Енерговитрати не можуть бути заповнені без споживання правильно підібраних продуктів. Їжа є як джерелом енергії, так і матеріалом для відтворення клітин. Необхідно враховувати те, що їжа для спортсмена повинна виконувати низку специфічних завдань, а не бути виключно джерелом вгамування почуття голоду.

Продукти в меню спортсмена повинні відповідати таким вимогам:

- постачати в організм усі необхідні речовини, мікро- та макроеlementи, вітаміни, калорії;
- калорійна цінність безпосередньо залежить від спортивних завдань атлета;
- сприяти нормалізації та активації тих, що відбуваються в організмі обмінних процесів;

Правильне розподіл фізичних навантажень і відновлення сил, що витрачаються при цьому, є головною запорукою успіху в досягненні високих спортивних результатів.

Тренування вимагає від спортсменів витрати величезної кількості енергії як на виконання фізичних навантажень, так і на підтримку найважливіших функцій для життєдіяльності. Це робота серцевого м'яза, дихальної та травної систем. Зумовлено це тим, що під час інтенсивного тренінгу у посиленому режимі працюють і м'язи, і внутрішні органи.

Якщо організм не отримуватиме у достатній кількості поживних та корисних речовин, то це призведе спочатку до енергетичного дисбалансу, а потім до виснаження. Щоб уникнути цього, спортсмену, який займається спортивною аеробікою, необхідно приділяти підвищену увагу своєму щоденному раціону. Він повинен бути максимально збалансованим, повністю заповнювати енергію, що витрачається, складатися з корисних натуральних продуктів тваринного і рослинного походження.

Їжа повинна відповідати наступним основним вимогам:

- бути легко та добре засвоюваною; споживатися у кількості, достатній для відшкодування енергетичних витрат;
- бути доброякісною;

- містити всі харчові речовини, необхідних побудови тканин, нормального перебігу фізіологічних процесів;

- мати невеликий обсяг та забезпечувати почуття ситості;

- мати приємний смак, запах, зовнішній вигляд і викликати апетит;

- бути різноманітною, складатися з продуктів тваринного та рослинного походження, містити достатню кількість волокнистих речовин.

Крім енергетичної боку харчування, також слід враховувати її якісну сторону, тобто. вміст білків, вуглеводів, жирів, мінеральних солей, мікроелементів та вітамінів.

Перше, що потрібно зробити при складанні меню – розрахувати свою добову норму калорій. Визначити це значення можна за такою формулою: норма калорій = вага (кг) x 30. Число, що вийшло, потрібно збільшити в середньому на 20–30%, якщо метою є наросування та збільшення сили м'язів.

Визначивши калорійність їжі, необхідно розподілити структуру білків, жирів та вуглеводів у раціоні.

Велику частку раціону спортсменів, в спортивній аеробіці, займають вуглеводи (50-60%), оскільки вони необхідні для підтримки запасів енергії та усунення руйнації м'язів. Вуглеводи є основним джерелом енергії для спортсменів, які займаються спортивною аеробікою. Вони потрібні для м'язової діяльності, підтримки температури тіла. Потреба у вуглеводах на добу для спортсменів становить від 600 до 700 грамів. З цієї кількості на частку цукру має припадати близько 35%, а решта 65% на частку хліба, картоплі, макаронів, гороху, квасолі. Перед спортивним тренуванням слід використовувати складні вуглеводи, щоб мати достатньо сил для заняття. Після тренування рекомендують вживати невелику кількість простих вуглеводів, щоб швидко поповнити сили.

Особливу роль для спортсменів грають білки, які становлять 30-35% раціону. Вони є будівельним матеріалом в організмі людини. Це обов'язковий та незамінний компонент спортивного харчування. Спортсмени, які регулярно тренуються, повинні споживати від 2 до 2,5 грам білка на кілограм маси тіла. Більше половини білка має бути тваринного походження. Найбільш цінними є білки молока та молочних продуктів, м'ясо, риби, яєць. У рослинних продуктах найбільш цінні білки містяться в деяких крупах: гречана, вівсяна, рисова; бобові, особливо соя, в овочах та картоплі. Нестача білків у харчуванні спортсменів веде до погіршення стану здоров'я та професійних результатів.

Жири мають становити 10-20% раціону спортсмена. Повноцінна кількість жирів у раціоні відповідає за працездатність суглобів, навантаження на які у спортивній аеробіці висока. Жири є важливим складником здорового меню на кожен день. Потреба спортсменів у жирах становить 100-120 грам, з них 80% жирів тваринного походження. З цієї норми на частку молочних жирів повинно припадати близько 90%. Рекомендація відмовитися від їх вживання докорінно неправильна. Певна

кількість корисних жирів критично важлива для раціону.

Складаючи спортивне меню, варто брати до уваги спосіб розподілу їжі протягом дня. Раціон харчування спортсмена протягом дня розподіляється за калорійністю наступним чином: сніданок – 30-35%; обід – 35-40%; вечеря – 30-35%. Крім того, при можливості слід робити невеликі перекушування між кожними прийомами їжі. Здоровий перекус після активного тренування є запорукою чудових спортивних результатів. Особливо придатні для споживання як перекус продукти, які багаті протеїном, такі як горіхи, яйця, риба та ін.

Невеликі перекушування допомагають підтримувати стабільний рівень цукру в крові і запобігає різким стрибкам енергії. Необхідно не перевантажувати шлунок перед фізичними навантаженнями, підтримувати організм в одному енергетичному ритмі і не створювати тяжкість, дозволяючи їжі швидко перероблятися.

Необхідно відзначити, що є деякі обмеження в продуктах, які вживаються професійним спортсменом, серед яких виділяють наступні:

- Кава. Кофеїн дає енергію лише короткостроково. Через певний час ви відчуватимете втому і виснаженість. Газовані напої дуже шкідливі. Корисною альтернативою кави може стати зелений чай і настої трав;

- Соуси із магазинів. Кетчупи та соуси категорично заборонені спортсменам. У їхньому складі міститься багато барвників, консервантів, цукру та інших шкідливих речовин;

- Солодощі з рафінованим цукром. Натуральний мед замінює цукор.

- Фастфуд містить багато барвників, консервантів, канцерогенів.

Питання ваги можна назвати головним у гімнастичних видах спорту. Загальна калорійність раціону спортсменів розраховується досить чітко і суворо, щоб уникнути як помітного збільшення маси тіла, так і виснаження. Щоб не втратити результат, не можна перевищувати калорійність більше ніж на 20% за розраховану, і не зменшувати більше ніж на 10%. Загальноприйнятною та досить узагальненою для гімнастичних видів спорту вважається калорійність 3500-4700 ккал/добу для чоловіків та 3000-3800 ккал/добу для жінок. Але варто пам'ятати, що для спортсменів даних видів спорту особливо важливим є індивідуальний підхід.

Хоча дуже важливо не допускати дефіциту калорій, для спортсменів гімнастичних видів спорту іноді спеціально застосовують регульований енергодефіцит — коли в підготовчому періоді протягом 7-10 днів калорійність раціону знижується на 5-10% від потрібної. Робиться це з метою того, що енергодефіцит активує реакції пристосовуваності. Безперечно, все це здійснюється під пильним наглядом лікаря, а також рекомендується в цей період слідувати за складом тіла всіма доступними методами, особливо коли гімнасти прагнуть до зниження ваги, вдаючись до будь-яких засобів.

Саме вони і є групою, найбільш схильною до порушень харчової поведінки. Кошти, що використовуються для досягнення бажаної статури, контрпродуктивні з багатьох причин. Скорочення кількості споживаної їжі забезпечує неадекватне енергоспоживання, що веде до уповільнення швидкості обміну речовин та недостатнього надходження харчових та біологічно активних речовин.

У спортивній аеробіці, як і в будь-якому складнокоординаційному виді спорту, найважливішими умовами успіху є дисципліна і постійні самообмеження. Особливо це стосується харчування, оскільки організм гармонійно функціонує лише при добре збалансованому раціоні, а ймовірність досягнення спортивних висот безпосередньо залежить від можливостей організму.

До організації раціону харчування спортсменів входить:

- отримання достатньої кількості питних речовин та вітамінів без набору лишніх кілограмів;

- підтримання стабільної і відносно малої маси тіла з низьким рівнем вмісту жиру;

- набір порівняно невеликого обсягу мускулатури і одночасно – збереження пластичності та функціональності скелета та м'язів;

- стабільна та збалансована робота парасимпатичної та симпатичної нервної системи.

Тяжкі тренування та недостатнє споживання їжі є причиною хвороб, які зустрічаються у багатьох спортсменок при використанні екстремального зниження ваги (голодування, зневоднення, дієти з дефіцитом нутрієнтів). Необхідно знижувати вагу здоровими методами, щоб уникнути негативних наслідків для організму та зберегти спортивну форму.

Тривалість та характер навантаження дозволяють охарактеризувати спортивну аеробіку як високоінтенсивний вид спорту з анаеробним типом енергозабезпечення м'язової діяльності.

Анаеробний характер спортивної аеробіки накладає деякі обмеження на загальну кількість споживаного жиру, оскільки він навряд чи може бути джерелом енергії в ході тренувальної діяльності. Уникати споживання жиру не слід, але розумне зменшення його кількості з одночасним збільшенням частки складних вуглеводів могло б стати дуже бажаною зміною раціону спортсменів, які займаються спортивною аеробікою.

Потрібно пам'ятати про втрату рідини, тому що ми не завжди відчуваємо жагу під час фізичних вправ. Як зневоднення, так і гіпергідратація знижує продуктивність і можуть бути небезпечними. Для більшості видів спорту достатньо пити звичайну воду, але напої, що містять електроліти та вуглеводи, у тому числі «спортивні напитки» та розведені фруктові соки з дрібною солі, можуть допомогти підтримати баланс рідини та навіть підвищити ефективність фізичних упражнений.

Таким чином, на підставі вищевикладеного можна зробити висновок про те, що найважливішою умовою досягнення успіхів у спорті є раціональне, збалансоване та досить калорійне харчування. Правильне харчування для спортсменів

відіграє не менш важливу роль, ніж тренування. Те, як ви відпрацюєте своє тренування, залежить від того, що ви їсте. Ви не прогресуватимете у спорті, якщо у вашому раціоні не вистачає поживних речовин.

Список літератури:

1. Андріанов, В. В. Основи спортивного харчування. Київ: Олімпійська література. 2018 р. 198 с
2. Бабак С. В. Особливості харчування спортсменок, які спеціалізуються у художній гімнастиці // XII Міжнародної конференції молодих вчених «МОЛОДЬ ТА ОЛІМПІЙСЬКИЙ РУХ» 17 травня 2019 р. С.217-219
3. Гумовська І. Десять заповідей здорового харчування //К. Видавничий дім "Медкнига" 2017 р., 64 с.
4. Міхеєнко А. Основи раціонального та оздоровчого харчування: навч. посібник. Київ, «Університетська книга», 2016. 184 с.

5. Основи харчування: підручник /М. І. Кручаниця, І.С. Миронюк, Н.В. Розумикова, В.В. Кручаниця, В.В. Брич, В.П. Кіш. Ужгород: Вид-во УжНУ «Говерла», 2019. – 252 с.

6. Пархотик І.І. Дієто- і кінезітерапія. //К. Видавничий дім "Медкнига", 2019 р., 124 с.

7. Платонов, В. М. Адаптація спортсменів до фізичних навантажень: роль харчування. Київ: Олімпійський комітет України. 2015 р.

8. Сімахіна Г. О., Науменко Н.В. Харчування як основний чинник збереження стану здоров'я населення// Проблемы старения и долголетия. – 2016. – Вип. 25, № 2. – С. 204—214.Шевченко, Д. В. (2018). Вітаміни та мінерали в раціоні спортсмена: вплив на працездатність і відновлення. Харків: Видавничий дім "Фактор".

9. Монік Райан Харчування у спорті на витривалість. Все, що потрібно знати бігуну, плавцю, велосипедисту та триатлету. 2018р., 400с.

10. Daniel E. Lieberman Why Something We Never Evolved to Do Is Healthy and Rewarding // перекладач Любенко О., 2021р., 432с.

FEATURES OF MATHEMATICAL DEVELOPMENT OF PRESCHOOL CHILDREN WITH DISABILITIES**Binnatova Sh.***Doctor of Philosophy in Pedagogy, associate professor of the Department of Pedagogy and Methodology of Primary Education of the Pedagogical Faculty of Ganja State University, Ganja, Azerbaijan***ОСОБЕННОСТИ МАТЕМАТИЧЕСКОГО РАЗВИТИЯ ДОШКОЛЬНИКОВ С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ ЗДОРОВЬЯ****Биннатова Ш.***доктор философии по педагогике, доцент кафедры педагогики и методики начального образования Гянджинского Государственного Университета, Гянджа, Азербайджан*<https://doi.org/10.5281/zenodo.14870590>**Abstract**

In the context of modern educational processes aimed at the comprehensive development of each child, particular attention is paid to children with disabilities. The author notes that an important task of preschool educational institutions is to create conditions that will allow children with disabilities to successfully master basic mathematical concepts. The article discusses the peculiarities of forming mathematical representations in children of this category, as well as methods and approaches that contribute to effective learning in preschool.

The study of the peculiarities of forming mathematical representations in preschool children with disabilities is relevant and necessary for the improvement of the educational process within the framework of an inclusive approach.

The practical significance of the article is determined by its contribution to improving educational practices in preschool institutions that work with children with disabilities. The methodological recommendations presented in the paper can be used by preschool educators to develop and implement programs aimed at developing mathematical representations in children with various types of health limitations. Applying the described methods and approaches in practice will increase the effectiveness of teaching, improve the results of mastering mathematical concepts, and promote the social adaptation of children with disabilities.

As a result, the article may become an important resource for specialists in the field of preschool education working in inclusive groups, as well as for parents of children with disabilities who are interested in supporting and developing their children's mathematical skills.

Аннотация

В условиях современного образовательного процесса, направленного на всестороннее развитие каждого ребёнка, особое внимание уделяется детям с ограниченными возможностями здоровья. Автор отмечает что, важной задачей дошкольных образовательных учреждений является обеспечение таких условий, которые позволят детям с ограниченными возможностями здоровья успешно осваивать базовые математические понятия. В статье рассмотрены особенности формирования математических представлений у детей данной категории, а также методы и подходы, которые способствуют эффективному обучению в детском саду.

Исследование особенностей формирования математических представлений у дошкольников с ограниченными возможностями здоровья является актуальным и необходимым для совершенствования образовательного процесса в рамках инклюзивного подхода.

Практическая значимость статьи определяется её вкладом в совершенствование образовательной практики в дошкольных учреждениях, работающих с детьми с ограниченными возможностями здоровья. Предложенные в работе методические рекомендации могут быть использованы педагогами дошкольных образовательных учреждений для разработки и реализации программ, направленных на развитие математических представлений у детей с различными видами ограничений здоровья. Применение описанных методов и подходов на практике позволит повысить эффективность обучения, улучшить результаты усвоения математических понятий и способствовать социальной адаптации детей с ограниченными возможностями здоровья.

В результате, статья может стать важным ресурсом для специалистов в области дошкольного образования, работающих в инклюзивных группах, а также для родителей детей с ограниченными возможностями здоровья,

Keywords: mathematical representations, inclusive groups, preschool educational institution, children with disabilities, preschool education, individualization of learning, visual methods, social adaptation.

Ключевые слова: Математические представления, инклюзивные группы, дошкольное образовательное учреждение, дети с ограниченными возможностями здоровья, индивидуализация обучения, наглядные методы, социальная адаптация.

Введение

Современное образование в Азербайджане претерпевает значительные изменения, стремясь к созданию инклюзивной среды, способствующей полноценному развитию всех детей, включая детей с ограниченными возможностями здоровья (ОВЗ). Инклюзивное образование предполагает интеграцию детей с ОВЗ в общий образовательный процесс, что требует от педагогов особого подхода и применения специфических методик. Одним из важнейших аспектов успешного инклюзивного обучения является развитие математических представлений, так как математика не только формирует логическое мышление и аналитические способности, но и способствует развитию социальных навыков, необходимых для взаимодействия в коллективе.

Инклюзивное обучение в настоящее время является альтернативой традиционного дифференцированного обучения и различных форм интегрированного обучения. При этом следует сказать, что интегрированное обучение является промежуточным между дифференцированным и инклюзивным. В некоторых своих формах оно ближе к дифференцированному, в других формах, интеграция приближается к инклюзивным моделям обучения [1; с.4].

Развитие элементарных математических представлений и как следствие формирование основ логико-математической компетентности у детей дошкольного возраста имеет большую ценность для интенсивного умственного развития ребенка, его познавательных интересов и любознательности, логических операций (сравнение, обобщение, классификация). Логико-математическая компетентность стимулирует настойчивое стремление ребенка получить результат (собрать, соединить, измерить), проявив при этом познавательную инициативу и творческие способности. Она помогает развивать внимание, память, речь, воображение и мышление, создает положительную атмосферу [2, с. 551-555].

Развитие математических представлений в раннем возрасте имеет особое значение, так как именно в дошкольном возрасте закладываются основы математического мышления. Дети начинают осознавать количественные и пространственные отношения, учатся классифицировать предметы, устанавливать связи между ними, что является необходимым для дальнейшего успешного обучения в школе. Однако, в инклюзивной группе ДОУ (дошкольного образовательного учреждения) возникает ряд сложностей, связанных с различиями в уровне развития детей, их индивидуальных особенностях и потребностях. Педагоги должны быть готовы к тому, что в классе будут дети с различными формами ОВЗ, и подходы к каждому из них должны быть адаптированы с учетом их возможностей и потребностей.

Теоретические аспекты развития математических представлений в инклюзивной группе требуют глубокого анализа и понимания. Важно рассмотреть, какие методические подходы и стратегии

могут быть использованы для того, чтобы обеспечить равные возможности для всех детей в освоении математических концепций. Это включает в себя как традиционные методы обучения, так и инновационные подходы, основанные на современных исследованиях в области психологии и педагогики. Необходимо также уделить внимание тому, как организовать учебно-воспитательный процесс так, чтобы он был максимально эффективным для детей с различными потребностями.

Практические методики и приемы работы с детьми с ОВЗ также играют ключевую роль в развитии математических представлений. Педагоги должны быть вооружены разнообразными инструментами, которые помогут им адаптировать учебный материал и создать комфортные условия для обучения. Это может включать в себя использование наглядных пособий, игровых методик, а также индивидуализированных заданий, которые учитывают особенности каждого ребенка. Важно, чтобы обучение проходило в игровой форме, что сделает его более увлекательным и доступным для детей.

Постепенное усложнение материала является ещё одним принципом, который должен учитываться при работе с детьми с ОВЗ. Переход от простых понятий к более сложным должен осуществляться плавно, с учётом возможностей каждого ребёнка. Это позволяет избежать перегрузки и способствует более уверенной работе с математическим материалом. Начинать обучение рекомендуется с простейших категорий, таких как «больше-меньше», «один-много», и лишь затем переходить к арифметическим действиям.

При организации инклюзивного образования педагогам рекомендуется использовать критерии эффективности образовательного процесса в соответствии с принципами инклюзии. При инклюзивном образовании детей с ОВЗ продуктивное взаимодействие с семьями является в ряде случаев решающим условием для успешного освоения воспитанником образовательной программы и активной социализации в социуме [3, с. 68-73].

Воспитатель ежедневно взаимодействует с детьми. От педагога требуются отдельные компетентности: знания об особенностях детей с ОВЗ, создание необходимых условий в группе для детей с ОВЗ, индивидуальный подход. Так же необходимо правильно ввести ребенка в коллектив детей. Для этого проводятся: утренний круг «Мы все разные», контактные игры «Дай ручку», «Коготки-царапки» и др., игры на формирование групповой сплоченности «Давай знакомиться», «Гусеница», игры на снятие мышечного напряжения «Кленовые листочки», «Догонялки» [4, с.18-20].

Социальное взаимодействие играет важную роль в формировании математических представлений у детей с ОВЗ. Групповые занятия не только развивают коммуникативные навыки, но и позволяют детям обмениваться опытом, учиться взаимодействовать и совместно решать задачи. Важно, чтобы такие занятия были организованы таким образом, чтобы каждый ребёнок чувствовал себя частью коллектива и мог проявить свои способности.

Оценка эффективности работы по развитию математических представлений в инклюзивной группе является важным этапом, который позволяет выявить сильные и слабые стороны реализуемых программ и методик. Это может включать в себя как количественные, так и качественные методы оценки, которые помогут педагогам понять, насколько успешно дети усваивают математические концепции и какие аспекты требуют дополнительного внимания. Важно также учитывать мнение самих детей и их родителей, так как это может дать ценную информацию о восприятии учебного процесса и его результатах.

Несмотря на достижения в области инклюзивного образования, существует ряд проблем, с которыми сталкиваются педагоги и дети в процессе обучения. Это может быть связано как с недостатком ресурсов и поддержки, так и с отсутствием должной подготовки педагогов для работы в инклюзивном классе. Важно выявить эти проблемы и предложить возможные пути их решения, чтобы обеспечить более эффективное развитие математических представлений у детей с ОВЗ.

Перспективы развития математических представлений в инклюзивной группе ДОУ также представляют собой важный аспект исследования. Важно рассмотреть, какие новые подходы и технологии могут быть внедрены в образовательный процесс, чтобы сделать его более доступным и эффективным для всех детей. Это может включать в себя использование цифровых технологий, а также программ, направленных на поддержку детей с ОВЗ.

Основная часть

Развитие математических представлений в инклюзивной группе ДОУ представляет собой сложный и многогранный процесс, который требует внимания к особенностям каждого ребенка, особенно тех, кто имеет ограничения в здоровье. В последние десятилетия концепция инклюзии становится все более актуальной, поскольку она направлена на создание условий, способствующих полноценному обучению и развитию всех детей, независимо от их индивидуальных особенностей. В этом контексте математические представления рассматриваются как один из ключевых компонентов общего развития ребенка, поскольку они формируют основы логического мышления, пространственного восприятия и способности к решению задач, что является необходимым для успешной социализации и дальнейшего обучения.

Математические представления включают в себя множество аспектов, таких как количество, форма, величина, пространство и время. Эти понятия развиваются у детей в процессе их взаимодействия с окружающим миром, и в инклюзивной группе важно учитывать, что дети с ОВЗ могут испытывать трудности в усвоении этих понятий. Например, дети с нарушениями слуха могут не всегда улавливать вербальные объяснения, что делает необходимым использование визуальных и тактильных методов обучения. С другой стороны, дети

с нарушениями зрения могут не воспринимать графические материалы, поэтому важно адаптировать учебные материалы и использовать альтернативные подходы, такие как тактильные модели и аудиоматериалы [5].

Сегодня в школе создается такая образовательная среда, которая «учитывает» осмысленный запрос самого ребенка, его родителей; предоставляет все возможности в выборе образовательного маршрута ребенка, обеспечивает многообразие образовательных услуг (предложений) для обучающегося и его родителей. Индивидуализация является одним из принципов, обеспечивающих данные характеристики образовательной среды [6, с. 21].

Важным аспектом математического развития детей с ОВЗ является создание адаптированной образовательной среды. Это подразумевает не только использование специальных материалов и технологий, но и организацию пространства таким образом, чтобы оно способствовало активному участию всех детей в учебном процессе. Например, использование сенсорных столов, на которых дети могут манипулировать различными предметами, помогает развивать их математические представления через практическое взаимодействие. Кроме того, важно, чтобы воспитатели и педагоги были готовы к индивидуализации обучения, что включает в себя создание персонализированных заданий и использование различных подходов в зависимости от потребностей каждого ребенка [7].

Методы и приемы, используемые для развития математических представлений в инклюзивном классе, должны быть разнообразными и включать как индивидуальную, так и групповую работу. Игровые технологии, такие как ролевые игры и настольные игры, могут стать эффективным инструментом для вовлечения детей в процесс обучения. Важно, чтобы игры были доступны для всех детей, а задания в них могли быть адаптированы в зависимости от уровня подготовки. Например, в игре на сортировку предметов можно предложить детям с ОВЗ сортировать не только по цвету, но и по размеру или форме, что позволит им развивать не только математические, но и логические навыки [8].

Социальная интеграция детей с ОВЗ в инклюзивной группе также играет ключевую роль в их математическом развитии. Взаимодействие с сверстниками способствует не только обмену знаниями, но и развитию коммуникативных навыков, что крайне важно для формирования уверенности в себе и готовности к обучению. Важно, чтобы воспитатели создавали атмосферу поддержки и сотрудничества, где каждый ребенок чувствует свою значимость и может свободно выражать свои мысли и идеи. Это может быть достигнуто через совместные проекты, в которых дети работают в группах, решая математические задачи и обсуждая свои решения.

Необходимо также отметить, что для успешного развития математических представлений у детей с ОВЗ важно учитывать их эмоциональное состояние и уровень мотивации. Дети, у которых есть

ограничения в здоровье, могут сталкиваться с низкой самооценкой и страхом перед обучением, поэтому важно создавать условия, в которых они будут чувствовать себя комфортно и уверенно. Педагоги должны быть внимательны к эмоциональным реакциям детей и использовать положительное подкрепление для поощрения их усилий и достижений. Это может включать в себя похвалу за успешное выполнение задания или создание системы поощрений, которая будет мотивировать детей к активному участию в учебном процессе [9; с.83].

Важной задачей развития математических представлений в инклюзивной группе является понимание различных подходов к обучению, таких как конструктивистский подход, который основывается на идее, что дети учатся лучше, когда активно вовлечены в процесс. В контексте инклюзии это означает, что педагоги должны создавать условия для активного участия всех детей, предоставляя им возможности для исследования и открытий. Например, использование заданий, которые позволяют детям самостоятельно находить решения, может быть особенно полезным для детей с ОВЗ, поскольку это способствует развитию их критического мышления и самостоятельности.

У дошкольников с ЗПР нарушено формирование и обобщение сенсорно-перцептивного опыта, наглядно-действенного и наглядно-образного мышления, которые служат предпосылками для выделения пространственно-количественных признаков и оперирования математическими представлениями. Эти дети испытывают трудности в соотношении практической деятельности со структурой знаково-символического содержания математических представлений [10; с.4-5].

Кроме того в инклюзивной группе могут быть представлены дети из различных культурных и социальных слоев, что может влиять на их восприятие математических понятий. Педагоги должны быть готовы учитывать эти различия и адаптировать свои методы обучения, чтобы обеспечить равные возможности для всех детей. Это может включать в себя использование заданий, которые отражают разнообразие культур и традиций, что поможет детям увидеть математику как универсальный язык, который объединяет людей.

Развитие математических представлений в инклюзивной группе ДОУ требует комплексного подхода, который учитывает индивидуальные особенности каждого ребенка, его эмоциональное состояние и социальное окружение. Педагоги должны быть готовы использовать разнообразные методы и техники, создавая адаптированную образовательную среду, которая будет способствовать активному участию всех детей в учебном процессе. Важно помнить, что каждый ребенок уникален, и его развитие должно быть поддержано с учетом его потребностей и возможностей. Таким образом, инклюзивное образование не только способствует математическому развитию, но и формирует у детей навыки сотрудничества, уважения и понимания, что является важным аспектом их общего развития и социализации.

Важно отметить, что математические представления формируются на основе конкретного опыта, поэтому создание условий для активного познания и практического применения математических знаний является важной задачей для педагогов. Инклюзивное образование, в свою очередь, требует от учителей гибкости и индивидуального подхода к каждому ребенку, что позволяет учитывать его уникальные потребности и возможности.

В логико-математическом развитии детей проблемное обучение призвано учитывать возможности, склонности и потребности каждого дошкольника, развивает способность самостоятельно мыслить, подключая к работе различные источники информации. Все это позволяет результативно подготовиться к школьному обучению, к самостоятельному освоению материала с использованием и активным развитием собственного логического мышления [8].

Применение разнообразных методов и приемов, направленных на развитие математических представлений, дает возможность создать комфортную и продуктивную образовательную среду. Важно, чтобы занятия были разнообразными и включали в себя элементы игры, что способствует не только усвоению математических знаний, но и развитию социальных навыков у детей. Также необходимо учитывать возрастные и индивидуальные особенности детей, что требует от педагогов высокой квалификации и умения адаптировать программы обучения.

В ходе исследования обсужденные вопросы позволили глубже понять специфику и важность инклюзивного подхода в образовательном процессе, а также выявить ключевые методические и организационные моменты, способствующие успешному развитию математических навыков у детей.

Мы рассмотрели различные методические подходы, такие как использование манипулятивных материалов, игровых технологий, интеграцию математики с другими образовательными областями. Эти методы позволяют сделать обучение более наглядным и доступным для детей с особыми потребностями. Кроме того, важно создать атмосферу поддержки и сотрудничества, где каждый ребенок чувствует себя комфортно и уверенно.

В оценке эффективности работы по развитию математических представлений в инклюзивной группе мы обратили внимание на необходимость системного подхода к мониторингу и оценке результатов обучения. Использование различных форм оценивания, позволяет более точно определить уровень усвоения материала и выявить области, требующие дополнительного внимания. Также важно учитывать мнение самих детей, их родителей и других участников образовательного процесса, что способствует созданию более целостной картины достижения образовательных результатов.

Мы выявили, что несмотря на положительные результаты, существуют определенные трудности, связанные с недостаточной подготовкой педагогов,

нехваткой ресурсов и материалов, а также необходимостью формирования у детей с ОВЗ уверенности в своих силах. Перспективы развития данной области заключаются в необходимости повышения квалификации педагогов, разработки новых методических материалов и программ, а также в создании условий для обмена опытом между образовательными учреждениями.

Заключение

В заключение, на основе проведенного исследования можно выделить несколько ключевых рекомендаций по развитию математических представлений в инклюзивной группе ДОУ. Во-первых, необходимо создать условия для активного и разнообразного обучения, включая использование игровых технологий, манипулятивных материалов и интеграции различных образовательных областей. Во-вторых, важно обеспечить индивидуальный подход к каждому ребенку, учитывая его особенности и потребности. В-третьих, необходимо регулярно проводить мониторинг и оценку результатов обучения, что позволит своевременно корректировать образовательные стратегии. Наконец, необходимо активно работать над повышением квалификации педагогов и созданием условий для обмена опытом.

Таким образом, развитие математических представлений в инклюзивной группе ДОУ является важной задачей, требующей комплексного подхода и сотрудничества всех участников образовательного процесса. Успешная реализация инклюзивного образования может значительно улучшить качество жизни детей с ОВЗ, способствуя их социальной адаптации и интеграции в общество.

Список литературы:

1. Зеленкова Т. В. и др. Методические рекомендации по созданию инновационных организационных форм по обеспечению детей с ограниченными возможностями здоровья психолого-педагогической коррекционной поддержкой при обучении в Московской области.- Орехово-Зуево: МГОГИ.- 2014,-с.4, – 194 с.
2. Изотова, О. А. Уголок занимательной математики как средство формирования основ логико-

математической компетентности у детей старшего дошкольного возраста // Молодой ученый. — 2017. — № 3 (137). — с. 551-555. — URL: <https://moluch.ru/archive/137/38512/> (дата обращения: 16.01.2025)

3. Сырьева, П. П. Детский сад как условие социально-образовательной интеграции детей с ОВЗ в жизнь и общество // Молодой ученый. — 2022. — № 35 (430). — С. 68-73. — URL: <https://moluch.ru/archive/430/94715/> (дата обращения: 16.01.2025).

4. Махонина, А. Э. Содействие взрослых и детей с ОВЗ в современном детском саду / А. Э. Махонина. // Молодой ученый. — 2018. — № 48.1 (234.1). — С. 18-20. — URL: <https://moluch.ru/archive/234/43001/> (дата обращения: 16.01.2025).

5. Екжанова Е. А., Резникова Е. В. *Основы интегрированного обучения: пособие для вузов.* — М.: Дрофа, 2008. — 210 с.

6. Вишнякова Е. А. *Методические рекомендации с моделями тьюторского сопровождения по обучению детей с ОВЗ.* — Липецк: ГАУДПО ЛО «ИРО», 2017.- с. 21, — 66 с.

7. Аллаярова Л. Ю. *Обучение математике детей с умственной отсталостью (интеллектуальными нарушениями) в условиях инклюзивного образования* [Электронный ресурс]. — 2018. — URL: <http://elar.uspu.ru/handle/uspu/10261> (дата обращения: 25.01.2025).

8. Карелина И. О. *Дошкольная педагогика: курс лекций* [Электронный ресурс]. — Рыбинск: филиал ЯГПУ, 2012. — URL: <https://citoweb.yspu.org/link1/metod/met177/met177.pdf> (дата обращения: 25.01.2025).

9. Богданова Н. В. «Нумикон» как эффективный метод обучения счету детей с ограниченными возможностями здоровья. — 2023. — ББК 74.0. — С. 83,- 461 с.

10. Баряева Л. Б. *Интегративная модель математического образования дошкольников с задержкой психического развития:* Специальность 13.00.03 — «Коррекционная педагогика» автореферат диссертации на соискание ученой степени доктора педагогических наук / Баряева Людмила Борисовна; Московский Государственный Педагогический университет им. М. А. Шолохова. — Москва, 2005, с.4-5,— 41 с.

ADAPTATION STRATEGIES IN AN INCLUSIVE EDUCATIONAL ENVIRONMENT

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АДАПТАЦИОННЫЕ СТРАТЕГИИ В ИНКЛЮЗИВНОЙ ОБРАЗОВАТЕЛЬНОЙ СРЕДЕ

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“Inclusion” is a powerful term in the world of education. It symbolizes acceptance, support, and a desire to make every student feel welcome, capable, and valued. But inclusive education is not just about placing students with different needs in the same classroom; it is about changing the nature of education and making it accessible to all. The Philosophy Behind Inclusion. Inclusive education is based on the belief that every student has a fundamental right to education, regardless of gender, race, language, religion, political belief, ethnicity, social status, origin, health status (physical, mental, emotional, social, linguistic), or other circumstances. arrival. Inclusive education, based on this philosophy, is not just a reform or an educational trend, but a fundamental change in the protection of equal rights in society. Inclusive education is a testament to the belief that differences are an asset, not a liability. It is a clear reflection of the diverse yet interconnected world we live in. Just as ecosystems thrive when biodiversity is high, classrooms thrive when they accommodate the diverse learning styles, abilities, backgrounds, and experiences of their students. The Essence of Inclusion: At its core, inclusive education is not about special programs or additional resources. It is about a change in mindset, a commitment to creating an environment where differences are welcomed and everyone feels valued. It goes beyond accommodating students with disabilities or different backgrounds. Rethinking the essence of education is about shaping it around the needs and strengths of each student. Challenges and Triumphs: The path to a fully inclusive education system has its challenges. It requires mobilizing resources, changing mindsets, and improving practices. However, the rewards are great. Students in inclusive classrooms often develop a deeper understanding of the world, increased empathy, and superior collaboration skills.

Аннотация

«Инклюзивность» — мощный термин в мире образования. Это символизирует принятие, поддержку и стремление сделать так, чтобы каждый ученик чувствовал себя желанным, способным и ценным. Но инклюзивное образование заключается не только в размещении учащихся с разными потребностями в одном классе; Речь идет об изменении характера образования и обеспечении его доступности для всех. Философия, лежащая в основе инклюзивности. Инклюзивное образование основано на убеждении, что каждый учащийся имеет основное право на образование, независимо от пола, расы, языка, религии, политических убеждений, этнической принадлежности, социального положения, происхождения, состояния здоровья (физического, умственного, эмоционального, социального, языкового). или другие обстоятельства. прибытие. Инклюзивное образование, основанное на этой философии, — это не просто реформа или образовательная тенденция, но и фундаментальное изменение в защите равных прав в обществе. Инклюзивное образование является свидетельством веры в то, что различия — это преимущество, а не препятствие. Это наглядное отражение разнообразного, но взаимосвязанного мира, в котором мы живем. Так же, как экосистемы процветают, когда биологическое разнообразие высоко, классы процветают, когда они принимают разнообразные стили обучения, способности, происхождение и опыт своих учеников. Суть включения: По сути, инклюзивное образование не касается специальных программ или дополнительных ресурсов. Речь идет об изменении мышления, приверженности созданию среды, где различия приветствуются и каждый чувствует себя ценным. Это выходит за рамки приспособления учащихся с ограниченными возможностями или разным происхождением. Переосмысление сути образования заключается в его формировании вокруг потребностей и сильных сторон каждого ученика. Проблемы и триумфы: Путь к полностью инклюзивной системе образования имеет свои проблемы. Необходимо мобилизовать ресурсы, изменить образ мышления и усовершенствовать практику. Однако награда велика. Учащиеся в инклюзивных классах часто развивают более глубокое понимание мира, повышенную эмпатию и превосходные навыки сотрудничества.

Keywords: inclusion, health, students, learners, teachers, educational institutions**Ключевые слова:** инклюзия, здоровье, студенты, учащиеся, учителя, образовательные учреждения

Многие люди по всему миру создают разные видения своего общества. Они рассматривают общество как группу, в которой все члены ценятся и включены. Это люди, которые поддерживают

начало процесса построения инклюзивного общества со школы. В противном случае мы должны научить наших детей жить и работать вместе, подходя к разнообразию культуры, национальности, языка, семейной принадлежности и, что еще более

трагично, к различным умственным, социально-эмоциональным и сенсорно-физическим способностям не только с толерантностью, но и с высокими ценностями. Но мы почти всегда учим противоположному — дискриминации, рабству и элитаризму.

Пример: Представьте себе сад. В этом саду, где созданы все условия, каждое растение, будь то высокие деревья или обычные кустарники, получает свою долю солнечного света, воды и питательных веществ. Некоторым растениям может потребоваться больше ухода, другим — меньше, но каждое растение важно для баланса экосистемы.

- Разнообразие — это сила: инклюзивный класс предлагает богатый опыт. Различные точки зрения, навыки и образ жизни создают более динамичную и насыщенную среду обучения.

- Способствует равенству: каждый ребенок имеет право на получение качественного образования, независимо от его способностей и образа жизни, наравне с другими сверстниками. Инклюзивность предотвращает дискриминацию в этой области и способствует устранению образовательных пробелов, существующих в обществе.

- Улучшает эмпатию и социальные навыки: в инклюзивной среде учащиеся усваивают ценность эмпатии, принятия и командной работы больше, чем академический контент. Пример: представьте себе футбольную команду, где у каждого игрока есть свои сильные и слабые стороны. Некоторые могут преуспеть в защите, в то время как другие — в нападении. Но успех команды достигается благодаря признанию и использованию сильных сторон каждого игрока и поддержке их слабых сторон.

Инклюзивное образование не ограничивается интеграцией учащихся с ограниченными возможностями в основную систему образования. К ним относятся студенты разного расового, этнического и социально-экономического происхождения, а также студенты с разными стилями обучения и, наконец, студенты с разным языковым происхождением. Пример: Рассмотрим мозаичное произведение искусства: независимо от формы, размера и цвета, каждый фрагмент очень важен. Если хотя бы один элемент упущен, картина останется неполной. Аналогичным образом, инклюзивный класс признает и ценит уникальный вклад каждого ученика [4].

Практика сложнее философии. Практика включает в себя адаптацию материалов к конкретным методам обучения, создание благоприятной среды и непрерывное образование учителей. Учителя, администрация Учителя и родители должны сотрудничать и быть открытыми для непрерывного обучения и адаптации. Пример: рассмотрим групповой обед, где каждый участник приносит один вид еды. Чтобы гарантировать, что все могут наслаждаться едой, некоторые из них являются веганами (они избегают употребления мяса, молочных продуктов, яиц, меда, а также других ингредиентов и добавок животного происхождения, таких как желатин или кармин), некоторые придерживаются безглютеновой диеты (они избегают употребления пшеницы, пшеницы и другие родственные белки), а

некоторые являются веганами (они избегают всех продуктов животного происхождения, таких как мясо, молочные продукты, яйца, мед и другие ингредиенты и добавки животного происхождения, такие как желатин или кармин). Это натуральный белок, содержащийся в зерновых растениях), в то время как другие могут готовить пищу в соответствии с различными культурными предпочтениями. В конечном итоге главная цель — обеспечить, чтобы каждый чувствовал себя учтенным и включенным.

Метафора оркестра прекрасно передает дух инклюзивного образования. Так же, как каждый инструмент вносит свой вклад в гармоничную мелодию своим уникальным звучанием, каждый ученик обогащает учебную среду своими индивидуальными талантами и способностями. Принятие этого различия не только полезно, но и необходимо для более справедливого, сострадающего и прогрессивного общества.

Инклюзивность — это больше, чем концепция. Это набор руководящих принципов, которые при правильной реализации могут преобразовать систему образования. Инклюзивность основана на нескольких ключевых принципах, которые поддерживают инклюзивную практику:

Равенство: Основой инклюзивного образования является достижение равенства, которое явно отличается от равенства. В то время как равенство означает предоставление всем одинаковых ресурсов, справедливость гарантирует, что каждый ученик имеет доступ к ресурсам, необходимым для успешной учебы и дальнейшей жизни. Пример: представьте себе двух студентов, пытающихся заглянуть через забор. Один из учеников выше другого. Если дать обоим ученикам коробку одинакового размера (равенство), то более низкорослому ученику будет сложнее заглянуть за забор. Однако, если предоставить ученику с меньшим ростом ящик большего размера (равенство), это позволит им обоим эффективно заглядывать через забор.

Разнообразие: Каждый студент уникален, и это очень важно понимать. Признание разнообразия заключается скорее в понимании и использовании этих различий для более глубокого опыта обучения, чем в их принятии. Пример: класс, в котором отмечаются различные праздники всех представленных в нем культур, а не только культуры большинства, не только позволяет учащимся из числа меньшинств чувствовать себя частью окружающей среды, но и обогащает понимание мира каждым [2].

Доступность: Истинная инклюзивность означает, что все ресурсы, будь то физические или интеллектуальные, доступны каждому. Крайне важно обеспечить, чтобы учащиеся всех уровней подготовки могли извлечь пользу из инфраструктуры школьных зданий и используемых учебных материалов. Пример: ученик с ограниченными возможностями передвижения может испытывать трудности с доступом в класс на втором этаже. Наличие пандусов и лифтов позволяет учащимся беспрепятственно участвовать в занятиях. Если это невозможно, то школа должна обеспечить, чтобы класс,

в котором учится этот ученик, находился на первом этаже. Кроме того, цифровые инструменты с возможностью чтения с экрана могут помочь учащимся с нарушениями зрения.

Инклюзивное сообщество: речь идет не только о размещении в школах учащихся с различными потребностями; создать сообщество, в котором каждый студент чувствует себя своим. Инклюзивное сообщество — это такое сообщество, в котором все учащиеся, родители и преподаватели работают в гармонии, поддерживая и вдохновляя друг друга. Пример: ученик с аутизмом поначалу может считать социальное взаимодействие пугающим. Однако когда одноклассники, учителя и родители сотрудничают, чтобы вовлечь ученика в занятия и групповую работу, это укрепляет чувство общности и принадлежности.

Ключевые элементы инклюзивного образования тесно связаны друг с другом. Обеспечение равенства может означать признание различий и обеспечение доступности. Развитие чувства общности происходит путем понимания и использования уникальных сильных сторон каждого ученика. Когда эти основы признаются и поддерживаются, инклюзивное образование может по-настоящему процветать и приносить пользу не только отдельным учащимся, но и обществу в целом.

Диапазон методов обучения и предпочтений в любом классе довольно широк. Разные жизненные ситуации, опыт и врожденные особенности учащихся приводят к тому, что они по-разному получают, обрабатывают и воспринимают информацию. Учителям крайне важно распознавать этот спектр и создавать среду, в которой каждый ученик может преуспеть. Давайте подробнее рассмотрим различные стили обучения, основанные на теории «многожественного интеллекта» Говарда Гарднера:

Визуалы: Визуалы лучше понимают и запоминают информацию, когда видят ее. Они используют такие инструменты, как графики, диаграммы, инфографику и иллюстрированные учебники. Эти студенты часто визуализируют концепции и решения в своем воображении, что помогает им понять делает визуальные подсказки критически важными для аскета. Пример: При обучении круговороту воды в природе использование подробной схемы, показывающей процессы испарения, конденсации, осадения и накопления, будет весьма полезным для учащихся-визуалистов.

Для аудиалов слушание и речь являются основными средствами усвоения информации. Они успешно учатся в традиционных классах, обычно хорошо запоминают устные инструкции и умеют читать вслух для лучшего понимания. Пример: Учащийся, который учится на уроках литературы, слушая, может извлечь большую пользу из прослушивания аудиозаписи обсуждаемого стихотворения, понимая интонацию поэта и ритмические нюансы [1].

Кинестетические (тактильные) учащиеся (телесно-кинестетический интеллект):

Кинестетикам (тактильным учащимся) для понимания необходимо двигаться и прикасаться. Им

приносят пользу такие виды деятельности, как экспериментальное обучение, экскурсии, лабораторные эксперименты и ролевые игры. Традиционная обстановка в классе, где им приходится сидеть неподвижно в течение длительного времени, может быть для них сложной и скучной. Пример: на уроках физики, где изучают маятники и рычаги, предоставление учащимся-кинестетикам возможности создавать настоящие маятники и гири для практического опыта улучшит их понимание.

Логические учащиеся (логико-математический интеллект):

Учащиеся логического склада ума преуспевают в рассуждениях, логике и системном мышлении. Им нравятся головоломки, задачи на решение проблем и опыт, в котором они могут применить структурированный подход. Эти студенты часто стремятся понять основные принципы и склонны методично классифицировать информацию. Пример: При обучении алгебраическим выражениям учащиеся с логическим складом ума могут оценить системный подход, при котором они сначала изучают основные принципы, а затем переходят к сложным уравнениям.

Коллективные и индивидуальные учащиеся (межличностный и внутриличностный интеллект):

Учащиеся, склонные к сотрудничеству, лучше всего усваивают концепции, обучаясь в группах или обсуждая идеи. Цель здесь — вместе учиться и вместе решать проблемы. Они преуспевают в совместной работе, групповых проектах и командных обсуждениях. С другой стороны, те, кто обучается в одиночку, предпочитают исследовать, анализировать и часто лучше понимают, когда их оставляют в покое для обработки информации. Пример: во время урока истории эпохи Возрождения учащиеся могут извлечь пользу из групповых обсуждений или совместных проектов, в то время как учащиеся, обучающиеся самостоятельно, могут предпочесть провести независимое исследование или вести дневник, размышляя по теме [6].

Одной из проблем, с которой сталкиваются учителя, является определение стиля обучения каждого ученика. В этом отношении полезными мерами для учителей могут стать внутриклассные опросы и тесты, определяющие стили обучения. Худший вариант: «Вы предпочитаете читать книги или слушать аудиокниги?» из вопроса «Нравятся ли Вам практические эксперименты в точных науках?» можно использовать вопросы. Анализ ответов даст учителям бесценную информацию, которая позволит им разрабатывать уроки, отвечающие разнообразным потребностям учеников, гарантируя, что никто не останется без внимания.

Понимание стилей обучения — это не просто адаптация к разным методам; речь идет о чествовании богатой части сознания, которая существует в каждом классе. Когда преподаватели адаптируют свои методы к этой разнице, они не только помогают студентам лучше понимать материал, но и прививают им понимание множества способов работы человеческого разума.

Чтобы создать образовательную среду, которая действительно способствует инклюзивности, учителя должны использовать ряд стратегий, направленных на удовлетворение потребностей в обучении. Давайте рассмотрим некоторые ключевые стратегии адаптации, используемые в инклюзивном образовании:

Дифференцированное обучение предполагает понимание сильных сторон, проблем и предпочтений учащихся, а затем адаптацию методов обучения к потребностям каждого учащегося. Речь идет не о создании отдельного курса для каждого студента, а об адаптации содержания, процесса или продукта к уровню подготовки студентов, областям интересов и профилям обучения. Пример: на уроке математики по дробям некоторые ученики могут работать с карточками с дробями или наглядными пособиями, такими как пироги и кусочки пиццы, в то время как другие могут решать текстовые задачи, а продвинутые ученики могут уметь применять дроби к действительным числам. - примеры из жизни, такие как рецепты еды или плотницкое дело.

Универсальный дизайн обучения (ULD):

LLL — это структура для улучшения и оптимизации обучения всех людей, основанная на научном понимании того, как люди учатся. Он фокусируется на вопросах «что, почему и как» в обучении, предоставляя многочисленные средства участия, представления, действия и выражения. UÖD сводит к минимуму препятствия в обучении, предвосхищая разнообразные потребности учащихся на этапе планирования. Пример: При преподавании литературы подход UÖD предполагает представление текста как в письменном, так и в аудиоформате, а также позволяет индивидуально и в группе Это может включать вовлечение учащихся в различные виды деятельности и предоставление им возможности выразить свое понимание посредством письма, обсуждения или художественного представления.

Совместное обучение (работа в парах)

Взаимное обучение позволяет использовать сильные стороны учащихся для оказания поддержки своим сверстникам. Учащимся становится комфортнее задавать вопросы одноклассникам или выражать свое понимание тем, а этот метод также облегчает работу учителя. Пример: на уроке географии ученик, который хорошо читает карты, может помочь своим сверстникам понять топографические символы, в то время как другой ученик, увлекающийся культурой, может глубже погрузиться в социальные нюансы изучаемой области.

Гибкие адаптивные настройки классов:

Физическая структура классной комнаты оказывает положительное влияние на обучение. Гибкая среда обучения возможна в областях, где предусмотрены групповая работа, индивидуальная работа, движение и интерактивные мероприятия. Сюда входят переносные столы, различные варианты сидения и выделенные зоны для выполнения конкретных задач. Пример: во время чтения некоторые ученики могут собираться в круг для групповых обсуждений, другие могут стоять, некоторые

могут выбирать тихие уголки с мягкими сиденьями, а кинестетики могут иметь зону с тактильными материалами, связанными с содержанием книги.

Пример: рассмотрим класс, в котором учатся ученики с разным языковым происхождением. Хотя на первый взгляд изучение нескольких языков может показаться сложной задачей, учителя могут превратить это в возможность. Объединяя учащихся в пары для обучения друг друга словам из их родных языков, потенциальное препятствие можно превратить в насыщенный, многокультурный опыт обучения.

Поощрение коллективного роста: Прелесть инклюзивного образования в том, что оно учитывает индивидуальные потребности, одновременно способствуя развитию коллективного духа. Учащиеся узнают, что они являются частью большого сообщества, где у каждого есть своя роль и вклад каждого имеет значение.

Пример: Давайте вернемся к метафоре школьного оркестра. Представьте себе, что эта секция, играющая на духовых инструментах, всегда остается без внимания. В таком случае общая производительность, несомненно, пострадает. Но когда каждому инструменту дают время проявить себя и работать в гармонии с остальными, результат становится шедевром. Аналогичным образом, в инклюзивном классе уникальные таланты и взгляды каждого ученика объединяются, создавая насыщенный и всесторонний опыт обучения.

Заключительные мысли: Для нас, педагогов и заинтересованных сторон в будущем наших детей, стремление к инклюзивности — это не только ответственность, но и привилегия. Эффект инклюзивного образования распространяется за пределы классной комнаты. Студенты вырастают не только как знающие личности, но и как чуткие граждане, готовые вносить позитивный вклад во все более разнообразный мир. Принятие инклюзивности, по сути, означает возвращение гармоничной мелодии нашего коллективного будущего.

Сторонники идеи создания таких школ понимают, что обучение детей со значительным разнообразием в инклюзивных классах — это не «хорошее к ним отношение». Таким образом, это является основополагающим условием хорошей школы, основанной на принципах совершенства и равенства. Но могут ли совершенство и равенство существовать одновременно? Лореман, Деппелер и Харви однозначно утверждают, что это возможно. В послании ясно говорится, что совершенство не может существовать без равенства.

Подходы авторов полезны со многих точек зрения, поскольку они предоставляют читателям стратегии и инструменты. Я хотел бы остановиться на некоторых из них. Во-первых, предметом нашего обсуждения являются вопросы, связанные с детьми с «различными образовательными потребностями». Авторы используют платформу, выстроенную между двумя точками их широкого спектра — детьми с ограниченными возможностями и детьми с особыми талантами. Они хорошо понимают, что создание эффективных инклюзивных

классов требует целого ряда умственных и физических возможностей. Это очень важная точка зрения.

Во-вторых, они демонстрируют, как реализовать эти подходы, сочетая практичные, понятные стратегии с конкретными ситуациями и обстоятельствами. Рассматриваемые стратегии основаны на надежных исследованиях, которыми поделились авторы. Таким образом, их основное внимание уделяется скорее практическим стратегиям, чем литературному анализу. Эта точка зрения касается вопроса «Что я буду делать в понедельник?» будет более ценен учителям, которые ищут ответы на такие вопросы, как: В-третьих, авторы четко выражают свою точку зрения. Эта книга не содержит идей и текстов, демонстрирующих «альтернативы», с помощью которых школа должна относиться к ребенку псевдообъективно. Таким образом, авторы четко излагают свои взгляды на хорошую школу: хорошая школа должна вовлекать всех детей в процесс обучения одновременно. В то же время они признают абсолютную важность убеждений, ценностей и поведения и создают возможности для исследования когнитивных и эмоциональных измерений этой важнейшей основы.

В-четвертых, авторы полагают, что стратегии подходят для учителя общего профиля. В нем описывается с точки зрения эксперимента, как разрабатывать индивидуальные программы для детей, а затем разрабатывать инклюзивные рекомендации, чтобы эти программы можно было внедрить в качестве части общей учебной программы. Они обсуждают возможность сотрудничества с точки зрения

поддержки учителей, организации занятий и, что наиболее важно, удовлетворения социально-эмоциональных потребностей учащихся путем поощрения позитивного поведения и социальных навыков. Авторы также хорошо общаются с учителями, которые в своем опыте живут в этом разнообразном мире.

Список литературы:

1. Алиева Б. Х., Джаббарова Р. В. Проблема идентичности в образовании. Баку, Просвещение, 2008, 125 с.
2. Аскерова М. Сотрудничество педагогов и учащихся – как важное требование нового педагогического мышления. // Научные труды, Институт Образования Азербайджанской Республики, № 1, 2015, стр. 30-34
3. Муслимов З. Нравственное воспитание студентов педагогических вузов. Баку, Восток-Запад, 1996, 87 стр.
4. Мамедов И. Роль ИКТ в повышении эффективности обучения. // Научные труды, АРТПИ, 2013, № 1, с. 154-157
5. Пашаев А., Рустамов Ф. Педагогика. Баку, Наука и образование, 2010, 316 стр.
6. Пашаев Т. Вопросы оценки деятельности учителя. Научные труды АРТПИ. Баку, 2011, № 2, стр. 37 – 41.
7. Рустамов Ф. Педагогические основы адаптации к вузовской жизни. // Высшее образование и общество, Университет Хазар, № 2, 2012, с. 10-15

PHILOLOGICAL SCIENCES

TURKISH ORIGIN WORDS IN THE SLAVIC LANGUAGES

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Abstract

The role of Turkic languages in the enrichment of the lexicon of Slavic languages is great. There are thousands of words of Turkish origin in Russian. The root words created by Turkish words form the definite part of the lexical fund of the Russian language. The components of these root word slots are subject to the grammatical, semantic and functional laws of the Russian language and enrich it. These words were not only developed independently in the Russian language, but also created their own root word slots and phraseological units. The components included in the root word slots created by morphemes of Turkish origin are widespread in the toponyms, hydronyms and anthroponyms of the Russian language. Some archaic semantic shades of the Turkish origin words are still preserved in Russian toponyms. This article deals with the Turkish origin onomastic units, which are widely used in Russian, and their semantic functional features.

Keywords: root word slots, turkisms, antroponyms, toponyms, hydronyms, onomastic units.

Introduction

The relationships between Russian and Turkish have been known since ancient times. It is necessary to note several periods in the history of Russian-Turkish language relations. The oldest period dates back to the first years of our era, before the establishment of the Kyiv-Russian state.

From the 6th to the 7th centuries AD, the Slavs entered into trade relations with the Turkic Avars, the Volga Bulgars, the Caspians, and other Turkic peoples. From ancient times, the settlement of Turkic and Slavic peoples in neighboring territories, trade relations forced the representatives of these peoples to learn each other's language.

The directions of these very broad relations are also interesting for their breadth and diversity. Russian culture benefited from the Turks, borrowing clothing, weapons, songs and tales, military structure and way of thinking.

The words of Turkish origin were included in the dictionary of modern and ancient Russian, "Slove o polku Igoreve", "Zadonshchina", "Domostroy" and others. It has been preserved in literary monuments and chronicles. The famous Russian linguist N.K.Dmitriyev considered all words included in Slavic from Turkish, regardless of their origins, to be Turkism.

According to V.Arakin, regardless of their previous history, words that passed into Slavic languages through Turkic languages are considered Turkisms. Thus, words related to religion, law, and everyday life that passed from Mongolian, Iranian, Arabic, and other languages were considered Turkisms by researchers.

There is a qualitative advantage in Turkish borrowings in the Russian language, which is the antiquity of Turkish borrowings. Due to the density and antiquity of ties in Russian-Turkish relations, Russians, who were under Turkish influence, adopted not only the customs and traditions of the Turks, but also various

aspects of the Turkic-Tatar way of life. They even became close to this people from a spiritual point of view, familiarizing themselves with and adopting their language. So many words and expressions have passed from Turkic languages to Russian that these lexical units have become so close to the words of the Russian language that it is currently difficult to replace a large part of them with special words and expressions in Russian.

The extensive connection between the Slavic and Turkic languages has been so continuous and consistent in the history of the mutual relations of these peoples that, as a result, it has left deep traces in the lexicon, phraseology, phonetics and grammar of the Russian language and in the onomastics.

Toponyms

Great Russian scientist A.K. Matveyev in his dictionary "Geographical names of the Urals. Short toponymic dictionary" divides the word "aktay" into the components "ak" and "tay". He explains the word "ak" in the meaning of color, and the lexeme "tay" in the meaning of "mountain" and "baby horse". In our opinion, this is a wrong idea. "Ak tay" should be translated as "white river, like a white watery, clear, transparent, watery river". The name of one of the left tributaries of the Yalva River in the Yekaterinburg region is Agyar. This name is formed from the words "ag" - high, upper and "yar" - abyss, ravine. The word "ag" in the expression "ag yar" means "high", "upper".

In the toponyms of Western Siberia, the expressions Akkaya, akkoba, Ak khorum (mountain, mountain) are often found. In the languages of the Siberian Turks: Khakass, Tuva, this word, found in the forms "korum", "khorem", "khorum", refers to stony, rocky areas formed on mountain slopes. "Ak korum" means high slope; "ak kaya" means high rock; "ak kobu" means high plain. N. Kononov, in his article "On the semantics of the words "kare" and "ak" in Turkic

geographical terminology,” notes that the adjective “kara” has many meanings in Turkic languages.

The archaic shades of meaning of the word “kara” (black) have been preserved more in the toponymic layer, unlike other layers of the lexical composition of the language.

Kartalı – Karatalı, Chelyabinsk Oblast, Russian Federation – a city located on the Ayat River. The word “Kara” is used in the meaning of color. Karatay, Karatash – a mountain called in Bashkiria. In these homonyms, it is used in the meanings of “big”, “giant”. The name of the city of Krasnoyarsk in the Russian Federation is derived from the words Kizil Yar. There is a Kiziltash road in the Irtysh region of the Russian Federation.

The railway station “Kizler” near Rostov consists of a set of the formants Kizil + er, meaning “red place”. It is so called because the soil in this settlement consists of red rocks.

Hidronyms

Karachaykul – the name of a lake in the Chelyabinsk Oblast, Russian Federation. In the Bashkir and Tatar languages, karachay means pine tree. From this we can conclude that this hydronym means “pine lake”. The term “Aksu” is also widely used in the hydronyms of the territories inhabited by Turkic-speaking peoples. M.F.Rozen in his dictionary “Dictionary of Geographical Terms of Western Siberia” uses the word “ağ” in three meanings. In the first meaning, it refers to white, transparent waters that originate from glaciers; in the second meaning, it refers to waters with a constant flow; and in the third meaning, it refers to rivers that flow heavily and do not dry up in summer.

Karatibs – a lake in the Chelyabinsk region of the Russian Federation. In ancient Turkic monuments, “tabir”, “teriz” mean a salty area. The water of this lake is indeed very salty. Karabash – the name of a city in the north of the Chelyabinsk region of the Russian Federation. Karabashka – the name of a river in the Chelyabinsk region. Karabash – a settlement in the Bogulma district of Tatarstan. Karamaskalı – the name of a village in Bashkiria. Karabashka – the name of a river in the Chelyabinsk region.

Antroponyms

Russian surnames containing roots of Turkic origin are of particular importance. The Turkic elements included in the semantic structure of these surnames prove that Russian-Turkic language relations began in ancient times. The components included in the nests of root words of Turkic origin are very widely used in the composition of Russian surnames.

The surname Karamazov was formed from the words “kara” – “kara” and мазать (to smear), that is, from a combination of Turkic and Russian lexemes. The surname Karaulov was formed in the Russian language by adding the suffix - “ов” to the forms “караул” - “гаровул” that came from the Turkic languages. Another noble surname, which is considered one of the Russian anthroponyms, is Karacharov. This surname was formed on the basis of

the toponyms “kara dzar” – “kara yar” – “kara yer”. Among the surnames in Russian that have the word “kara” – “kara” in their structural composition, the onomastic units Karamazov and Karaulov can be cited.

The Russian surname Karachinsky is also of Turkic origin. The members of this noble family loyally served the Russian Empire and the Tsarist throne. N.A.Baskakov notes that the surname Karachinsky comes from the Crimean Tatar word gypsy. This title was once given by the Crimean Khan to the nobles who served the kingdom. In modern Turkic languages and ancient Turkic, there is a rich root word nest of the word “Garaja”. In these nests, the word “garaja” is mainly used in the meaning of “karayanız”.

The surname of the famous Russian writer and historian Nikolai Karamzin is also of Turkic origin. This surname consists of the components Kara Mirza - Qara Mirza, and was transferred to the Russian language from the Crimean Tatar language. Mirza, of Kara-Turkic origin, is a combination of the words amir (prince) of Arabic origin and zade (son) of Persian origin. The word “kara” - “qara” included in this surname is one of the most frequently used lexical units in Turkic languages.

The Russian princely surname “Kurakin” (Kurakin) derives its origin from the word “Kuraka”. Here, the basis of the word is the Turkic root guraq (dry) and the Russian suffix -a. The etymology of this word includes the word “kurghaq”. This lexeme had a very rich root paradigm in the ancient Turkic language: kurghaq (dry); kurgha (drying); gurgiz (drying); guri (drying); kurıǵlıǵ (infertile, childless, barren); kurıǵu (drying, drying); gurin (drying); guriz (drying); gurit (drying); kurü (drying); kurüg (dry); kurügla (drying); kurüglan (dried); kurügluq (drought, dryness); kurügsi (drying).

Conclusion

Turkic-speaking peoples are settled in the territories where they have historically lived. These territories mainly cover a large area, including a certain part of the Asian continent, the south-east of Europe, the North Caucasus, Transcaucasia, and South Azerbaijan.

The Turkic peoples had a great position in the cultural and ethnic composition of Russia. The ideological and cultural life, language, and even political struggle of this state for many years can be fully and objectively understood in the context of Turkish-Russian relations. The establishment of Russia's relations with the Middle East and the Turkic world gave impetus to the development of Slavic and Turkic language relations. The settlement of Turkic and Slavic peoples in neighboring territories and trade relations developed relations between these peoples.

As a result of long-term economic, political, and territorial contacts, a common lexicon of the Russian and Turkic peoples was formed. Russian-Turkic relations and relations are reflected in ethnography and culture, architecture and ornaments, household items and customs, many details of everyday life, as well as in the vocabulary of the Russian language, in Russian chronicles and the “Slove o polku Igoreve”, in terms of

animal husbandry and hunting, in surnames and nicknames, toponyms, hydronyms, and a huge number of Turkic borrowings preserved in all semantic groups of the Russian language, terminology and onomastic system. The study of the ethnography and onomastics of the history of the Turkic world, which is connected with a single root, is one of the most urgent problems. In our study, we discussed the semantic functional characteristics of onomastic units of Turkic origin, which are widely used in the Russian language.

References:

1. Aliyeva, Z.M. Adjectives in Turkic languages / Baku, – 2010. – 451 p.
2. Antonov. N.K. Materials on the historical vocabulary of the Yakut language / - Yakutsk: Yakutknigoizdat - 1971. - 254 p.
3. Arakin, V.D. Turkic vocabulary in monuments of the Russian language of the Mongolian period / Moscow: Nauka - 1974. - 347 c.
4. Baskakov, N.A. Russian families / Moscow: Nauka, - 1979. - 280 c.
5. Dobrodomov, I.G. History of vocabulary of Turkic origin in ancient Russian language / Moscow: AKD, - 1969. - 411 p
6. Dmitriev, N.K. On the Turkic elements of the Russian dictionary / Moscow: Nauka, - 1982. - p. 82-84.
7. Kononov, A. N. Grammar of the language of Turkic runic monuments. VII - IX centuries. / Moscow: Nauka, - 1965. - 246 p.
8. Malov, S.V. Yeniseiskaya pismennost' Turkov / Moscow: Nauka, - 1962. - 148 c.
9. Matveyev A.K. "Geographical names of the Urals. Short toponymic dictionary". Moscow -2000
10. Русско-татарский словарь / Moscow: Изд. Soviet encyclopedia, – 1972. – 1028 p.

ON THE ISSUE OF SHAPING THE MEDIA CULTURE OF YOUTH

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The interests and preferences of the youth audience in the context of digitalization of the media space, which is actually the natural habitat of modern youth, have changed significantly. The relevance of the topic is determined by the need to model mass publications for the younger generation.

Аннотация

Интересы и предпочтения молодежной аудитории в условиях цифровизации медиапространства, которое является фактически естественной средой обитания современной молодёжи, существенно изменились. Актуальность темы определяется необходимостью моделирования массовых изданий для подрастающего поколения.

Keywords: youth; media space; civic consciousness; values; youth media.

Ключевые слова: молодёжь; медиапространство; гражданское самосознание; ценности; молодежные СМИ.

Одним из важнейших приоритетов государственной политики Республики Казахстан остаётся развитие сферы информации. 19 июня 2024 года Президент РК Касым-Жомарт Токаев подписал закон «О масс-медиа», призванный защищать интересы независимого государства и общества с учетом новейших тенденций в медиасфере. Молодёжь, как одна из социально-демографических групп общества, является главным социальным ресурсом демократических преобразований. От её социализации, формирования системы ценностей, становления гражданского самосознания непосредственно зависит, как в дальнейшем будут развиваться казахстанское общество, имидж и будущее страны. Важное место в этом процессе занимают средства массовой информации, которые имеют большие возможности влияния на сознание, мировоззрение, на мыслительную деятельность, поведенческие установки личности в медийном пространстве.

По состоянию на ноябрь 2024 г. в Республике Казахстан зарегистрировано 5911 СМИ, из которых 4039 составляют периодические печатные издания, 225 – телеканалы, 95 – радио, 1250 – информационные агентства и сетевые издания [1].

Количество средств массовой информации ежегодно увеличивается. Одновременно расширяется и территория распространения масс-медиа, и разнообразие языков издания не только в местах компактного проживания той или иной националь-

ности, но и на всю республику. С развитием системы СМИ Республики Казахстан молодежная периодика прошла сложный путь трансформации. В стране по разным сведениям периодически функционирует около пятидесяти региональных, детских, школьных изданий для детей и юношества [2].

Многие поколения казахстанцев разных возрастных групп давно полюбили еженедельное республиканское печатное масс-медиа для детей «Дружные ребята». Газета выходит с 1933 года. До 1942 года имела название «Пионер Казахстана». Издание привлекает внимание публикациями о любви к Родине, заботе об окружающей природе, показывает героев, известных людей нашей страны. Материалы способствуют патриотическому и нравственному воспитанию подрастающего поколения, развитию их творческого потенциала. В каждом номере представлены образцы детского творчества: стихи, песни, рисунки. Проблематика детской и юношеской печати имеет цель приобщить ребят к культуре, разностороннему образованию, этике, эстетике.

Первый казахстанский научно-популярный журнал Оула (что в переводе – «Думай»), позиционирующий себя как научно-популярное издание для школьников, начал функционировать в 2015 году. Цель проекта – формирование интереса к науке, изобретательству и техническому творче-

ству у детей школьного возраста, а также у взрослых, которые не потеряли тяги к знаниям. Издание привлекает новым взглядом на привычные вещи, демонстрацией разных точек зрения, дискуссий, публикацией живых репортажей.

Из региональных изданий внимание может привлечь Костанайская газета «Зеленое яблоко», которая выходит уже более двадцати лет. За этот период газета стала лауреатом многочисленных Международных конкурсов, которые проходили в Казахстане и России. На её страницах авторы рассказывают о юных талантах города, области и республики. Печатное издание поддерживает стремление к здоровому образу жизни, занятиям спортом, стремится привить детям любовь к прекрасному. В каждом номере освещаются темы, направленные на развитие патриотизма, духовно-нравственных ценностей. Стоит отметить, что авторами материалов являются, как журналисты, педагоги, библиотекари, так и юные корреспонденты. Конкуренция на рынке молодёжных медиа для детей и юношества практически отсутствует.

Подчеркнём, что почти во всех вузах республики функционируют университетские газеты. Одна из наиболее насыщенных и содержательных - региональная студенческая газета Карагандинского университета имени академика Е.А. Букетова «Мир молодежи». Печатное средство массовой информации выходит один раз в месяц тиражом в 90 экземпляров. Его объем составляет 32 страницы. Газета выходит в черно-белом варианте с одним цветным разворотом и обложкой. Жанры преимущественно информационные: новость, интервью, репортаж. Большое количество мероприятий, проходящих в университете, находит отражение в материалах, богатых иллюстрациями издания. «Мир молодежи» повествует о важных научных, социальных событиях, визитах иностранных гостей в рамках международного сотрудничества, деятельности активистов вуза, увлечениях студентов и магистрантов, результатах разнонаправленных конкурсов и соревнований. Популярностью у обучающихся на всех курсах и факультетах университета, а также у абитуриентов и школьников города и области пользуется раздел под названием «Проба пера». Немало внимания уделяется научным достижениям студентов, магистрантов и докторантов Карагандинского университета. Традиционно каждый номер включает в себя материалы из истории вуза, поздравления юбиляров, слова благодарности преподавателям, наставникам. Немаловажно, что у «Мира молодежи» есть свой веб-сайт, который разработан в соответствии с современными тенденциями и технологиями. В электронной версии размещаются материалы и фотосюжеты, которые не вошли в печатный орган.

Безусловно, средства массовой информации призваны формировать необходимые ценности у подрастающего поколения, формировать личность, стимулировать желание знакомиться с наукой и культурой, тем самым внося свой вклад в социальное развитие общества. Для того чтобы создать

продукцию, отвечающую всем требованиям молодёжной аудитории, надо знать её интересы и потребности. Эмпирической базой исследования популярности студенческой газеты «Мир молодежи» и запросов читателей послужили материалы анкетного опроса студентов первых, вторых и третьих курсов Карагандинского университета имени Е.А. Букетова в возрасте от 17 до 20 лет, проведённого в конце 2024 года. Ставилась цель - определить потребности молодых людей в получении информации; отношения к СМИ в целом; и конкретно, насколько популярна газета и освещаемые в ней темы среди студентов. Выяснилось, что информацию о жизни университета большая часть студентов получает непосредственно через веб-сайт учебного заведения. Около 40% опрошенных используют наравне с интернетом другие виды СМИ, такие как телевидение, радио и печатные издания. Важными критериями масс-медиа, по мнению молодых людей, являются актуальность, достоверность и доступность информации. В то же время анкетирование подтвердило, что газеты вузов могут охватить далеко не все проблемы молодежи, отмечено, что недостаточно информации, которая могла бы пригодиться обучающимся в настоящее время. Например, предлагалось чаще публиковать сообщения о новых специализациях в сфере образования, о нововведениях учебных учреждений в стране и зарубежных странах, о жизни и быте студентов в них, о взаимодействии вузов, о новинках музыки и т.п. Также отмечена необходимость публикации материалов, которые помогли бы молодым людям социально адаптироваться и научиться преодолевать психологические барьеры в общении. Одна из причин непопулярности некоторых молодёжных изданий, по мнению респондентов, - их официальный характер. Высказывались мнения, что интерес к газете был бы значительно выше, если бы актуальные материалы о политических, экономических, научных событиях, сохраняли такие качества как эмоциональность, доходчивость изложения, образность языка, нестандартная подача материала. Кроме того, авторами вузовских СМИ должны быть сами студенты, молодые журналисты, которые смогут преподносить материал на своём языке и поднимать знакомые проблемы.

Анализ показывает, что новое поколение формируется в условиях цифровизации и интенсивного технологического развития. Цифровое медиaproстранство является естественной «средой обитания» для современной молодёжи. В процессе потребления информации происходит формирование их социальных и политических представлений, установок и ориентаций, то есть осуществляется воздействие на нравственное, политическое сознание юных граждан, а также формирование новых моделей поведения. Наибольшие противоречия, по мнению учёных, свойственны гражданскому самосознанию представителей поколения Z, для которых характерен «скудный и упрощённый символический ряд, отсутствие образцов гражданственности и объектов гордости за страну» [3, 111].

Многолетняя практика работы в приёмной комиссии Карагандинского университета имени академика Е.А. Букетова показала, что в последние пять лет из большого числа абитуриентов, пишущих эссе в рамках творческого экзамена, лишь единицы выбирали темы о героизме, патриотизме, подвигах, к примеру, такие, как «В жизни всегда есть место подвигу», «Герой нашего времени. Кто он?», «Мой знаменитый современник», «Герои книг, пример которых меня вдохновляет» и т.п. Происходит и смена кумиров, героев повествований.

Безусловно, на формирование такой картины мира в сознании молодёжи и её гражданской позиции влияет целый ряд факторов. Возможно, сказывается воздействие медиапространства. Ключевым источником информации о событиях и процессах, происходящих в РК и мире становится для молодёжи Интернет. Устное собеседование с абитуриентами в рамках творческого экзамена по группам образовательных программ «Журналистика и репортерское дело», а также «Связь с общественностью» показало, что из всех средств массовой информации наименее востребованы у молодёжи печатные издания - газеты и журналы. Подавляющее большинство наших респондентов либо не читают их совсем («Родители не покупают и не выписывают газеты»; «А кто вообще читает сейчас газеты?»), либо периодически обращаются к интегрированным в едином пространстве разнообразным онлайн-ресурсам: сайтам газет и радиостанций. Причиной такого отношения к печатной прессе сами молодые люди считают устаревший формат изданий, его несоответствие потребностям и условиям жизни молодёжи. Существует ещё и объективное обстоятельство социально-психологического характера, которое объясняет снижение популярности газет и журналов среди молодёжи. Это противоречие между способом подачи информации в печатных СМИ (тексты, рассчитанные на спокойное и длительное чтение, анализ и размышление) и спецификой развития познавательных процессов у современной молодёжи, так называемое «клиповое мышление», которое основано на фрагментарном восприятии небольших объёмов информации, представленной в образной форме.

Наблюдения показывают, что телевидение становится также менее интересным для молодёжи средством массовой информации, уступая место Интернету, который воспринимается определёнными группами молодёжи как открытое пространство, на их взгляд, «свободное» от цензуры и представляющее «объективную» информацию и плюрализм мнений, является доминирующим источником социально-политической информации.

Согласно исследованиям, социальные сети, видеоплатформы, мессенджеры и другие онлайн-ресурсы, с одной стороны, расширяют доступ к информации и образованию, способствуют культурному обмену, укрепляют связи между людьми и способствуют активному обсуждению общественно значимых вопросов. С другой стороны, новые медиа могут негативно влиять на образ мышле-

ния, самооценку, социальные отношения и поведение молодых людей. Идеализированные образы и сказочные истории о стремительном обогащении, неожиданных жизненных успехах, которые нередко появляются в социальных сетях, создают искажённое представление о реальности. Кроме того, порой главными ориентирами в медиапространстве для молодых людей становятся блогеры, «независимые» журналисты и музыканты, которые нередко выражают критические взгляды на политические процессы и транслируют их в востребованных молодёжью форматах. Эксперты отмечают, что они не ставят задачи формировать конкретную позицию по социально-политическим проблемам, формировать гражданское самосознание молодого поколения. Анализ позволяет отнести к проблемам казахстанских СМИ для молодёжи отсутствие конкуренции на медиарынке, недостаточно творческий подход к содержанию и оформлению изданий, тематическую ограниченность, недостаток финансирования молодёжных изданий. Кроме того, наблюдается стремление к увеличению доли развлекательного контента за счёт просветительских, воспитательных и общественно-политических материалов.

Существенный вопрос, который стоит в связи с этим, в том числе и перед исследователями: как сегодня в условиях цифровизации медиапространства, которое является фактически естественной сферой жизни современной молодёжи, и в то же время - порой объектом манипуляции, способствовать формированию их гражданского самосознания.

Становление подрастающего поколения происходит посредством коммуникации одновременно в реальном и виртуальном пространствах. Важно сохранить баланс между онлайн и офлайн миром. В контексте рассматриваемой проблемы целесообразно сделать акцент на ценностных, когнитивных и эмоциональных компонентах гражданского самосознания, поскольку именно они формируются в результате восприятия молодыми людьми социальной реальности. Правдивость и истинность, справедливость в её духовно-нравственной интерпретации, законность и порядок являются для молодёжи смысловыми доминантами, определяющими их установки по отношению к средствам массовой информации.

Безусловно, мы хотим, чтобы наша молодёжь стала активной, реализовала свой интеллектуальный и творческий потенциал, а не превратилась в аморфную массу, управляемую через социальные сети. В этой связи мы видим необходимость нестандартного подхода к организации периодических изданий для этой категории населения с креативным дизайном, разнообразием тем и рубрик, с регулярным обновлением информации, с компетентным, ярким журналистским составом, с полноценной представленностью в сети, с расширением читательской аудитории.

Развитие молодежной прессы в Казахстане требует дальнейшего внимания. Средства массовой

информации являясь важным фактором социализации, должны играть ведущую роль в формировании мировоззрения молодых людей. Проблемы масс-медиа для нового поколения должны стать одним из приоритетных направлений молодежной политики.

Список литературы:

1. Электронный ресурс. Режим доступа: URL: <https://beta.egov.kz/memleket/entities/inf/press/article/details/189251>.
2. Стадниченко Н. И. Детская журналистика Казахстана //Язык. Культура. Коммуникации. –

2015. – №1. <https://journals.susu.ru/lcc/article/view/141/347>.

3. Селезнева А. В., Азарнова А. А. «Рождение гражданина»: политико-психологический анализ гражданственности российских старшеклассников. – Полис. Политические исследования. 2020, № 5. - С. 101-113.

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PHYSICAL SCIENCES

TIME TRAVELS FOR PEOPLE ON EARTH ARE ALREADY PHYSICALLY AVAILABLE¹

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Abstract

The article argues that the version of the special theory of relativity (SRT), which is generally recognised and studied in all physics textbooks, is incorrect. And numerous proofs are given to it. SRT on the one hand and all radio engineering, electrical engineering and computer technology on the other hand mutually refute each other. SRT is also refuted by the existence of resonance and shock oscillations. I.e. if SRT were true, then neither computers, nor mobile phones and smartphones, nor television, nor GPS trackers, nor pianos and other musical instruments should exist, nor even tsunamis should not exist and swings on children's playgrounds should not swing after a push from parents. Consequently, to refute SRT it was not necessary to invent some very expensive experiments on Tevatron and Large Hadron Collider. And it was necessary simply to look around and to understand that the generally recognised version of SRT is refuted by numerous all known and therefore irrefutable natural and created by people processes. And, hence, SRT should be corrected.

Therefore the author has created the corrected version of SRT, from which relativistic formulas and new scientific knowledge received after creation of incorrect version of SRT it followed that in the nature there is not only our visible universe, but besides it there are many other mutually invisible universes and antiverse. And besides existing in universes of matter, space and time, in antiverses there exist antimatter, anti-space and anti-time. And the existence of anti-time makes travelling in space possible not only in space but also in time. And the article explains how it can be done now.

Keywords: imaginary numbers; special theory of relativity, invisible universes and anti-universes, hidden Multiverse, portals, anomal zones

1. Introduction

The 20th century in physics turned out to be rich in new interesting scientific ideas. But many of them, even called theories, have not yet received experimental confirmation. For example, one of the most prominent and currently studied in all physics textbooks is the special theory of relativity (SRT) [1]-[3], which was nominated 66 times for the Nobel Prize, nevertheless, due to the lack of experimental confirmation, it has not received it.

And from the very beginning, the generally accepted version of SRT was criticised by Oliver Heaviside, Nikola Tesla, Nobel Prize winner Albert Abraham Michelson, Nobel Prize winner Wilhelm Frederick Ostwald, Nobel Prize winner Joseph John Thomson, Nobel Prize winner Svante August Arrhenius, Nobel Prize winner Philipp Eduard Anton von Lenard, Nobel Prize winner Alvar Gulstrand, Nobel Prize winner Wilhelm Carl Werner Otto Fritz Wien, Nobel Prize winner Walter Hermann Nernst, Nobel Prize winner Ernest Rutherford, Nobel Prize winner Johannes Stark, Nobel Prize winner Frederick Soddy, Nobel Prize winner Percy Williams Bridgman, Nobel Prize winner Edwin Mattison Macmillan, Nobel Prize winner Hideki Yukawa, Nobel Prize winner Hannes Olof Jösta Alven and many other distinguished scientists.

And in the XXI century this wrong version of STO was even by the above-mentioned arguments experimentally refuted [4]-[37] in the most indisputable way. However being unable to object, the authors of existing

physics textbooks simply ignored these refutations and the incorrect version of SRT still continues to be taught even in the most prestigious universities in all countries.

All modern science is in a similar state. In the 21st century Jean de Climont in his books [34]-[37] writes about 9671 scientists who refuted the currently recognised scientific truths in all sciences. But the trouble is not that one or another infidelity has been discovered in the modern sciences. The author of the concept of 'open society' Sir Karl Raimund Popper, a member of the Royal Society of London, wrote [38]: "*...the struggle of opinions in scientific theories is inevitable and is a necessary condition for the development of science*". From which he made, at first glance paradoxical, but in fact correct conclusion that the most valuable results of scientific research are precisely the refutations of generally recognised theories, because they allow them to develop. And this is inevitable. There is no doubt that all scientific knowledge in a thousand years, much less in a million or a billion years, will be quite different. Therefore, we should not naively assume that we have already learnt everything and hinder the research of colleagues who propose new ideas.

2. The version of the special theory of relativity taught in all physics textbooks is incorrect

So what are the refutations of the generally recognised version of SRT obtained during the last century? They are the following:

¹ This is reprint of the article "Antonov A. A. 2025. Time travels for people on Earth are already possible. European Journal of Applied Sciences, Services for Science and Education. UK. 13(1). 163-180. DOI:10.14738/aivp.131.18239".

- the relativistic formulas obtained in this SRT are incorrect;
- the relativistic formulas received in this SRT are incorrectly explained with use of incorrect principle of non-exceeding of speed of light;
- from relativistic formulas of this SRT wrong conclusions about physical unreality of imaginary numbers and existence in the nature of our only visible universe are made.

And these conclusions are available for experimental verification. Indeed, the relativistic formulae

$$m(v) = m_0 / \sqrt{1 - (\frac{v}{c})^2} \quad (1)$$

$$\Delta t(v) = \Delta t_0 \sqrt{1 - (\frac{v}{c})^2} \quad (2)$$

$$l(v) = l_0 \sqrt{1 - (\frac{v}{c})^2} \quad (3)$$

where m_0 is the rest mass of a moving body;

m - relativistic mass of a moving body;

Δt_0 - rest time of a moving body;

Δt - relativistic time of a moving body;

l_0 - rest length of a moving body;

l - relativistic length of a moving body;

v - the velocity of the moving body;

c - speed of light;

are explainable (see Fig. 1a,b,c) only in the range of pre-light velocities $v < c$, in which the values m , and l take values measured by real numbers. And in the range of superluminal velocities $v > c$ these quantities m , and l already take values measured by imaginary numbers discovered 500 years ago [39],[40], but still unexplained. After all, what is, for example, 10 grams, 20 seconds and 30 metres, everyone can explain, but what is 10*i* grams, 20*i* seconds and 30*i* metres, where $i = \sqrt{-1}$, is not explained in any textbook. Moreover, the graph in Fig. 1a in the range of velocities $v > c$ corresponds to a physically unstable process, which cannot exist in nature at all.

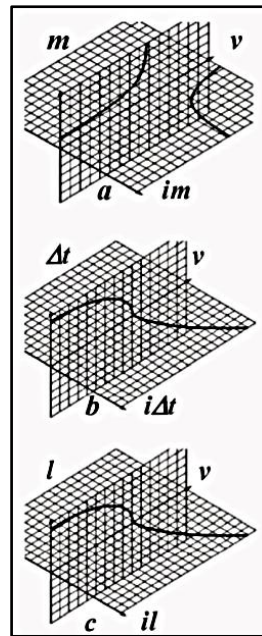


Fig. 1. Graphs of functions $m(v)$, $\Delta t(v)$ and $l(v)$ corresponding to the existing versions of the STR in the subluminal $v < c$ and superluminal $v > c$ ranges

And since such a theory, the formulas of which even its creators could not explain, would be of no use to anyone, a postulate called the principle of not exceeding the speed of light was introduced into it. From

this postulate it followed that imaginary numbers are physically unreal. Therefore, it was concluded that there was no need to explain them.

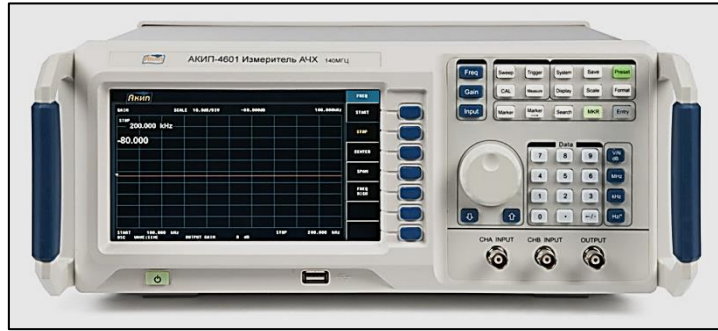


Fig. 2. In any radio engineering laboratory there are devices called frequency characteristic meters, which by their very existence prove the physical reality of imaginary and complex frequencies, and consequently, of any imaginary and complex numbers.

But there are other sciences besides physics. And in the theory of linear electric circuits used in radio engineering, electrical engineering and computer technology, according to Ohm's law as interpreted by Charles Proteus Steinmetz [41], there are imaginary resistances of capacitors and inductors (also called inductance coils), which are measured by devices available in any radio engineering laboratory (Fig. 2). This proves [42]-[53] that imaginary numbers are physically real² and the principle of non-exceeding the speed of light is incorrect. And therefore relativistic formulas (1)-(3) are incorrect³.

3. Corrected version of the special theory of relativity

But even from the uncorrected relativistic formulas (1)-(3) follows an important conclusion, which the authors of SRT have overlooked and by their principle of non-exceeding of the speed of light have made this conclusion impossible – the velocity $\mathbf{v}$ in these formulas is an additional, besides length, width and height, spatial dimension.

Therefore in the corrected version of SRT the corrected relativistic formulas [54]-[61] are received

$$m(q, r, s) = \frac{m_0 i_1^q i_2^r i_3^s}{\sqrt{1 - [\mathbf{v}/c - (q + r + s)]^2}} \quad (4)$$

$$\Delta t(q, r, s) = \Delta t_0 i_1^q i_2^r i_3^s \sqrt{1 - [\mathbf{v}/c - (q + r + s)]^2} \quad (5)$$

$$l(q, r, s) = l_0 i_1^q i_2^r i_3^s \sqrt{1 - [\mathbf{v}/c - (q + r + s)]^2} \quad (6)$$

where $q(\mathbf{v}) = \lfloor \mathbf{v}_q / c \rfloor$ – is the "floor" function of discrete mathematics from the argument $\mathbf{v}/c$,

which is the fourth spatial dimension (Fig. 3);

$r(\mathbf{v}) = \lfloor \mathbf{v}_r / c \rfloor$ – is the "floor" function of discrete maths from the argument $\mathbf{v}/c$, being the fifth spatial dimension (Fig. 3);

$s(\mathbf{v}) = \lfloor \mathbf{v}_s / c \rfloor$ – is the "floor" function of discrete maths from the argument $\mathbf{v}/c$, being the sixth spatial dimension (Fig. 3);

$\mathbf{v}_q, \mathbf{v}_r, \mathbf{v}_s$ – projections of the velocity vector $\mathbf{v}$ on orthogonal coordinates q, r, s (see Fig. 4).

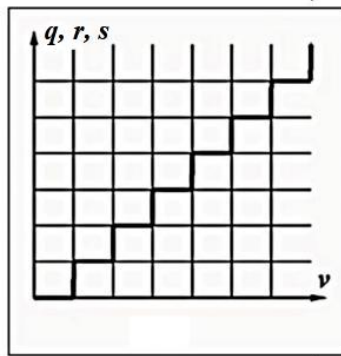


Fig 3. Graphs of functions $q(v)$, $r(v)$, $s(v)$ illustrating the meaning of the "floor" function of discrete mathematics

² Since you can only measure what actually physically exists.

³ Since the derivation of correct relativistic formulas due to

absence in the 20th century of necessary experimental and theoretical knowledge simply was not completed.

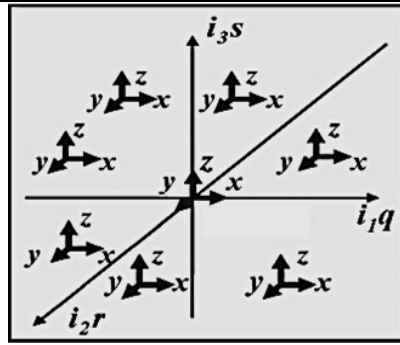


Fig. 4. Six-dimensional space of the hidden Multiverse, where q, r, s are the coordinates of invisible parallel universes, and x, y, z are the coordinates of the matter content in each parallel universe

From them it follows that we live in a Multiverse [62]-[77], which is six-dimensional – three dimensions x, y, z has each universe and three more dimensions q, r, s are coordinates of universes in the Multiverse (Fig. 4) – and is described by quaternions $f_{q,r,s}(x, y, z) + i_1q + i_2r + i_3s$, the number of which is equal to the number of universes in the Multiverse. This is exactly what Lisa Randall predicted: "We could be living in a three-dimensional pocket of higher dimensional space."

$$i_1^2 = i_2^2 = i_3^2 = -1 \quad (7)$$

$$i_1 i_2 i_3 = i_2 i_3 i_1 = i_3 i_1 i_2 = -1 \quad (8)$$

$$i_1 i_3 i_2 = i_2 i_1 i_3 = i_3 i_2 i_1 = 1 \quad (9)$$

In the mathematics of hypercomplex numbers, the function $i_1^q i_2^r i_3^s$ can be calculated only for integer values⁴ q, r, s , but can take both positive and negative values, as well as both real and imaginary values. But we have already proven that imaginary numbers are physically real. There-

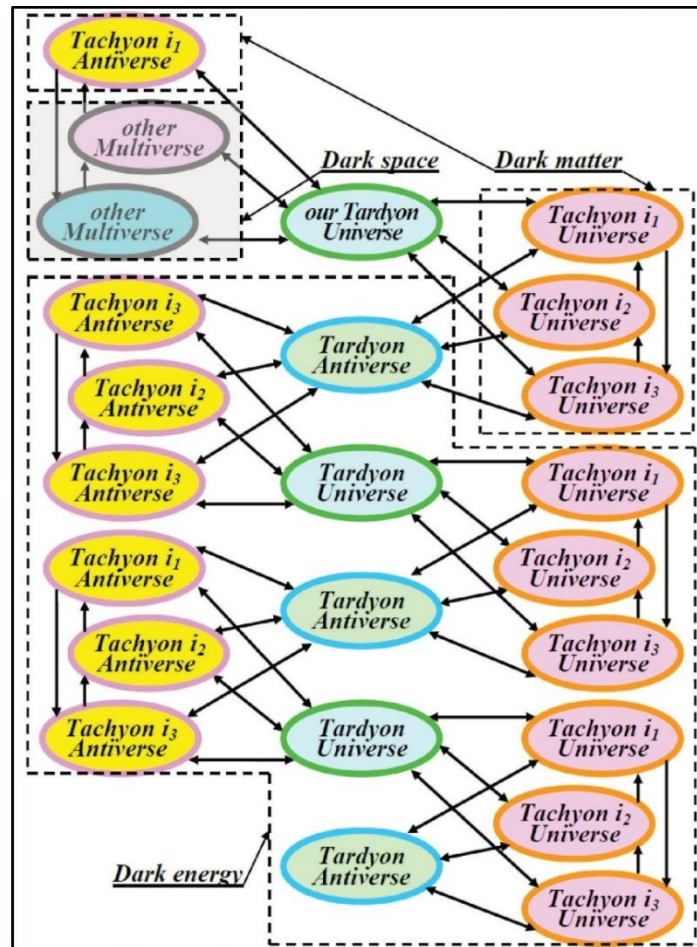


Fig. 5. Possible version of the quaternion structure of the hidden Multiverse

⁴ And for non-integer values of the argument the author obtained [78] the formula $i^q = \cos(q\pi/2) + i\sin(q\pi/2)$. It,

in particular, will be needed in mathematical processing of experimental data of geophysical investigations of portals

fore, we must also explain them. Therefore, let us now consider the values of the quantities $m(v)$, $\Delta t(v)$ and $l(v)$, and in the range of velocities $v > c$ for successive values of the argument $q + r + s$ equal to 0, 1, 2, 3, 4, 5, ... Then for our visible universe with coordinates $q = 0, r = 0, s = 0$, i.e. located at we get $i_1^q i_2^r i_3^s = -1$. This situation also corresponds to an invisible universe, since it is located beyond the event horizon. We will call it a tardyon⁵ antiuniverse. For the value $q + r + s = 3$ in the velocity range $v > c$ we get $i_1^q i_2^r i_3^s = -i$. This situation corresponds to an invisible universe, since it is also located beyond the event horizon. We will call it a tachyon⁶ antiuniverse. For the value $q + r + s = 4$ in the velocity range $v > c$ we get $i_1^q i_2^r i_3^s = +1$. This situation corresponds to an invisible tardyon universe (but a different one), since it is also located beyond the event horizon. For the value $q + r + s = 5$ in the velocity range $v > c$ we get $i_1^q i_2^r i_3^s = +i$. This

situation corresponds to an invisible tachyon universe (but a different one), since it is also located beyond the event horizon. Thus, all universes are mutually invisible. Therefore, we will call our Multiverse hidden. And to make sure that invisible universes and antiuniverses neighbouring our visible universe exist, one can try to see them [79]-[84] from portals, the entrances to which are probably more than two hundred thousand so-called anomalous zones [85]-[88] existing on Earth. People avoid visiting them - and rightly so - as the portals are invisible labyrinths, once in which it is almost impossible to get out of them. These portals are analogous to a corridor in your flat, from which you can look into the next room and see something in it. And to make sure that you really see something about the neighbouring universe in the portal, you should look at the starry sky through a telescope and see that the constellations on it are at least a little bit different from those outside the portals.

In other words, it is necessary to do an experiment similar to the famous experiment of Sir Arthur Stanley Eddington in 1919 [89] by which he confirmed the prediction of the general theory of relativity about the deflection of light rays in the Sun's gravitational field.

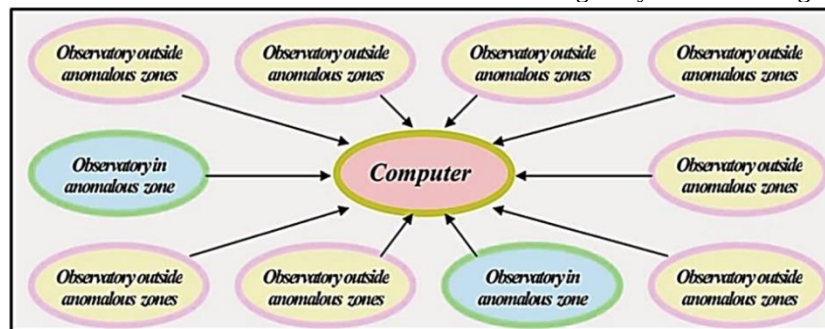


Fig. 6. Scheme of an astronomical experiment to detect invisible universes

And we're in luck. Since there are many anomalous zones on Earth, some of them may already host astronomical observatories, through whose telescope one can see these traces of the invisible out-of-portal neighbouring universe or antiuniverse. Such, for example, is the Main Astronomical Observatory of the National Academy of Sciences of Ukraine, which is located in the Goloseevsky forest 12 km from the centre of the capital of Ukraine, Kiev. But since in the anomalous zone, i.e. at the very edge of the portal, the differences of the constellations observed by neighbouring observatories located in anomalous zone and outside the anomalous zone are very small and may be not visible to the naked eye, it is necessary to compare the observations of these observatories on the computer (Fig.6). And if these differences turn out to be too small, the telescope will have to be moved deeper into the portal. After all, Sir Arthur Stanley Eddington moved the telescope much further away - from England to the island of Principe in the Atlantic Ocean in order to perform his famous experiment.

4. Time Travels

As is easy to notice, in Fig. 5 half of the universes of the hidden Multiverse are called antiuniverses in order to draw the readers' attention to the fact that they are cosmic antipodes of other universes. For them, the quantities $m(v)$, $\Delta t(v)$, $l(v)$ in formulas (4)-(6) differ only in sign. That is, the concepts of matter, time and space in the universes correspond to the concepts of antimatter, anti-time and anti-space in the antiuniverses [90]-[93]. But, as on Earth, inhabitants-antipode in space do not notice this difference, since the same physical, chemical, biological and other natural scientific laws operate in the universes and antiuniverses.

And when observed from Earth, in all universes and anti-universes, as they move away from our visible universe, not only the distance increases, but also time (like in time zones on Earth). Moreover, in universes it becomes greater than on Earth, and in anti-universes it becomes less than on Earth. And this circumstance makes time travel really possible both in the past and in the future.

⁵ The term tardyon-universe was proposed by Isaac Asimov in short story "Take a match".

⁶ The term tachyon-universe was proposed by Isaac Asimov in short story "Take a match".

Here are a couple of quotes that explain the current state of understanding of this problem. *"Time is the most frequently used word in the English language and the third most frequently used word in Russian. It is in every other language, too, because synchronizing actions in time is just as important as coordinating them in space. Without knowing the exact time, it is impossible to organize your life and plan it in advance. If in ancient times you could rely on natural cycles and an internal sense of time, then in our days you need to constantly have a watch or a phone with you. Time is the most important of the abstract concepts that we pronounce every day. Every thinking person has thought about the problem of time at least once in his life, and a huge amount of philosophical and scientific literature has been written on this topic. Nevertheless, no one can say for sure what time is."* [94]

Here is what Stephen William Hawking writes about this: *"In everyday life, there is a huge difference between moving forward and backward in time. Imagine that a cup of water falls from a table and breaks into pieces. If you film this fall, then when you watch the film, it will immediately become clear whether the film is running forward or backward. If it is running backward, then we will see how the fragments lying on the floor suddenly come together and, having formed a whole cup, jump onto the table. And you will be able to say that the film was running backward, because in everyday life this does not happen. Otherwise, the faience factories would have to be closed"* [95].

This phenomenon, known as the arrow of time, is one of the most amazing problems in physics. And the name "arrow of time" was proposed by the British physicist Sir Arthur Stanley Eddington at the beginning of the 20th century [96]. And all our life experience, it would seem, confirms this opinion.

The corrected version of the STR, in which the new concept of 'anti-time' has appeared, allows this life experience to be corrected. Indeed, if we assume that one day travel through the vastness of the hidden Multiverse will become possible for people on Earth, then time travel [97] will also become possible, both in the past and in the future. Let us show this.

But first, let us explain what we need to learn to do for this. And the main thing we need to learn is to master portals [98], [99], i.e. understand what they are and learn to navigate in them. Just as people once learned to navigate with a compass in the boundless expanses of the seas and oceans. Or even in the forest, in the desert, in the mountains, in any unfamiliar area. Even in labyrinths. So, a portal is an unfamiliar area that has become an invisible labyrinth for people. Portals are transitions from one universe to another, which turn these universes into communicating vessels. Therefore, at the entrance and exit of portals, according to the law of communicating vessels, the habitat should be almost the same – the same air, the same water, the

same vegetation and animals⁷. Only the area is unfamiliar. But in order not to get lost in the portals and find the way back, you can use, as in mythology, the 'thread of Ariadne'. Or, in order not to risk ourselves, we can send unmanned vehicles to explore the portals, which people have now learned to make very well. It is also not difficult to create something like a radio compass, taking into account that as you dive into the portals, the electromagnetic field intensity from earthly radio stations should decrease. And on the way back, it should increase. Having got through the portal to some other planet, in order to move further in the hidden Multiverse, you will need to use unmanned aerial vehicles to search for anomalous zones on it, which are entrances to portals that lead to other neighboring universes. And so on. But all these problems are quite solvable.

And now we will show that the concept of the 'arrow of time' in the corrected version of STR is already partially refutable, since although we will not restore the cup mentioned by Hawking, we will be able to move into the past and future time. For this, we will use Fig. 7 and 8. In them, the positive branch of the vertical coordinate axis corresponds to time t , measured in tardyon (including our visible tardyon) universes by positive real numbers, and its negative branch corresponds to negative time t in tardyon antiuniverses. Similarly, the positive branch of the horizontal coordinate axis corresponds to positive imaginary time⁸ it , measured in tachyon universes by positive imaginary numbers, and its negative branch corresponds to negative time it in tachyon antiuniverses. On the vertical axis of real time t and on the horizontal axis of imaginary time it , thick black arrows show our comparatively long-term activity in tardyon and tachyon universes and anti-universes. And thin красными и синими стрелками показаны red and blue arrows show transitions through portals (staying in which is short-lived) between neighboring universes and antiuniverses.

Then we will consider the simplest options for traveling to the future and the past, since they would be very useful to us. Indeed, traveling to the future would allow us to refuse to continue all types of our unsuccessful activities and make them much more effective. But after such a search for the most effective option for activity, it will be necessary to return to the original state in order to start doing something differently and to do this. Traveling to the past would also be useful if, despite the search for an acceptable option for subsequent activity, it still turned out to be bad. Then it would be necessary, again having returned to the past, to somehow correct it. Therefore, having received the opportunity to travel through time, people could make their lives much more successful and happier. And since such searches for happiness are often a rather intimate activity, it would obviously be useful to begin them with the transition from our tardyon universe through the necessary portal to one of the neighboring tachyon universes or antiuniverses, since our activity in

⁷ And if at least one portal on Earth ended in open space, then there would have been no air, no water, no anything else on Earth, like on the Moon or Mars.

⁸ Despite the fact that the physical reality of imaginary numbers is denied in the generally accepted version of SRT, the

term 'imaginary time' is used in modern physics. For example, in [95] Hawking writes: "Attempts to unify gravity with quantum mechanics have led to the concept of imaginary time".

them is not visible from our tardyon universe due to the fact that time in them flows in mutually perpendicular directions⁹. And we will have to move to the tachyon universe if we are interested in something in the future. And we will have to move to the tachyon antiuniverse if we need to do something in the past.

And Fig. 7 shows one of such simplest routes of travelling to the past time by successive travelling through portals through universes and antiuniverses of the hidden Multiverse. As it can be seen, this journey starts from the origin of coordinates, where in our visible tardyon universe there are conditionally two groups of researchers who spend the same biological time on the same duration of activity. And one of these groups of researchers through the portal (shown by the thin red arrow), moves to the tachyon antiuniverses and stays in it for some time (corresponding to the required lag time on the axis of imaginary time it , shown by the thick black arrow). All this time it is invisible from our tardyon universe, since imaginary time it is perpendicular

to real time t . Then it returns to our tardyon universe through the same or another portal (shown by the thin blue arrow) and completes the same work in the same time as the second group of scientists remaining in the tardyon universe. The duration of the activities of both groups in our tardyon universe is shown by thick black arrows of different lengths, which would both have to be on the actual time axis t . But to make the figure more understandable, we have conventionally placed the short thick arrow next to the long thick arrow. And as a result, both groups of researchers, having spent the same amount of time on their identical activity, will nevertheless finish it in our tardyon universe at different times. Thus, the effect of delay was obtained due to the travel into the past time of one group of scientists relative to the other. Naturally, the same result can be obtained using other routes of travel through the Multiverse.

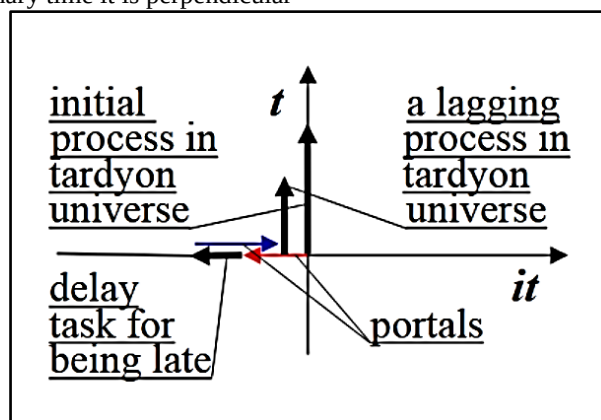


Fig. 7. Possible route of travel to the past time

Fig. 8 shows another version of the time travel route, which differs from that shown in Fig. 7 in that this travel is carried out into the future. As in the previous case, it begins with the movement of the first group of researchers from the origin of coordinates, but in the opposite direction - through the portal shown by the thin red arrow into one of the (see Fig. 5) neighboring tachyon universes i_1 . Then this group of researchers

spends some time, corresponding to a given interval of advance time, in the tachyon universe i_1 and through another portal (shown by the thin blue arrow) moves to the next tachyon universe i_2 in the same dimension v . And from it through the third portal (shown by the thin red arrow) moves to the third tachyon universe i_3 in the same dimension v .

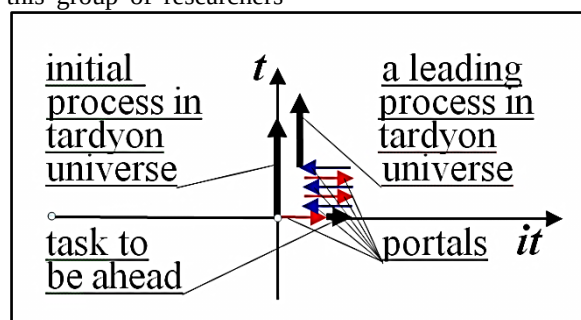


Fig. 8. Possible route of travel to the future time

And finally, from this third tachyon universe i_3 with a triple time advance (obtained due to successive visits to three tachyon universes) returns to our tardyon universe via the portal shown by the thin blue arrow.

But with some lead over the second group of researchers, who were in our tardyonta universe all the time. And therefore, when both groups, having spent their equal biological time on their activity, finish it, it will turn out that they finish it at different times. And such

⁹ On the essence of imaginary time, Hawking holds the same opinion: "Imaginary time is a new dimension at right angles

to ordinary real time" [95].

a result can be interpreted as follows: the group of researchers who traveled through the hidden Multiverse, was ahead in time of the group of researchers who did not leave our tardyon universe, i.e., they traveled into the future. The same effect, naturally, can be obtained using other time travel routes.

5. Conclusions

So, in the article by the analysis of numerous existing in the nature and created by people processes it is experimentally proved and theoretically explained that the version of SRT studied in all textbooks of physics is incorrect, as in it:

- relativistic formulae obtained by its authors are incorrect and incorrectly explained;
- the postulated principle of non-exceeding of the speed of light, used by the authors of this version of SRT because of inability to explain and correct the relativistic formulas received by them, is incorrect;
- the conclusions about physical unreality of imaginary numbers and about existence in the nature of our visible universe, in which everything existing is measured only by real numbers, made from the received by them incorrect relativistic formulas, are incorrect.

Therefore physicists, forced according to the incorrect version of SRT to search for explanations of all physical problems in our only visible universe, could not explain much. They could not explain dark matter and dark energy, they could not discover dark space, they could not solve the problem of baryonic asymmetry and many other problems. For the same reason physicists still cannot explain the physical phenomenon of time and why it is unidirectional. They even created a special term for this concept 'time arrow'. But they are not sure that this term is irrefutable.

And the article refutes this term. For this purpose the corrected version of SRT was used, in which:

- the physical reality of imaginary numbers is experimentally proven and theoretically explained;
- by the experimentally proved principle of physical reality of imaginary numbers the principle of non-exceeding the speed of light was refuted and thus it was proved that the speed v gives rise to three additional spatial dimensions;
- it was found out that there exists in Nature a six-dimensional Multiverse containing about twenty mutually invisible three-dimensional universes and antiuniverses, whose position in the Multiverse space is determined by three additional dimensions.

It is explained that antimatter in the Multiverse is located in the antiuniverses, which are antipodes of other universes. In the same antiuniverses there are an anti-time, which is opposite to time of other universes. Examples of use of this anti-time are given, allowing already now to move both in the past and in the future time. And the existence of anti-time corrects the understanding of the phenomenon 'arrow of time'.

But anomalous zones in different countries on Earth may have different service advantages and disadvantages. Therefore, different countries may use different portals and different time travelling routes using

them. And it will allow to get more valuable information about portals. Astro-geophysical researches of portals [99]-[115] made as a result of such time-traveling in our hidden Multiverse will allow to create time machines imitating on the Earth stay of people in portals. And this will significantly increase the effectiveness of scientific research and the corresponding accelerated intellectual and economic development of our entire human civilisation.

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References:

1. Einstein A. (1920). Relativity: The Special and General Theory. H. Holt and Company. NY.
2. Bohm D. (2006). The Special Theory of Relativity. Routledge, Abingdon on Thames.
3. Penrose R. (2010). The Nature of Space and Time. Princeton University Press. Princeton.
4. Antonov A.A. (2021). The special theory of relativity stated in physics text-books is incorrect. 77th International Scientific Conference of the Eurasian Scientific Association. "Theoretical and practical issues of modern science". Moscow. ESA. 11-15. (In Russian)
5. Antonov A. A. (2021). Version of the special theory of relativity that is studied in all physics textbooks is incorrect. Österreichisches Multiscience Journal (Innsbruck, Austria). 43(1). 17-22. <http://osterr-sci-ence.com>
6. Antonov A. A. (2021). Generally accepted version of the special theory of relativity contained in physics textbooks is incorrect. The scientific heritage. (Budapest, Hungary). 73(2). 39-43. DOI: 19.24412/9215-0365-2021-73-2-39-43
7. Antonov A. A. (2021). Special theory of relativity, which is studied in physics text-books, is incorrect. German International Journal of Modern Science. 16, 49-53.
DOI: 10.24412/2701-8369-2021-16-49-53
8. Antonov A. A. (2021). Special theory of relativity, which is studied in all physics textbooks, is incorrect. Danish Scientific Journal. 51(1). 31-35. <http://www.danish-journal.com>
9. Antonov A. A. (2021). Special theory of relativity taught in all physics text-books is incorrect. Annali d'Italia. 22(1). 39-44. <https://www.anditalia.com/>
10. Antonov A. A. (2021). Special theory of relativity presented in physics text-books is wrong. Norwegian Journal of development of the International Science 68(1). 3-7.
DOI: 10.24412/3453-9875-2021-68-3-7.
11. Antonov A. A. (2021). In all physics textbooks an erroneous version of special theory of relativity is given. International independent scientific journal. 31.34-39.
<http://www.iis-journal.com>

12. Antonov A. A. (2021). Special theory of relativity taught in physics textbooks is wrong. *Journal of science*. Lyon. 23. 47-52. <https://www.joslyon.com/>
13. Antonov A. A. (2021). All physics textbooks study incorrect special theory of relativity. *Sciences of Europe*. (Praha, Czech Republic) 79(1). 30-35.
DOI: 10.24412/3162-2364-2021-79-30-35
14. Antonov A. A. (2021). The version of STR stated in physics textbooks is incorrect because it denies the existence of radio engineering. 82nd International Scientific Conference of the Eurasian Scientific Association "Scientific result in theory and practice". Moscow. ESA. 11-15.
(In Russian) <https://esa-conference.ru/sborniki/?y=2021>
15. Antonov A. A. (2022). The version of STR presented in physics textbooks is incorrect, since it follows from it that radio engineering should not exist. *European Journal of Applied Sciences*. Services for Science and Education. UK. 10(1). 440-445.
DOI: <https://doi.org/10.14738/aivp.101.2022>
16. Antonov A. A. (2022). The existence of radio engineering refutes the physics text-books version of STR. *The scientific heritage*. (Budapest, Hungary). 83(1). 19-22.
DOI: 10.24412/9215-0365-2022-83-1-19-22
17. Antonov A.A. (2022). The fundamental Ohm's law in radio engineering as interpreted by Steinmetz, which proves the physical reality on imaginary capacitive and inductive reactances, refuted the version of the STR presented in physics textbooks even before its creation. *German International Journal of Modern Science*. 26. 50-53. DOI: 10.24412/2701-8369-2022-26-50-63
18. Antonov A.A. (2022). The version of STR stated in physics textbooks is refuted by the existence of radio engineering. *Danish Scientific Journal*. 56. 56-59. <http://www.danish-journal.com>
19. Antonov A.A. (2022). The version of STR presented in physics textbooks is in correct because it denies the possibility of the existence of Ohm's law as interpreted by Steinmetz and, consequently, the existence of radio engineering. *Annali d'Italia*. 28(1), 43-47.
<https://www.anditalia.com/>
20. Antonov A.A. (2022). The version of STR stated in physics textbooks is refuted by the existence of radio engineering. *Norwegian Journal of development of the International Science*. 78(1). 63-67. DOI: 10.24412/3453-9875-2022-78-63-66.
21. Antonov A.A. (2022). If the physics textbook version of STR were true, then Ohm's law should not exist in nature, and therefore all radio engineering would not exist. *International independent scientific journal*. 36. 16-19. <http://www.iis-journal.com>
22. Antonov A.A. (2022). If the version of STR in physics textbooks were true, then there would be no radar, no television, no radio navigation, no telecommunication and many other things. *Journal of science*. Lyon. 28. 76-79. <https://www.joslyon.com/>
23. Antonov A.A. (2022). The version of STR set out in physics textbooks is in-correct because it states that Ohm's law as interpreted by Steinmetz does not really exist, and therefore radio engineering does not exist either. *Sciences of Europe* (Praha, Czech Republic). 87(1). 54-57.
DOI: 10.24412/3162-2364-2022-1-54-57
24. Antonov A.A. (2022). Why the physics textbooks teach an incorrect version of the special theory of relativity which denies the existence of radio- and electrical engineering. III international scientific conference "Challenges and problems of modern science". London. Great Britain. 78-86. <https://doi.org/10.528/zenodo.7486814>
25. Antonov A. A. (2023). Why is the incorrect version of the special theory of relativity being studied in physics textbooks, refuted the existence of radio- and electrical engineering even before its creation? *The scientific heritage*. (Budapest, Hungary). 105. 83-89.
DOI: 10.5281/zenodo.7560145
26. Antonov A.A. (2023). Why is an incorrect version of the special theory of relativity that denies the possibility of the existence radio and electrical engineering being studied in physics textbooks? *German International Journal of Modern Science*. 48. 23-29.
DOI: <https://doi.org/10.5281/zenodo.7541137>
27. Antonov A.A. (2023). Who needs the incorrect version of special relativity taught in physics textbooks despite all its experimental refutations? *Annali d'Italia*. 39, 64-70.
DOI: 10.5281/zenodo.7568916
28. Antonov A.A. (2023). Why is incorrect version of the special theory of relativity that denies the possibility of the existence of radio and electrical engineering being studied in textbooks of physics? *Norwegian Journal of development of the International Science*. 100. 27-33. <https://doi.org/10.5281/zenodo.7528512>
29. Antonov A.A. (2023). Why is incorrect version of the special theory of relativity, refuted by the existence of radio and electrical engineering, is still studies in all university physics textbooks? *Danish Scientific Journal*. 69. 66-72. <https://doi.org/10.5281/zenodo.7692053>
30. Antonov A.A. (2023). Why is incorrect version of the special relativity still being studied in physics textbooks, which denies Ohm's law for alternating current used worldwide by millions of radio- and electrical engineers? *International independent scientific journal*. 46. 38-44. <https://doi.org/10.5281/zenodo.7525751>.
31. Antonov A.A. (2023). Why is the generally accepted version of STR, which denies the possibility of the existence of radio engineering and electrical engineering, tsunamis and bell ringing, the physical phenomenon of resonance and Ohm's physical law for alternating current, music created by the piano and even swing swings on the playground, nevertheless is still considered correct and studied in physics textbooks? *Sciences of Europe* (Praha, Czech Republic). 112. 44-50. DOI: 10.5281/zenodo.7708515
32. Antonov A.A. (2023). Why is the incorrect version of the special theory of relativity still being studied in physics textbooks, despite all its experi-

mental refutations. *European Journal of Applied Sciences. Services for Science and Education*. UK. 11(2). 61-71.

DOI: <https://doi.org/10.14738/aivp.112.14128>

33 Antonov A.A. (2023). Why the incorrect version of the special theory of relativity, which denies the possibility of the existence of radio engineering and electrical engineering, has not yet been refuted. *Journal of science*. Lyon. 40. 19-25. <https://doi.org/10.5281/zenodo.7704392>

34. Jean de Climont. (2009), (2010), (2016), (2020), (2023). *The Failure of Pure Science*. Editions d'Assailly.

35. Jean de Climont. (2017). *The alternative theories*. Editions d'Assailly.

36. Jean de Climont. (2019), (2020), (2023). *The Worldwide List of Alternative Theories and Critic*. Editions d'Assailly.

37. Jean de Climont. (2023). *Einstein and Maxwell speculation*. Editions d'Assailly.

38. Popper K.R. 2002. *Conjectures and Refutations. The Growth of Scientific Knowledge*. Routledge. London.

39. Weinstein E.W. (2005). *The CRC Concise Encyclopedia of Mathematics*. 3-rd ed. CRS Press. Boca Raton. FL.

40. Beckmann P. (1976). *A history of π* . 3rd edition. St. Martin Press. NY.

41. Steinmetz C. P. (2010). *Theory and Calculation of Electric Circuit*. Nabu Press.

42. Antonov A. A. (2008). Physical Reality of Resonance on Complex Frequencies. *European Journal of Scientific Research*. 21(4). 627-641. <http://www.eurojournals.com/ejsr.htm>

43. Antonov A. A. (2009). Resonance on Real and Complex Frequencies. *European Journal of Scientific Research*. 28(2). 193-204. <http://www.eurojournals.com/ejsr.htm>

44. Antonov A. A. (2010). New Interpretation of Resonance. *International Journal of Pure and Applied Sciences and Technology*. 1(2). 1-12. http://doi.org/10.17686/sced_rusnauka_2010-888

45. Antonov A. A. (2010). Oscillation processes as a tool of physics cognition. *American Journal of Scientific and Industrial Research*. 1(2). 342-349. doi:10.5251/ajsir.2010.1.2.342.349

46. Antonov A. A. (2010). Solution of algebraic quadratic equations taking into account transitional processes in oscillation systems. *General Mathematics Notes*. 1(9). 11-16.

http://doi.org/10.17686/sced_rusnauka_2010-887

47. Antonov A. A. (2013). Physical Reality of Complex Numbers. *International Journal of Management, IT and Engineering*. 3(4). 219-230. http://doi.org/10.17686/sced_rusnauka_2013-898

48. Antonov A. A. (2014). Correction of the special theory of relativity: physical reality and nature of imaginary and complex numbers. *American Journal of Scientific and Industrial Research*. 5(2). 40-52. doi:10.5251/ajsir.2014.5.2.40.52

49. Antonov A. A. (2015). Physical reality of complex numbers is proved by research of resonance. *General Mathematics Notes*. 31(2). 34-53.

http://www.emis.de/journals/GMN/yahoo_site_admin/asets/docs/4_GMN9212-V31N2.129701.pdf

50. Antonov A.A. (2015). Principle of physical reality of imaginary and complex numbers in modern cosmology: the nature of dark matter and dark energy. *Journal of the Russian physico-chemical society*. 87(1). 328-355. (In Russian) http://doi.org/10.17686/sced_rusnauka_2015-1119

51. Antonov A. A. (2016). Physical Reality and Nature of Imaginary, Complex and Hypercomplex Numbers. *General Mathematics Notes*. 35(2). 40-63.

http://www.geman.in/yahoo_site_admin/asets/docs/4_GMN-10932-V35N2.31895146.pdf

52. Antonov A. A. (2017). The physical reality and essence of imaginary numbers. *Norwegian Journal of development of the International Science*. 6. 50-63. <http://www.njd-iscience.com>

53. Antonov A. A. (2018). Physical Reality and Essence of Imaginary Numbers in Astrophysics: Dark Matter, Dark Energy, Dark Space. *Natural Science*. 10(1). 11-30.

doi:10.4236/ns.2018.101002

54. Antonov A.A. (2023). The Corrected Version of the Special Theory of Relativity. *European Journal of Applied Sciences. Services for Science and Education*. UK. 11(5). 68-83. DOI:10.14738/aivp.115.15474

55. Antonov A. A. (2023). Corrected special theory of relativity. *Journal of science*. Lyon. 48. 27-36. <https://doi.org/10.5281/zenodo.10277156>

56. Antonov A. A. (2023). Corrected special theory of relativity. *Annali d'Italia*. 49, 25-35. DOI: 10.5281/zenodo.10214679

57. Antonov A. A. (2023). The Corrected Version of the Special Theory of Relativity. The scientific heritage. (Budapest, Hungary). 123. 72-81,

58. Antonov A. A. (2023). The Corrected Version of the Special Theory of Relativity. *Norwegian Journal of development of the International Science*. 118. 40-49.

<https://doi.org/10.5281/zenodo.10009500>

59. Antonov A. A. (2023). Alternative Version of the Special Theory of Relativity. *Sciences of Europe*. (Praha, Czech Republic). 128. 62-71.

60. Antonov A. A. (2023). Special Theory of Relativity. *German International Journal of Modern Science*. 67. 64-73. DOI: 10.5281/zenodo.10966458

61. Antonov A. A. (2023). Corrected Version of the Special Theory of Relativity. *Danish Scientific Journal*. 77. 88-97. <https://doi.org/10.5281/zenodo.10054677>

62. Antonov A. A. (2011). Structure of the Multiverse. *British Journal of Science*. 2(2). 51-60. http://doi.org/10.17686/sced_rusnauka_2011892

63. Antonov A. A. (2012). Multiverse. Time Travels. *International Journal of Pure and Applied Sciences and Technology*. 12(2). 43-56. http://doi.org/10.17686/sced_rusnauka_2012-896

64. Antonov A.A. (2012). Discovery of the real Multiverse. *Encyclopaedia of Russian thought, Papers to the Russian Physical Society*. 16(3). 3-20. (In Russian)

- http://doi.org/10.17686/sced_rusnauka_2012-1115
65. Antonov A.A. (2013). Cognition of the Multiverse as a factor in accelerating the development of human civilisation. *Journal of Russian physical thought*. 1-12, 6-77. (In Russian)
http://doi.org/10.17686/sced_rusnauka_2011-1117
66. Antonov A. A. (2015). Hidden Multiverse. *International Journal of Advanced Research in Physical Science*. 2(1). 25-32.
67. Antonov A.A. (2015). The astrophysical phenomenon of dark matter and dark energy proves the existence of the hidden Multiverse. *American Journal of Modern Physics*. 4(4). 180-188. doi: 10.11648/j.jamp.20150404.14
68. Antonov A. A. (2015). Why dark matter and dark energy are invisible? *Optics*. 4(6), 43-47. doi: 10.11648/j.optics.20150406.12
69. Antonov A. A. (2015). Hidden Multiverse: explanation of dark matter and dark energy phenomena. *International Journal of Physics*. 3(2). 84-87. doi:10.12691/ijp-3-2-6
70. Antonov A. A. (2015). Principles and structure of the real Multiverse: explanation of dark matter and dark energy phenomena. *American Journal of Modern Physics*. 4(1). 1-9. doi:10.11648/j.ajmp.20150401.11
71. Antonov A. A. (2015). Explanation of dark matter and dark energy phenomena. *Journal of Science Frontier Research: A Physics and Space Science*. 15(1). 33-38.
http://doi.org/10.17686/sced_rusnauka_2015-902
72. Antonov A. A. (2015). Review of publications by A. A. Antonov on the problem of explaining the phenomenon of dark matter and dark energy. *Journal of the Russian physico-chemical society*. 87(3). 63-76. (In Russian)
73. Antonov A. A. (2016). Explaining the Phenomenon of Dark Matter and Dark Energy by Existence of the Hidden Multiverse. *Frontiers of Astronomy, Astrophysics and Cosmology*. 2(1). 1-9. doi: 10.12691/faac-2-1-1
74. Antonov A. A. (2016). What Physical World do We Live in? *Journal of Modern Physics*. 7(14). 1933-1943
75. Antonov A. A. (2016). Hypothesis of the Hidden Multiverse: Explains Dark Matter and Dark Energy. *Journal of Modern Physics*. 7(10), 1228-1246. doi: 10.4236/jmp.2016.71011
76. Antonov A. A. (2017). Nature of dark matter and dark energy. *Journal of Modern Physics*. 8(4). 567-582. doi: 10.4236/jmp.2017.84038
77. Antonov A. A. (2017). Hypothesis of the hidden Multiverse explains the phenomenon of dark matter and dark energy. *Applied Physics Research*. 9(2). 30-41.
doi: <https://doi.org/10.5539/apr.v9n2p30>
78. Antonov A. A. (2024). Mathematical Sciences: From the Experimentally Proved Principle of the Physical Reality of Imaginary Numbers it Follows that the Invisible Afterlife World, Mentioned in All Religions, Really Exists. *European Journal of Applied Sciences*, 12(5). 119-145. DOI:10.14738/aivp.125.17569.
79. Antonov A. A. (2020). How to See Invisible Universes. *Journal of Modern Physics*. 11(05), 593-607. DOI: 10.4236/jmp.2020.115039
80. Antonov A. A. (2020). Can invisible universes be seen? *International independent scientific journal*. 21(2). 51-60. <http://www.iis-journal.com>
81. Antonov A. A. (2020). How to discover invisible universes. *Norwegian Journal of development of the International Science*. 42(1). 36-48. <http://www.njd-iscience.com>
82. Antonov A. A. (2020). Universes Being Invisible on Earth outside the Portals Are Visible in Portals. *Natural Science*. 12(8). 569-587. <https://doi.org/10.4236/ns.2020.128044>
83. Antonov A. A. (2020). Invisible universes can be seen in anomalous zones. *Danish Scientific Journal*. 43(1). 9-24. <http://www.danish-journal.com>
84. Antonov A. A. (2021). Invisible universes can be seen in anomalous zones. *International independent scientific journal*. 23(1). 28-44.
85. Chernobrov, V. (2000). *Encyclopedia of mysterious places of the Earth*. Veche Publishing House. Moscow. (In Russian)
86. Chernobrov, V. (2004). *Encyclopedia of mysterious places of Russia*. Veche Publishing House. Moscow. (In Russian)
87. Chernobrov, V. (2007). *Encyclopedia of mysterious places of Earth and space*. Veche Publishing House. Moscow. (In Russian)
88. Chernobrov, V. (2009). *Encyclopedia of mysterious places of Moscow and Moscow region*. Helios ARV. Moscow. (In Russian)
89. Dyson F.W, Eddington A.S., Davidson C. (1929). A determination of the deflection of light by the sun's gravitational field, from observations made at the total eclipse of May 29, 1919. *Philosophical transactions of the Royal Society A*. 220. 291-333.
<https://doi.org/10.1098/rsta.1920.0009>
90. Frazer G. (2004). *Antimatter: The Ultimate Mirror*. Cambridge University Press, Cambridge, UK.
91. Santilli R. M. (2006). *Isodual Theory of Antimatter: With Applications to Antigravity, Grand Unification and Cosmology*. Springer. Dordrecht. Netherlands.
92. Alain M., Le Brun V. (2012). *Matter, Dark Matter, and Anti-Matter: In Search of the Hidden Universe*. Springer-Verlag. NY.
93. Antonov A.A. (2016). Dark matter, dark energy and antimatter are located in the hidden Multiverse. *PONTE*. 72(8). 288-300.
94. Dionis Dimetor. The arrow of time, Loschmidt's demon and quantum thermodynamics Why is time irreversible? <https://habr.com/ru/articles/785014/>
95. Hawking S.W. (1988). *Brief History of Time: From the Big Bang to Black Holes*. Bantam Dell Publishing Group. UK.
96. Eddington, A. S. (1928). *Nature of the Physical World*. Cambridge University Press, London.
97. Chernobrov, V. (1999). *Secrets of Time*. Helios ARV. Moscow. (In Russian)

98. Antonov A. A. (2012), Earth, portals, parallel universes. *American Journal of Scientific and Industrial Research*. 3(6). 464-473. doi:10.5251/ajsir.2012.3.6.464.473
99. Antonov A. A. (13 January 2016). How Portals of the Invisible Multiverse Operate. *Science PG Frontiers*.
<http://www.sciencepublishing-group.com/news/sciencepgfrontiersinfo?articleid=7>
100. Antonov A.A. Geophysical exploration of portals will provide new knowledge about space. *Proceedings of the III International Scientific Conference*. Philadelphia, USA. "The modern vector of the development of science". Philadelphia, USA. 2023. 85-101. <https://doi.org/10.5281/zenodo.7709801>
101. Antonov A.A. 2023. Geophysical researches of portals will allow to discover invisible universes and to explore them. *European Journal of Applied Sciences*. Services for Sciences and education. UK. 11(2). 370-391. DOI:10.14738/aivp.112.14323.
102. Antonov A.A. 2023. The necessity of geophysical researches of portals. *The scientific heritage*. (Budapest, Hungary). 110. 77-90. DOI: 10.5281/zenodo.7804563
103. Antonov A.A. 2023. Geophysical researches of portals will allow to prove the existence of invisible universes and to explore them. *German International Journal of Modern Science*. 53. 64-78. DOI: 10.5281/zenodo.7796151
104. Antonov A.A. 2023. The relevance of geophysical researches of portals. *Danish Scientific Journal*. 70. 75-89. <https://doi.org/10.5281/zenodo.778944>
105. Antonov A.A. 2023. Geophysical researches of portals will allow to prove the existence of hidden Multiverse and to research it. *Annali d'Italia*. 42. 71-85.
DOI: 10.5281/zenodo.7865307
106. Antonov A.A. 2023. Why geophysical researches of portals are necessary. *Norwegian Journal of development of the International Science*. 105. 83-96. <https://doi.org/10.5281/zenodo.7779019>
107. Antonov A.A. 2023. Geophysical researches of portals will allow to prove the existence of hidden Multiverse and to research it. *International independent scientific journal*. 49. 23-37.
108. Antonov A.A. 2023. Geophysical researches of portals will allow to discover invisible universes. *Journal of science*. Lyon. 41. 26-38.
109. Antonov A.A. 2023. Geophysical researches of portals will allow to prove the existence of hidden Multiverse and to research it. *Sciences of Europe*. 114. 76-90
110. Antonov A. A. 2024. Astrophysical portals are a source of new knowledge. *German International Journal of Modern Science* 95. 34- 44. DOI: 10.5281/zenodo.14609615
111. Antonov A. A. 2024. Scientific value of researches of astrophysical portals. 82. 41-51.
112. Antonov A. A. 2024. The relevance of research on astrophysical portals. *Znanstvena misel journal*. 98. 35-45
113. Antonov A. A. 2024. Scientific value of researches of astrophysical portals. *Sciences of Europe (Praha, Czech Republic)*. 153. 93-106.
114. Antonov A. A. 2024. The existence of astrophysical portals refutes the version of SRT studied in textbooks. *Annali d'Italia*. 63. 9-19. DOI: 10.5281/zenodo.14726250
115. Antonov A. A. 2025. Physical Sciences: Astrophysical Portals are a Source of New Knowledge. *European Journal of Applied Sciences, Services for Science and Education*. UK 13(1). 23-39. DOI:10.14738/aivp.131.18112.

QUANTUM ENTANGLEMENT AND STRING THEORY

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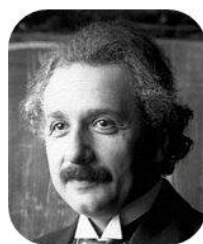
Abstract

At the beginning of the 20th century, A. Einstein revealed the theory of special relativity. According to this theory, the speed of movement of objects in the Universe has a limit value. According to A. Einstein, no object or interaction in the Universe can move at a speed higher than the speed of light. For a long time, this claim of special relativity was not in doubt. But in the following years, due to the discovery of new particles or phenomena, scientists doubt the accuracy of this limit speed. Is the speed of light in a vacuum the fastest in the vast Universe? Based on this question, numerous experiments were conducted on this issue. Quantum entanglement, which finally emerged at the end of the 20th century, proved this claim of special relativity to be false. According to quantum entanglement, the transmission of interaction occurs at a speed greater than the speed of light. That is, we can say with certainty that the speed of light propagation in a vacuum is not the limit speed of the Universe. The phenomenon of quantum entanglement still attracts attention today with its mysterious properties. To answer all the questions about this phenomenon, it is necessary to approach it through different theories. This phenomenon can be fully explained by the String theory, the biggest theory of the universe. In the presented work, an attempt was made to fully explain the important features of quantum entanglement with string theory. At the same time, a convenient way of calculating the limit speed is mentioned.

Keywords: Special relativity, speed of light, quantum entanglement, string theory, limit speed.

Introduction. Albert Einstein published his special theory of relativity in 1905, based on many theoretical and empirical results obtained by Albert A. Michelson, Hendrik Lawrence, Henri Poincaré and others. This theory was put forward in the article "On the Electrodynamics of Moving Bodies". The theory of special relativity is based on two contradictory postulates in classical mechanics: 1. Laws describing physical phenomena do not change when moving from one inertial system to another; 2. The speed of light propagation in a vacuum is constant regardless of the speed of movement of the source and the receiver. The final theory is in better agreement with experiment than classical mechanics. For example, postulate 2 explains the results of the Michelson-Morley experiment. An important conclusion is drawn from this postulate. The maximum speed is finite: no physical object, information or field lines can be transmitted faster than the speed of light in a vacuum [1]. In the following years, as quantum mechanics developed, Einstein's ideas began to be questioned. It is known that Einstein and Niels Bohr had a long disagreement about the nature of quantum mechanics. Based on these discussions, Einstein came up

with the idea of a photon-emitting box thought experiment. The essence of the experiment is that the photons emitted from the box, even if they are far from each other, were based on the possibility of changing the properties of one of them by changing the properties of the other. This idea, put forward by Einstein in 1931, was the first introduction of the phenomenon that would later be called entanglement [2]. In the same year, Herman Weyl, in his textbook on group theory and quantum mechanics, noted that quantum systems in multiple communications exhibit a kind of Gestalt where "the whole is greater than the sum of its parts" [3]. In 1932, Erwin Schrödinger wrote his own proposals for quantum entanglement, but abandoned these equations before publishing them [4]. In 1935, Grete Hermann mathematically refined the interaction of an electron with a photon and observed a phenomenon called entanglement [5]. That same year, Albert Einstein, Boris Podolsky, and Nathan Rosen wrote a paper we know today as the Einstein-Podolsky-Rosen (EPR) contradiction.



A. Einstein



B. Podolsky



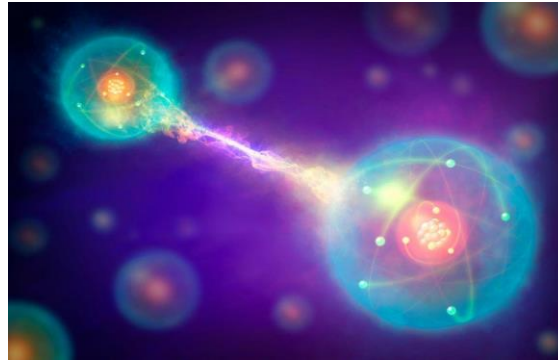
N. Rosen

In their theoretical experiments, they assumed that the two systems interacted and then separated, and then showed that the two systems of quantum mechanics do

not determine each other separately. After this paper was published, Erwin Schrödinger wrote a letter to Ein-

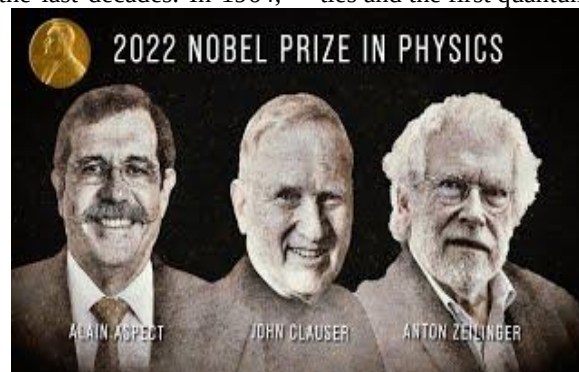
stein in German, in which he used the term "entanglement" to describe a situation such as the EPR contradiction [6]. Schrödinger then published a paper clarifying the term entanglement. In this paper, he referred to entanglement as a characteristic feature of quantum mechanics, not as an embedded concept [7]. Most people interested in quantum mechanics have encountered the principle of quantum entanglement at least once. According to this theory, two substances or bodies created at the same time or from the same source exist in

a state of constant entanglement with each other. For example, photons emitted at the same time are continuously connected to each other. This part may not seem like a very important detail. To explain with an example, thinking that two electrons ejected from the same source rotate due to each other's influence. The further apart we spin one of these electrons, the other changes at the same time.



One thing to note here is that when one turns, the other reacts at the same time. Schrödinger, like Einstein, was not convinced that entanglement exists, as it is not found in classical mechanics, but only in quantum mechanics. Because, as we mentioned above, in the theory of relativity, the maximum speed for the transmission of information was considered to be the speed of light [8]. In its simplest definition, quantum entanglement is when two objects are inextricably bound and perturbing one perturbs the other, regardless of the distance between them. Einstein later called this entanglement the "spooky effect at a distance." Of course, experimental results are needed to prove the truth of this fact. In 1946, John Archibald Wheeler proposed to refine the polarization of photon pairs of gamma rays produced by the annihilation of the electron-positron pair [9]. Chien-Shiung Shu and J. Shakna performed this experiment in 1949 and thus showed that the entangled particle pairs predicted by EPR can be created in the laboratory [10]. However, very few articles have been written in this field during the last decades. In 1964,

John S. Bell formulated a theorem called "Bell's inequality" [11]. This theory has been repeatedly reflected in practice. It should be noted that quantum entanglement is still not fully understood and researched enough for the scientific world. Quantum entanglement shows that two or more quantum systems are integrated by their effects on each other, even if they are very far apart. This integration creates correlations of the states of quantum systems with each other, and these correlations are the most striking feature of quantum entanglement. Many experiments have been carried out to test Bell's inequality in practice, such as the research of Stuart Freedman and John Clauser in 1972 and the experiments of Alain Aspect in 1982 [12]. Since the mid-1990s, Anton Zeilinger has used the creation of entanglement by parameter downconversion to explain the nature of entanglement [13]. For this reason, the 2022 Nobel Prize in Physics was awarded to Aspect, Clauser and Zeilinger "for experiments with wandering photons, the determination of violations of Bell's inequalities and the first quantum information science" [14].



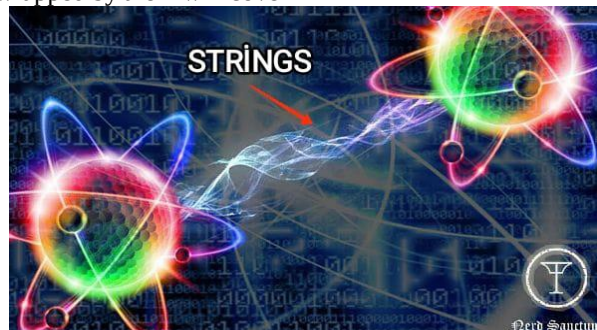
Problem setting: It becomes clear that the existence of quantum entanglement is no longer a matter of debate. Quantum entanglement is already being used to encrypt quantum computers. The importance of quantum entanglement has been recognized as a phenomenon in which two or more quantum systems are inter-

connected and can even influence each other. Let's explain the experience in simple language. Suppose that two electrons are located at a distance of 100 meters from each other. The speed of light takes about 300 nanoseconds to travel this distance. So, if the spin of the first electron goes up, this information must reach it after about 300 nanoseconds for the spin of the second

electron to go down. However, experiments show that the transmission of this information takes place in less than 300 nanoseconds. Therefore, information transfer occurs at a speed greater than the speed of light. But how does this happen? There are two popular approaches to this situation. The first of these claims that there is an energy that we cannot observe. This energy connection is so fast that the speed of light is negligible next to it. However, given our technologies today, this approach is quite difficult to prove. Another view claims that this movement is an illusion. The reason for this is the existence of theories that confirm that everything in the Universe is already intertwined.

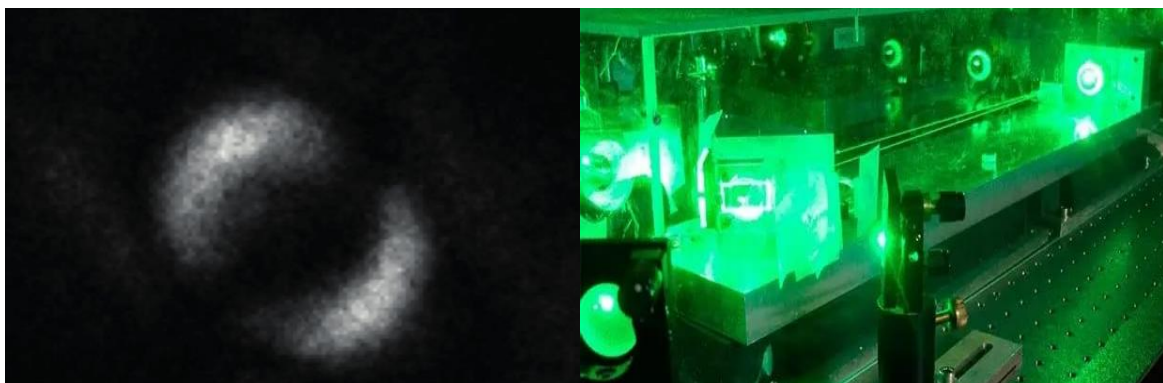
Solving the problem: The main issue here is to find out how the interaction is greater than the speed of light and how the particles interact with each other regardless of the distance. In the first claim, invisible communication can be thought of as dark energy. However, dark energy is only the creator of the gravitational field [15]. And since the mass of the particles is very small, the space-time piece wrapped by them will cover

a very small area. At the same time, dark matter belongs to higher dimensional spaces. In short, it would not be correct to say that this approach is correct. Second claim holders believe that everyone in the Universe is connected to each other. It is known that according to the String theory, all objects in the Universe are strings that vibrate in different patterns. String theory is the possibility of obtaining a quantum-freedom of the entire organization of matter with the 4 main forces of influence in the universe [16]. So, the transmission of influence is possible through strings. Since all strings are vibrating single energy resources, they are all connected to each other. Then, we determine that the particles are related to each other depending on the distance. There are approximately $6.4 \cdot 10^{53}$ strings in one electron [17]. We have seen that strings are much larger than photons, electrons, and other particles. Therefore, we can get the fact that the speed of energy transfer in the wire mesh is greater than the maximum speed of movement of the particles



It is the existence of quantum entanglement that once again confirms this fact. Therefore, the speed of energy transfer in the wire mesh can be considered the maximum speed of interaction transfer, and this speed can be considered the limit speed of the Universe (in 3D space). Note that an attempt was made to measure

this speed in experiment. Together with a Chinese research group, Joachim Burdörfer managed to measure the speed of quantum entanglement. According to their experiment, the entanglement of two particles occurs in a very short period of 232 attoseconds [18]. In addition, scientists have also obtained an image of the phenomenon of quantum entanglement.



Result: String theory proves that all particles in the Universe are interconnected. The speed of energy transmission through wires can be considered the maximum speed of information transmission. This speed is the maximum speed of the Universe in 3D space. By noting the distance between the particles in the above experiment $V^* = S/t$ ($t = 232 \cdot 10^{-18}$ Sec) the limit speed can be calculated using the formula. However, in order for a particle to acquire a state, information from another particle must reach it at this speed. That is, since

we are calculating at a finite speed, it can be said that nothing happens instantaneously in the Universe. For each process, a certain time should pass, even if it is small. Combining these facts, we can say that there may be a connection between quantum entanglement and matter teleportation. If we consider matter as a quantum system and note that all bodies are made of strings, if we could convert matter into a field system, we could move it to a certain distance with a velocity of approx-

imately V^* and convert it back into matter form. However, even if this process were possible, we would need very high energy.

Reference:

1. Greene, Brion. "The Theory of Relativity, Then and Now".
2. Howard, Don (1990). "Nicht Seinkann was Nicht Sein Darf, or The Prehistory of EPR, 1909-1935 Einstein's Early Worries About The Quantum Mechanics of Composite Systems".
3. Weyl, Herman (1931). "Gruppen theory and Quantum mechanics".
4. Christandl, Matthias (2006). The Structure of Bipartite Quantum States- Insights from Group Theory and Cryptography.
5. Filk, Thomas (2016). "Carl Friedrich Von Weizsäcker's 'Ortsbestimmung eines Elektrons' and its Influence on Grete Hermann". In Crull, Elise: Baccigaluppi, Guido.
6. Kumar, Manjit (2010). Quantum: Einstein, Bohr, and the Great Debate about the Nature of Reality. W. W. Norton & Company.
7. Schroeder, Daniel V. (1 November 2017). "Entanglement isn't just for spin" AJP.
8. Bokulich, Alisa, Jeager, Gregg, eds. (2010). "Introduction". Philosophy of Quantum Information and Entanglement. Cambridge University press.
9. Wheeler J.A. (1946). "Polyelectrons" Annals of the New York Academy of Sciences".
10. Wu S, Shaknov I. (1950). "The Angular Correlation of Scattered Annihilation Radiation".
11. Bell J.S. (1964). "On the Einstein-Podolsky-Rosen paradox".
12. Aspect, Alain (2015). "Closing the Door on Einstein and Bohr's Quantum Debate".
13. Lindley, David (8 January 2010). "Landmark: Teleportation is not Science Fiction".
14. "The Nobel Prize in Physics 2022". The Royal Swedish Academy of Sciences. 4 October 2022. Retrieved 5 October 2022.
15. Bashirov M., Abbasov V. "A new approximation to Dark matter". NJD-132.2024.
16. "String theory". Britannica.com.
17. Bashirov M., Abbasov V. "String theory: another approach to phenomena". NJD-141.2024.
18. Wei-Chao Jiang, Ming-Chen Zhong, Yong-Kang Fang, Stefan Donsa, Iva Brezinova, Liang-You Peng and Joachim Burgdörfer. "Time Delays as Attosecond Probe of Interelectronic Coherence and Entanglement". Physical Review Letters. 2024.

POLITICAL SCIENCES

JAISH AL-ADL: AN ANALYSIS OF ITS ACTIVITIES, IDEOLOGY, AND IMPACT ON IRAN'S NATIONAL SECURITY

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DŽAJSZ AL-ADL: ANALIZA DZIAŁALNOŚCI, IDEOLOGII I WPŁYWU NA BEZPIECZEŃSTWO NARODOWE IRANU

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Abstract

In this article, the author analyzes the activities, ideology, and impact of the Jaish al-Adl group on Iran's national security, examining its growing role in the region and the threats it poses to the stability of the state. The historical and political background of Baloch separatism is discussed, including the ethnic and religious tensions that contribute to rising tensions in the region. The author analyzes the ethno-political specifics of the Balochistan region, where interactions between ethnic, religious, and political factors promote the radicalization of the Baloch movement. An essential part of the study is also the analysis of the Iranian authorities' actions toward ethno-religious minorities. Special attention is paid to the impact of this policy on Iran's internal stability and the dynamics of conflicts in the region. The author concludes that the activities of Jaish al-Adl pose a serious threat to Iran's national security, strengthening existing social and political divisions, which have negative consequences for the region's stability and influence the broader geopolitical context.

Abstrakt

W niniejszym artykule autor analizuje działalność, ideologię oraz wpływ ugrupowania Dżajsz al-Adl na bezpieczeństwo narodowe Iranu, badając jego rosnącą rolę w regionie oraz zagrożenia, jakie stwarza dla stabilności państwa. Omówione zostały historyczne i polityczne przesłanki powstania beludżyskiego separatyzmu, w tym etniczne i religijne napięcia, które sprzyjają wzrostowi napięć w regionie. Autor analizuje specyfikę etnopolityczną regionu Beludżystanu, gdzie dochodzi do interakcji między etnicznymi, religijnymi i politycznymi czynnikami, które sprzyjają radykalizacji ruchu beludżyskiego. Istotnym elementem badania jest również analiza działań władz irańskich wobec mniejszości etnoreligijnych. Szczególną uwagę poświęcono wpływowi tej polityki na wewnętrzną stabilność Iranu oraz na dynamikę konfliktów w regionie. Autor dochodzi do wniosku, że działalność Dżajsz al-Adl stanowi poważne zagrożenie dla bezpieczeństwa narodowego Iranu, wzmacniając istniejące podziały społeczne i polityczne, co ma negatywne konsekwencje dla stabilności regionu oraz wpływa na szerszy kontekst geopolityczny.

Keywords: Iran, separatism, Jaish al-Adl, regional security, Pakistan.

Słowa kluczowe: Iran, separatyzm, Dżajsz al-Adl, bezpieczeństwo regionalne, Pakistan.

Wstęp

Iran jest jednym z kluczowych państw Bliskiego Wschodu, odgrywającym historycznie rolę centrum cywilizacyjnej, etnicznej i religijnej interakcji. Jako spadkobierca wielkich imperiów, nie tylko zachował swoją państwowość, ale także ukształtował złożoną strukturę społeczno-kulturową, w której różnorodność etnopolityczna i konfesyjna odgrywa istotną rolę.

Współczesny Iran jest państwem wieloetnicznym, w którym obok dominującej perskiej grupy narodowej żyją liczne społeczności etniczne, w tym Azerowie, Kurdowie, Beludżowie, Turkmeni, Arabowie, Lurzy i inne (łącznie ponad 30 grup etnicznych). Każda z nich wykształciła na przestrzeni dziejów własne formy samoorganizacji, struktury gospodarcze oraz tradycje

kulturowe, co nieuchronnie wpływa na krajobraz polityczny kraju. Kwestie tożsamości narodowej i polityki językowej od dziesięcioleci stanowią przedmiot dyskusji, kształtując zarówno reformy wewnętrzne, jak i strategię polityki zagranicznej Iranu.

Jak zauważa I. Sarkisjan, polityka państwa wobec grup etnicznych zamieszkujących Iran charakteryzuje się powściągliwością i ostrożnością. W oficjalnej retoryce oraz ustawodawstwie kraju nie funkcjonuje pojęcie „mniejszości narodowe” – zamiast tego stosowany jest termin „mniejszości religijne”, obejmujący chrześcijan, zaratusztrian i żydów. Zdaniem Sarkisjana taki model wynika z dążenia władz do minimalizacji ryzyka ruchów separatystycznych oraz konfliktów

narodowościowych. Podstawą tej strategii jest idea kulturowej i historycznej wspólnoty większości grup etnicznych Iranu, gdyż znaczna ich część przynależy do rodziny języków irańskich [7].

Jeśli chodzi o status oficjalnie uznanych mniejszości religijnych, pozostaje on stosunkowo stabilny. Na przykład chrześcijańska wspólnota, składająca się głównie z Ormian, posiada szerokie prawa, w tym możliwość zakładania prywatnych szkół, w których prowadzone jest nauczanie języka, literatury i historii ormiańskiej. Chrześcijanie mogą swobodnie praktykować swoją religię, uczęszczać do świątyń, cieszyć się pełnią praw i swobód obywatelskich, a także otrzymują państwowe wsparcie w zakresie ochrony swoich zabytków kulturowych i historycznych. Mimo to, jak zauważa Sarkisjan, znaczna część irańskich chrześcijan wyemigrowała do Stanów Zjednoczonych i innych krajów zachodnich, uzasadniając swoją decyzję „dyskryminacją religijną” ze strony islamskiego rządu Iranu [7].

Ten badacz jednak uważa, że w kwestiach religijnych Iran wykazuje „pragmatyczne podejście” i zwraca uwagę na fakt, że oprócz chrześcijan w kraju żyje również liczna społeczność żydowska, która nie jest pozbawiona praw i swobód religijnych ani politycznych [7]. Pomimo ostrej retoryki antysyjonistycznej i sprzeciwu wobec polityki Izraela na Bliskim Wschodzie, irańskie władze podkreślają brak jakichkolwiek roszczeń wobec narodu żydowskiego jako takiego, zaznaczając, że ich konflikt dotyczy jedynie syjonistów, których uważają za radykałów – „żydowskich nazistów” – niemających reprezentatywnego charakteru dla całego narodu żydowskiego ani judaizmu.

Państwo wspiera irańską społeczność żydowską, przeznaczając środki na budowę i renowację obiektów narodowych i religijnych, takich jak synagogi. Społeczność ta, podobnie jak chrześcijańska, posiada własnego przedstawiciela w parlamencie. Żydowskim dzieciom przysługuje prawo do zwolnienia z obowiązku szkolnego w soboty, a ich dziedzictwo językowe i kulturowe jest chronione i rozwijane, choć młode pokolenie jest stosunkowo dobrze zintegrowane z państwowym systemem edukacyjnym. Podobna sytuacja dotyczy zaratusztrian, którzy również mają swoich przedstawicieli w parlamencie i cieszą się swobodą wyznania [7].

Jedyną grupą religijną, która w Iranie oficjalnie podlega dyskryminacji, są bahaiści – największa nieuznawana mniejszość religijna w Islamskiej Republice, licząca około 350 tysięcy osób. Irańskie władze postrzegają wyznawców bahaizmu jako „niewiernych”, co skutkuje systematycznymi represjami.

Sarkisjan zwraca uwagę, że bahaiści nie mają prawa do kształcenia na uczelniach państwowych, wykonywania określonych (dochodowych) zawodów ani obejmowania stanowisk w administracji publicznej. Po rewolucji islamskiej z 1979 roku wielu członków tej społeczności zostało aresztowanych, deportowanych lub straconych [7].

Pomimo wysiłków władz zmierzających do osłabienia sprzeczności etnopolitycznych i religijnych, problem separatyzmu pozostaje istotnym wyzwaniem dla Iranu. W kilku regionach przygranicznych, znajdujących się pod wpływem sąsiednich państw – Azerbejdżanu, Turcji, Iraku i Pakistanu – nadal utrzymują się ogniska działalności separatystycznej. I. Sarkisjan wyróżnia cztery kluczowe obszary napięć etnopolitycznych w Iranie: azerski, kurdyjski, arabski i beludżyjski [7].

Historia powstań i separatyzmu Beludżów

Jednym z kluczowych czynników wpływających na wewnętrzną stabilność kraju oraz bezpieczeństwo narodowe Iranu jest kwestia separatyzmu beludżyjskiego, mającego istotny wpływ na sytuację polityczną i społeczną w państwie.

Beludżowie to lud irański o koczowniczej kulturze i rozwiniętej strukturze plemiennej, posługujący się językiem z grupy języków irańskich i wyznający sunnicki madhab hanaficki. Ich ojczyzna, Beludżystan, to suchy, pustylny i górzysty region historyczno-geograficzny w Azji Południowej. Obejmuje pakistańską prowincję Beludżystan, irańską prowincję Sistan i Beludżystan oraz południowe obszary Afganistanu – części prowincji Nimroz, Helmand i Kandahar. Pomimo wspólnej tożsamości etnicznej i językowej, społeczności beludżyjskie cechuje wysoki stopień fragmentacji, wynikający z plemiennej organizacji społeczeństwa oraz różnic w statusie politycznym w poszczególnych krajach [1, 7].

Większość Beludżów zamieszkuje pakistańską prowincję Beludżystan, która stanowi 44% terytorium Pakistanu. Według różnych szacunków liczba Beludżów w pakistańskim Beludżystanie sięga 12,3 mln osób, a kolejne około 12 mln mieszka w prowincjach Pendżab i Sindh (według spisu z 2017 roku). W irańskiej prowincji Sistan i Beludżystan żyje około 3 mln Beludżów, a w całym Iranie ich populacja wynosi około 5 mln. W Afganistanie mieszka natomiast około 3 mln Beludżów. Tym samym w przygranicznych prowincjach trzech państw żyje łącznie 18 mln Beludżów, a ich całkowita liczba na świecie szacowana jest na około 30 mln osób [1].

Rysunek 1. Prowincje Beludżystan w Pakistanie oraz Sistan i Beludżystan w Iranie na mapie regionu.



Źródło: <https://www.rferl.org/a/iran-jaish-al-adl-baluch-separatists/32901542.html> (dostęp: 05.02.2025).

Przez wieki Beludźowie dążyli do stworzenia własnego państwa, jednak w różnych okresach historii, jako miejscowe chanaty i księstwa, wchodzili w skład zmieniających się potężnych państw i imperiów: Kalifatu Arabskiego (VII-X w.), Imperium Gaznawidów i dynastii Ghurydów (X-XIII w.), Sultanatu Delhijskiego, ulusu chana Czagataja (XIII-XIV w.), Imperium Timuridów (XV w.), Imperium Wielkich Mogołów sułtana Babura (XVI-XVII w.), Imperium Durrani. W XVII wieku Beludźowie utworzyli Chanat Kalat, który od XVIII wieku do połowy XIX wieku uzyskał względną niezależność, balansując pomiędzy interesami rywalizujących imperiów — Mogołów i afgańskich władców. W 1839 roku Kalat wszedł w skład Imperium Brytyjskiego. W okresie podziału Brytyjskich Indii (1947 r.) na mapie politycznej świata pojawiły się niepodległe państwa Indie i Pakistan. Pakistan stał się prawnie konstytucyjnym i politycznym spadkobiercą Wielkiej Brytanii w odniesieniu do terytoriów, które przyznano mu po podziale. Przywódca Beludźów, Mir Ahmad Khan, w tym samym roku ogłosił niepodległość Chanatu Kalat. W wyniku zbrojnego starcia z ekspedycyjnym korpusem Pakistanu, przywódca Beludźów odniósł zwycięstwo, tym samym na krótki okres zapewniając niepodległość Chanatu Kalat. W marcu 1948 roku założyciel Pakistanu, Muhammad Ali Jinnah, zmusił M.A. Khana do podpisania dokumentu o przystąpieniu do Pakistanu, a w kwietniu tego samego roku pakistańska armia przejęła kontrolę nad prowincją [1].

Jak zauważa R. Dżumadżanow, pomimo terytorialnego podziału między trzy państwa, lud beludżyjski nie zrezygnował z idei samostanowienia i od 1947 roku nieustannie walczy o swoje prawa. Dżumadżanow twierdzi, że we wszystkich trzech krajach, które podzieliły Beludżystan, rdzenni mieszkańcy czuli się „ludźmi drugiej kategorii”, pozbawionymi prawa do zarządzania własnymi ziemiami. Interesy biednej i niepiśmiennej ludności beludżyjskiej były ignorowane. Niemniej jednak, pomimo tego, wielu Beludźów podejmowało studia na uniwersytetach, a po zdobyciu wykształcenia zaczęli aktywnie bronić swoich praw, walczyć o swoje interesy polityczne i o zachowanie swojej tożsamości [1].

Jak pisze K. Iqbal, Pakistan zainicjował kilka niewielkich projektów rozwoju w swoim Beludżystanie przy pomocy Chin, na przykład rozszerzając port Gwadar nad Morzem Arabskim. Jednak równocześnie kraj prowadził politykę zmiany składu demograficznego regionu, zachęcając migrację grup etnicznych z Pendżabu i Kaszmiru do beludżyjskiej prowincji. Mimo że środki te zapewniły minimalny poziom modernizacji w regionie, Beludźowie „z pogardą” odnosili się do przybyszów. Wiele osób oskarżyło Pendżabców i Kaszmiczyków o to, że działają jako „piąta kolumna pakistańskiego wywiadu (ISI)”, a niektórzy z przybyszów stali się ofiarami przemocy. Analizując sytuację Beludźów w Iranie, Iqbal twierdzi, że Iran stosuje „systematyczną przemoc” i „marginalizację” Beludźów w prowincji Sistan i Beludżystan, odbierając im podstawowe prawa,

w tym prawo do praktykowania swoich rytuałów religijnych zgodnie z sunnicką doktryną [1].

Prowincja Sistan i Beludżystan zajmuje powierzchnię 178 431 km², co czyni ją największą jednostką administracyjną Iranu. Położona na południowym wschodzie kraju, graniczy z Pakistanem i Afganistanem, a jej stolicą jest Zahedan. Do największych miast należą także Chasz, Iranszahr, Sarawan oraz port handlowy Czabahar nad Morzem Arabskim, który ma kluczowe znaczenie dla irańskiej strategii handlowej i geopolitycznej [5].

Region ten dzieli się na dwie części: Sistan na północy oraz Beludżystan na południu. W południowych rejonach prowincji większość mieszkańców stanowią Beludżowie. Nazwa Beludżystan oznacza „Ziemie Beludżów”, podczas gdy nazwa Sistan wywodzi się od staroperskiego Sakastana, czyli „Ziemi Saków” [5].

Sistan i Beludżystan jest jednym z najsłabiej rozwiniętych regionów Iranu, zmagającym się z wysokim poziomem ubóstwa, ograniczonym dostępem do infrastruktury i niskim poziomem usług publicznych. Mimo bogactwa surowców naturalnych, takich jak rudy miedzi, złota oraz węgiel, rozwój przemysłu wydobywczego pozostaje ograniczony. Gospodarka prowincji opiera się głównie na rolnictwie, hodowli oraz handlu przygranicznym, który odgrywa istotną rolę w utrzymaniu lokalnych społeczności. Region ten, z uwagi na swoje peryferyjne położenie, trudne warunki naturalne i napięcia etniczne, odgrywa istotną rolę w kształtowaniu polityki bezpieczeństwa państwa.

Według R. Dżumadżanowa w Iranie sytuacja Beludżów do lat 70. była bardziej spokojna niż w Pakistanie, ponieważ byli oni znacznie bliżsi Irańczykom pod względem językowym i kulturowym niż ludom Pakistanu. Relacje zmieniły się po dojściu do władzy duchowieństwa szyickiego w 1979 roku, ponieważ Beludżowie są sunnitami, a ich status w życiu społecznym i politycznym kraju „natychmiast spadł”. Irańscy Beludżowie tradycyjnie zajmowali się transgranicznym handlem, w tym przemytem afgańskich narkotyków, co spotykało się z represjami ze strony irańskich służb granicznych oraz Korpusu Strażników Rewolucji Islamskiej (IRGC). W odpowiedzi na te działania część przygranicznych grup zaczęła odwoływać się do haseł religijnych, podkreślając swoją sunnicką tożsamość w celu mobilizacji zwolenników [1].

W 2003 roku w irańskim Sistanie i Beludżystanie pojawiła się zbrojna organizacja Dżundullah („Wojsownicy Allaha”), która według R. Dżumadżanowa była salaficka, chociaż to stwierdzenie można uznać za kontrowersyjne, ponieważ trudno jednoznacznie określić jej ideologiczną przynależność. Organizacja została założona w celu walki o prawa sunnickich Beludżów, których uważała za uciskanych przez szyicką większość w Iranie. Głównym celem Dżundullah było stworzenie niepodległego państwa islamskiego na terenie Sistanu i Beludżystanu. W swojej działalności organizacja stosowała metody ataków terrorystycznych, w tym zamachy, napaści na obiekty wojskowe i policyjne oraz porwania [1].

Zgodnie z raportami Departamentu Stanu USA, cele Dżundullah obejmowały uznanie przez rząd Iranu kulturalnych, religijnych, ekonomicznych i politycznych praw Beludżów, a także szerzenie informacji na temat sytuacji w Beludżystanie.

Początkowo Dżundullah koncentrowała swoje ataki na przedstawicielach irańskich służb bezpieczeństwa, szczególnie Korpusu Strażników Rewolucji Islamskiej, jednak z czasem zaczęła przeprowadzać ataki także na cywilów. W wyniku jej działań zginęły setki osób. Liderem Dżundullah był Abdulmalik Rigi, który przewodził organizacji od jej założenia. Jednak w 2010 roku został on aresztowany i stracony przez władze irańskie, co było poważnym ciosem dla organizacji [1, 2, 8].

Dżajsz al-Adl: cele, metody i ideologia

Po likwidacji Abdolmoleka Rigi Dżundullah stanęła w obliczu wewnętrznych podziałów, co doprowadziło do powstania nowych grup, takich jak Harakat-e Ansar-e Iran („Ruch Partyzantów Iranu”) i Dżajsz al-Adl („Armia Sprawiedliwości”) – dwóch najbardziej aktywnych formacji powstańczych. Masowe przejście byłych członków Dżundullah do Dżajsz al-Adl skłoniło niektórych ekspertów, takich jak I. Sarkisjan, do uznania tej organizacji za następczynię Dżundullah [7].

Według K. Sharifiego Dżajsz al-Adl została założona w 2012 roku przez Abdurraufa, brata zmarłego lidera Dżundullah. Jednak Abdurrauf wkrótce opuścił tę organizację i utworzył nową grupę – Dżajsz an-Nasr. Następnie, według Sharifiego, obie organizacje szybko połączyły się pod sztandarem Dżajsz al-Adl pod przywództwem Salahuddina Farukiego [9].

Zgodnie z oficjalnymi źródłami irańskimi, grupa Dżajsz al-Adl, mająca swoją bazę na terytorium Pakistanu, jest jedną z najbardziej aktywnych organizacji zbrojnych działających w południowo-wschodnich regionach Islamskiej Republiki Iranu. Na przestrzeni ostatnich dekad grupa przeprowadziła szereg ataków, głównie w prowincji Sistan i Beludżystan, stosując zarówno metody partyzanckie, jak i terrorystyczne [2, 6, 8].

Jednym z pierwszych poważnych ataków było zdarzenie z sierpnia 2012 roku, w wyniku którego zginęło dziesięciu żołnierzy Korpusu Strażników Rewolucji Islamskiej. W październiku 2013 roku grupa zaatakowała irańskich strażników granicznych w mieście Sarawan, co doprowadziło do śmierci 14 żołnierzy. W listopadzie tego samego roku bojownicy Dżajsz al-Adl dokonali zamachu na prokuratora miasta Zabol, w wyniku którego zginął on wraz ze swoim kierowcą. W tym samym miesiącu organizacja przeprowadziła również atak na patrol straży granicznej, zabijając 14 osób i raniąc 6 kolejnych [2].

W kolejnych latach aktywność zbrojna grupy nie ustała. W lutym 2014 roku porwano pięciu irańskich policjantów, co doprowadziło do zaostrzenia relacji irańsko-pakistańskich. W październiku tego samego roku w ataku na prowincję Sistan i Beludżystan zginęło trzech funkcjonariuszy sił bezpieczeństwa. W kwietniu 2015 roku w wyniku transgranicznego ataku zginęło ośmiu irańskich strażników granicznych, a kilka dni później zabito dwóch oficerów IRGC [2].

W kwietniu 2017 roku bojownicy Dżajsz al-Adl zastawili zasadzkę na irański patrol graniczny, w wyniku czego śmierć poniosło dziewięciu żołnierzy. W październiku 2018 roku grupa porwała 12 funkcjonariuszy sił bezpieczeństwa i wywiozła ich na terytorium Pakistanu; pięciu zostało uwolnionych po miesiącu, a czterech – w marcu 2019 roku [2].

W styczniu i lutym 2019 roku w prowincji Sistan i Beludżystan doszło do serii ataków, które spowodowały liczne ofiary wśród ludności cywilnej i personelu wojskowego. Jednym z najbardziej tragicznych zdarzeń był atak z 13 lutego 2019 roku, gdy zamachowiec-samobójca zaatakował autobus z żołnierzami IRGC, zabijając co najmniej 27 osób. Incydent ten spotkał się z potępieniem ze strony oficjalnych władz Iranu [2].

W grudniu 2019 roku Dżajsz al-Adl przyznała się do przeprowadzenia zamachu terrorystycznego w portowym mieście Chabahar, gdzie w wyniku eksplozji zamachowca-samobójcy zginęło dwóch funkcjonariuszy policji, a 40 osób zostało rannych [2].

Sharifi twierdzi, że grupa Dżajsz al-Adl działa aktywnie wzdłuż 900-kilometrowej, „dziurawej” granicy

między Iranem a Pakistanem [9]. Działalność bojowników w tym regionie od długiego czasu stanowi czynnik napięcia w stosunkach irańsko-pakistańskich. Na początku 2024 roku Iran przeprowadził masowy atak raketowy na bazy tej grupy w pakistańskim Beludżystanie, co spowodowało odpowiedź ze strony pakistańskiej armii, która uderzyła w terytorium Iranu. Incydent ten postawił Iran i Pakistan na krawędzi pełnoskalowego konfliktu zbrojnego [4].

Według autora, to wydarzenie świadczy o poważnym zagrożeniu, jakie działalność Dżajsz al-Adl w strefach przygranicznych Iranu i Pakistanu stanowi dla bezpieczeństwa regionalnego i międzynarodowego. Potencjalna niekontrolowana eskalacja zbrojnego konfliktu między Iranem a Pakistanem, posiadającym broń jądrową, może prowadzić do poważnej destabilizacji w regionie Azji Południowej i Bliskiego Wschodu.

Rysunek 2. Cele irańskich i pakistańskich ataków w odpowiedzi na eskalację wywołaną działalnością terrorystyczną Dżajsz al-Adl, zaznaczone na mapie Bliskiego Wschodu i Azji Południowej (styczeń 2024).



Źródło: <https://www.rferl.org/a/iran-pakistan-strikes-baluchistan/32780717.html> (dostęp: 05.02.2025).

Zgodnie z danymi irańskich mediów, celem Dżajsz al-Adl jest właśnie prowokowanie destabilizacji Iranu. W irańskim dyskursie grupa ta uważana jest za narzędzie obcych państw, dążących do osłabienia irańskiej państwowości i pogłębienia wewnętrznych sprzeczności. Irańskie służby wywiadowcze twierdzą, że bojownicy są finansowani przez geopolitycznych przeciwników Iranu, takich jak USA, Izrael i Arabia Saudyjska. Z tego powodu w Iranie grupę nazywają

„Dżajsz al-Zulm” („Armia Niesprawiedliwości”), podkreślając, że nie wyraża ona interesów irańskich sunnitów i Beludżów, lecz jest siłą proxy obcych graczy prowadzących działalność wywrotową przeciwko Iranowi [6].

Jednakże, ten punkt widzenia jest krytykowany. K. Beludż nie zgadza się z twierdzeniami irańskiego wywiadu i zauważa, że wyjaśnianie oporu Beludżów wyłącznie amerykańską pomocą wojskową lub

saudyjskim finansowaniem ignoruje wieloletnią politykę represji Iranu wobec Beludżów. Z jego słów wynika, że finansowanie Dżajsz al-Adl pochodzi głównie od zamożnych Beludżów mieszkających w krajach Zatoki Perskiej. Ważnym źródłem dochodów grupy jest także przemyt narkotyków. Iran znajduje się na jednym z głównych szlaków transportu afgańskiego opium do Europy, co sprzyja rozwojowi nielegalnego biznesu [1].

Ponadto, Beludż zauważa, że po wycofaniu się amerykańskich wojsk z Afganistanu w 2021 roku, znaczna część porzuconego uzbrojenia trafiła w ręce różnych formacji bojowych, w tym Dżajsz al-Adl. Wskazuje również na zakupy broni przez grupę na czarnym rynku. Z kolei D. Garofalo uważa, że twierdzenia Iranu o wsparciu Dżajsz al-Adl przez obce państwa są słabo uzasadnione. Zwraca również uwagę na to, że grupa niedawno zainicjowała kampanię zbierania datków kryptowalutowych przez swoją stronę internetową i kanał Telegram [1].

Według H. Beludża, oficjalnego przedstawiciela grupy Dżajsz al-Adl, organizacja ma złożoną strukturę, składającą się z kilku kluczowych działów [3]:

1. *Dział kierowniczy*: Dział ten obejmuje najwyższe kierownictwo, a także centralną radę i specjalistyczne grupy doradcze, które podejmują najważniejsze decyzje.

2. *Departament informacji i bezpieczeństwa*: Dział ten działa w dwóch głównych obszarach: zbieranie informacji o wrogich organizacjach oraz obrona przed atakami skierowanymi przeciwko samej grupie.

3. *Departament wojskowy*: Dział ten dzieli się na sześć jednostek geograficznych, z których każda odpowiada za operacyjną działalność w określonym regionie.

4. *Departament społeczny i polityczny*: Składa się z trzech głównych struktur:

- o *Dział komunikacji z publicznością*: Zajmuje się nawiązywaniem i utrzymywaniem relacji z opinią publiczną oraz wpływowymi starszyznami, w celu wzmocnienia zewnętrznych więzi organizacyjnych. Odpowiada również za interakcje z ludźmi, różnymi grupami i innymi zainteresowanymi stronami, udzielając informacji na temat działalności organizacji.

- o *Dział polityczny*: Współpracuje z politykami i partiami politycznymi w celu identyfikacji i formowania wspólnych interesów.

5. *Dział finansowy*: Odpowiada za zarządzanie finansami i zasobami organizacji.

H. Beludż zaprzecza twierdzeniom, że Dżajsz al-Adl jest grupą separatystyczną i salaficką, jak często twierdzą irańskie i zagraniczne media. Według niego głównym celem grupy jest obalenie irańskiego rządu i przywrócenie „godności narodowi irańskiemu”, w szczególności Beludżom, innym grupom etnicznym oraz wszystkim sunnitom Iranu. Powodem walki, jak twierdzi Beludż, jest niezadowolenie z dyskryminacji i brutalności, z jaką spotyka się jego naród. Oskarża irański rząd o podążanie za sektancką ideologią i wykorzystanie zasobów finansowych oraz ludzkich kraju do tłumienia opozycji i szerzenia szyickiej ideologii, co prowadzi do „marnotrawienia zasobów

państwa”. Zgodnie z twierdzeniami Beludża wszyscy bojownicy Dżajsz al-Adl są irańskimi Beludżami, choć wśród nich znajdują się również inni obywatele Iranu [3].

D. Garofalo wskazuje, że szczegółowe wywiady z przedstawicielami Dżajsz al-Adl wyraźnie ujawniają cele tej „dżihadyjskiej organizacji”. Głównym celem grupy jest obalenie reżimu w Iranie. Ponadto, organizacja dąży do wspierania irańskiego komponentu sunnickiego, w szczególności Beludżów oraz innych irańskich mniejszości etnicznych, takich jak Kurdowie. W jego ocenie grupa „zdecydowanie realizuje lokalne cele dżihadyjskie, które są odległe od globalnego dżihadyzmu”, o czym świadczy jej odmowa przyjmowania zagranicznych bojowników oraz gotowość do współpracy wyłącznie z lokalnymi organizacjami w walce z irańskim rządem [3].

Zdaniem Garofalo organizacja ta różni się od dżihadyjskich grup o regionalnych lub globalnych ambicjach, takich jak Al-Kaida czy „Państwo Islamskie”. Twierdzi, że podobnie jak syryjskie grupy dżihadyjskie, Dżajsz al-Adl opowiada się za walką zbrojną o charakterze wyłącznie lokalnym, zarówno ideologicznym, jak i operacyjnym, „przypominającą bardziej ruch oporu lub grupę partyzancką” [3].

W ocenie Garofalo organizacja, działająca na terenie Iranu, „stara się unikać działań wojskowych, które mogłyby zaszkodzić ludności cywilnej”. Wskazuje także na „brak chęci atakowania infrastruktury, przestrzeni publicznych czy zabijania więźniów, w odróżnieniu od brutalnych operacji takich jak te przeprowadzane przez ISIS, które w swojej działalności dążyły do najbardziej ekstremalnej formy dżihadyzmu w nowożytnej historii”. Jednocześnie podkreśla, że jej możliwości militarne oraz wsparcie w dążeniu do obalenia rządu „pozostają ograniczone” [3].

Wnioski

Podsumowując, można stwierdzić, że Dżajsz al-Adl stanowi poważne zagrożenie dla bezpieczeństwa narodowego Iranu. Jej działalność wpływa nie tylko na stabilność wewnętrzną kraju, ale także na relacje Iranu z sąsiednimi państwami, przede wszystkim z Pakistanem. W przyszłości nie można wykluczyć eskalacji konfliktu, w tym również na terytorium Afganistanu, którym od 2021 roku rządzą Talibowie.

Jeśli chodzi o ideologię Dżajsz al-Adl, to na chwilę obecną trudno jednoznacznie ją określić. Niemniej jednak, z całą pewnością można stwierdzić, że organizacja ta nie jest ugrupowaniem salafickim, w przeciwieństwie do wielu radykalnych grup działających na Bliskim Wschodzie. Przeciwnie, wykazuje ona tendencję ku ideologii nacjonalistycznej, w której czynniki etniczne i narodowe odgrywają większą rolę niż aspekty religijne. Co więcej, brak dowodów na to, że organizacja dąży do utworzenia sunnickiego państwa teokratycznego w Beludżystanie irańskim. Zamiast tego koncentruje się na realizacji celów związanych z ochroną i samostanowieniem określonej grupy etnicznej – Beludżów zamieszkujących Iran.

Jednocześnie nie ma wątpliwości, że w realizacji swoich celów Dżajsz al-Adl stosuje metody terror-

ystyczne, co poważnie destabilizuje sytuację w Beludżystanie – regionie położonym na newralgicznej granicy między Bliskim Wschodem a Azją Południową. Organizacja aktywnie wykorzystuje terytorium Pakistanu do przeprowadzania ataków na Iran, co generuje dodatkowe zagrożenia dla bezpieczeństwa regionalnego i międzynarodowego. Ryzyka te związane są nie tylko z eskalacją militarną i internacjonalizacją konfliktu, ale także z możliwością ingerencji innych aktorów regionalnych i globalnych, takich jak Afganistan, Stany Zjednoczone, Indie, Arabia Saudyjska, Chiny i inne.

Bibliografia:

1. Джумажанов Р., Белуджский сепаратизм больше не является забытой проблемой, <https://www.inform.kz/ru/beludzhskiy-separatizm-bolshe-ne-yavlyaetsya-zabitoy-problemoy-a51975> (dostęp: 04.02.2025).
2. Explainer: What is 'Jaish al-Adl' and what makes it a dreaded terrorist group?, <https://www.presstv.ir/Detail/2024/01/17/718390/explainer-what-jaish-adl-what-makes-dreaded-terrorist-group> (dostęp: 04.02.2025).
3. Garofalo D., Inside Jaish al-Adl Armed Struggle: Interview with the Spokesperson, <https://thekhorasandiary.com/en/2023/12/02/inside-jaysh-al-adl-armed-struggle-interview-with-the-spokesperson> (dostęp: 04.02.2025).

jaysh-al-adl-armed-struggle-interview-with-the-spokesperson (dostęp: 04.02.2025).

4. Iran Tries To Allay Fears Of Rising Tensions Following Pakistan Cross-Border Attacks, <https://www.rferl.org/a/iran-pakistan-strikes-baluchistan/32780717.html> (dostęp: 04.02.2025).

5. Province of Sistan and Baluchistan, https://www.iranchamber.com/provinces/21_sistan_baluchistan/21_sistan_baluchistan.php (dostęp: 04.02.2025).

6. Riyadh provided Jaish ul-Adl terrorists with weapons, equipment: IRGC cmdr., <https://www.presstv.ir/Detail/2020/02/18/618993/Iran-Brigadier-General-Mohammad-Pakpour-Saudi-Arabia-Jaish-ul-Adl-terrorist-group-> (dostęp: 04.02.2025).

7. Саркисан И., Современный сепаратизм в Иране, <http://www.iimes.ru/?p=48655> (dostęp: 04.02.2025).

8. Senior leader of Jaish-ul-Adl terrorist group killed: Source, <https://www.presstv.ir/Detail/2015/04/20/407112/Jaish-ul-Adl-second-in-command-killed> (dostęp: 04.02.2025).

9. Sharifi K., What Is Jaish Al-Adl, The Separatist Group Targeting Iranian Forces?, <https://www.rferl.org/a/iran-jaish-al-adl-baluch-separatists/32901542.html> (dostęp: 04.02.2025).

TECHNICAL SCIENCES

RISK FACTOR IN ECONOMIC FORMATION FOR DEVELOPMENT OF OIL AND GAS RESOURCES (ON THE EXAMPLE OF AZERBAIJAN)

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Abstract

The article describes that developed countries such as Norway and the United States annually receive hundreds of billions of US dollars in the development of oil and gas resources due to the maintenance of the existing scientific and technical potential, the constant development of infrastructure and economic mechanisms, the use of accumulated national and world experience, and the implementation of commercially attractive projects. The development of the oil and gas sector is considered from the point of view of the general technological process, taking into account the market for high-tech products and services related to oil and gas operations. It is proposed to mobilize the existing scientific and technical potential of the republic and invest in the implementation of advanced technologies for the production of competitive products and their sale on world markets. The article describes the ways of modernization and development of an innovation-oriented approach to the development of hydrocarbon resources both on land and at sea, ways to solve existing and prospective problems in this area based on a comprehensive transformation of the technical system and economic mechanism.

Keywords: oil and gas, growth of reserves, development, investment, innovation, scientific and technological progress, oil sector

I. Introduction

On a global scale, in the context of continuous deterioration in the quality of the resource base of the oil and gas production industry and minimal increases in oil reserves due to exploration work, as well as the non-replenishing volumes of production, increasing oil recovery is acquiring strategic importance for stabilizing oil production and fostering its growth.

In the 21st century, science has become a powerful productive force, and scientific and technical potential is a determining factor in the competitive struggle of countries in the world market. National power increasingly depends on knowledge, science-intensive activities, and high technologies.

The practice of developed countries in developing oil and gas fields shows that the growth of oil recovery depends on the substantiation of operational facilities. Today, in industrially developed countries, 70 to 90% of GDP growth is achieved through the use of scientific research and development, i.e., through innovation. The main purpose of innovation policy today is to preserve accumulated scientific and technical potential while developing the infrastructure and economic mechanisms that launch innovation processes. Worldwide, the state plays a decisive role in creating innovation infrastructure. Financial resources invested in infrastructure are returned through increased employment and higher tax collection. Additionally, a layer of entrepreneurs oriented toward high-tech business is emerging.

The role of the state in the development of oil and gas resources is significant not only in oil-producing countries of the third world but also in industrially

developed countries such as the USA, Canada, Great Britain, Norway, and Australia. Over the past decades, the state's focus on the innovative aspects of the oil and gas sector has increased significantly. This is because the dynamics of innovation processes largely determine the efficiency of the oil and gas sector and its useful return to society. All mechanisms of state regulation—licensing, tax, pricing, investment, anti-monopoly, scientific, and technical policy—along with direct state participation in economic activity, affect the dynamics of technological development in the sector. The model of interaction between the state and oil and gas companies is, to some extent, a model for the innovative development of the oil and gas sector. This is especially evident in industrially developed countries like the USA and Norway.

USA The US government's stance on the oil and gas sector is outlined in the 2001 document titled *National Energy Policy*. The document emphasizes energy security, defined as a functioning energy sector that ensures sustainable public welfare growth while preserving the environment. In the US, there is no conflict between high-tech sectors and raw-material-based industries.

Norway In June 2002, the Ministry of Energy presented the White Paper to the Storting (the Norwegian parliament), examining the prospects and challenges of the national oil and gas industry. Two scenarios for the development of oil and gas production on the Norwegian continental shelf were presented: a scenario of declining production and a long-term scenario. The former implies a gradual reduction of the oil and gas industry, while the latter envisions another

100 years of development. The Norwegian government sees the continental shelf as a basis for long-term development and a market for high-tech goods and services related to oil and gas operations.

The interaction of Azerbaijan's oil and gas sector with its economy is extremely close. In Soviet times, extensive development of the oil and gas industry led to declining profitability. This imbalance became critical, prompting a transition to a market economy. During this initial stage, production volumes declined while the influence of the oil and gas sector on the economy and budget revenues sharply increased. For nearly 15 years, Azerbaijan's economy, including its oil and gas sector, has undergone economic transformations marked by uncertainties in scientific and technical priorities.

At the present stage, the role of oil and gas enterprises and the state in ensuring effective functioning and breakthroughs in the gas sector has been re-evaluated. Analysis of the global market reveals that science-intensive products account for \$2.3 trillion, projected to reach \$4 trillion in 15 years. The USA earns \$700 billion annually from high-tech exports, Germany \$530 billion, and Japan \$400 billion.

Azerbaijan's search for effective forms of oil business is driven by the significant role of the oil and gas sector and its competitiveness in the external market. The weakening of favorable internal economic factors such as the inconvertibility of the national currency, cheap labor, and low initial costs necessitates answers to critical questions:

- What is the nature and intensity of specific stimulating factors on innovation in the domestic oil and gas sector?
- What level of competitive advantage should be targeted?
- What are Azerbaijan's opportunities for participating in global oil and gas processes?
- Who are potential partners for strategic relationships in the sector?
- What are the current and future opportunities for implementing technological innovations?

Azerbaijan has accumulated significant experience in field development, but it remains underutilized. Developing oil fields requires complex scientific research, incorporating foreign experience, modern achievements, and economic factors. Aging wells, high formation water cuts, and deteriorating conditions further challenge recoverable reserves. Yet, opportunities exist to increase the raw material base by improving oil recovery onshore and offshore through innovative approaches.

II. Methods

Modernization in Oil Production Three levels of possible modernization can be identified:

- 1.Improvement and optimization of current development system parameters.
- 2.Classification of oil deposits by geological and technical factors to apply modern technologies.
- 3.Organizational and technical changes in production, collection, and preparation structures.

From this point of view, using the accumulated rich scientific and technical experience, Azerbaijan needs to:

1.Develop a mechanism for commercializing technologies suited to its economy:

- Select developments with high commercialization potential.
- Form investment-attractive projects.
- Expand investments for introducing competitive new technologies.
- Reduce investor risks.

1.Establish a constructive system of relationships between government, enterprises, and scientific organizations, ensuring equality and mutual benefit. Strategic goals include improving domestic production efficiency and competitiveness through:

- Property rights protection.
- Improved innovation information support.
- Stable business conditions.
- Tax incentives for innovation.

1.Manage innovations effectively within the oil and gas sector by fostering knowledge management and professional development to compete globally. Key aspects include valuing knowledge, learning continuously, and adopting organizational dynamism.

2.Develop an innovation-oriented approach to subsoil development by creating budgets for exploration, supporting effective technologies, and improving monitoring systems.

III. Results

The global energy mix is expected to undergo a transformative shift by 2050, with renewable energy sources such as wind, solar, and hydropower playing a dominant role. Despite this transition, oil and gas will remain integral to the energy landscape due to their versatility, particularly in industrial applications, aviation, and petrochemicals. Analysts predict that oil and gas will still account for approximately 40-50% of the global energy supply by mid-century, albeit with a reduced share compared to today.

Advances in technology, such as carbon capture, utilization, and storage (CCUS), will enable continued oil and gas production while mitigating environmental impacts. Additionally, the development of hydrogen as a clean energy carrier, often produced from natural gas, will provide new avenues for the oil and gas sector to align with decarbonization goals.

Opportunities for Azerbaijan: Azerbaijan is well-positioned to adapt to these changes and establish itself as a leader in sustainable oil production technologies. Key strategies include:

- Investing in carbon capture and storage (CCS) infrastructure to reduce greenhouse gas emissions from oil and gas operations.
- Promoting the use of digital technologies, such as artificial intelligence and predictive analytics, to optimize resource extraction and reduce waste.
- Diversifying energy exports by developing expertise in hydrogen production and integrating renewable energy sources into the national grid.

- Enhancing collaboration with international energy companies to bring advanced, environmentally friendly technologies to Azerbaijan's oil fields.

- Strengthening educational and research institutions to build a workforce capable of driving innovation in the energy sector.

Through these measures, Azerbaijan can not only maintain its competitiveness in the global energy market but also contribute to the global transition toward a more sustainable energy future.

Conclusion

Taking into account the above, the following main technological and economic principles are highlighted:

- More complete extraction of oil and gas reserves from the subsoil.

- Reduction of investment risks in the development of new oil areas, including deep-seated gas formations.

- Stimulation of the development of small oil fields and deposits that are unprofitable under normal taxation conditions.

- Use of a balanced regime of extraction (equilibrium regime), allowing for the extraction of 10-18% more oil than under "forced" oil extraction.

- Increase in the hydrodynamic continuity of the reservoir through compaction and drilling based on detailed geological modeling of the object and its current oil saturation.

- Effective use of periods of high oil prices by enterprises to fund, at their own expense, capital-intensive work on the construction of new wells.

- Intensive impact on low-productivity, low-water deposits to reduce the heterogeneity (asynchrony) in the rates of reserve development.

- Consideration of the selling price of oil in domestic and foreign markets, as the practice of assessing the effectiveness of technologies and projects based on transfer prices for oil underestimates their economic attractiveness.

- Use of environmentally friendly technologies in the production and transportation of hydrocarbon raw materials.

The main prerequisites for the formation of a scientific approach include diagnostics, interpretation of data from various studies, and decision-making aimed at extending the development periods of fields.

This requires combining the efforts of the oil and gas business and the state to effectively develop hydrocarbon resources for the benefit of society.

References:

1. Beygulenko I.V., Karimov K.S. Problems of development of offshore oil and gas deposits. M. -2016
2. Karimov K.S. Technical and economic substantiation of exploitation and exploitation of oil fields. Baku. 2014
3. Zubareva V., Sarkisov A. Project risks in the oil and gas industry. - 2005.
4. Report "Ernst and Young" "Main risks for oil and gas companies", 2011.
5. Buzko I.R. Economic risk (methods of analysis, evaluation and limitations). — Donetsk: ІЭП НАН України, 2006
6. Golubitskaya E.A., Kukharensky E.T., Sergeeva I.V. A methodical approach to assessing the efficiency of investments with risk. Ser. Scientific-technical information collection "Communication", Vol. 9- Ю/ІНТІ "Informsvyaz". — M., 1995.
7. Amiraghyan A. C. Mastering of UV-resources shelf // Neftgaz.ru. 2017. No. 8. C. 16–22.
8. Dzyublo A. D., Savinova M. C. Dangerous natural phenomena during the development of oil and gas fields on the shelf of the Sea of Okhotsk // Actual problems of oil and gas. 2018. No. 4(23). C. 57.
9. Dzyublo A. D., Voronova V. B. Investigation of the mechanisms of the occurrence of dangerous natural phenomena during the development of oil and gas deposits on the shelf of arctic and subarctic seas // Safety of work in industry. 2019. No. 4. C. 69–77.
10. M.A.Aliyev., K.S.Karimov et al. "Economics and Management of the Oil and Gas Industry", Baku, 2016
11. K.S. Karimov., F.G.Dadashov "Fundamentals of Project Analysis in the Oil and Gas Industry" Baku, 2014.
12. K.S.Karimov "Technical and economic design of industrial enterprises" Baku, 2014
13. M.Hajizadeh "Economic development model of the oil and gas extraction complex", Baku, 2002
14. E.M.Hajizadeh Z.S.Abdullayev "Modernization of the economic structure of the oil industry. Baku .Sci. 2003

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