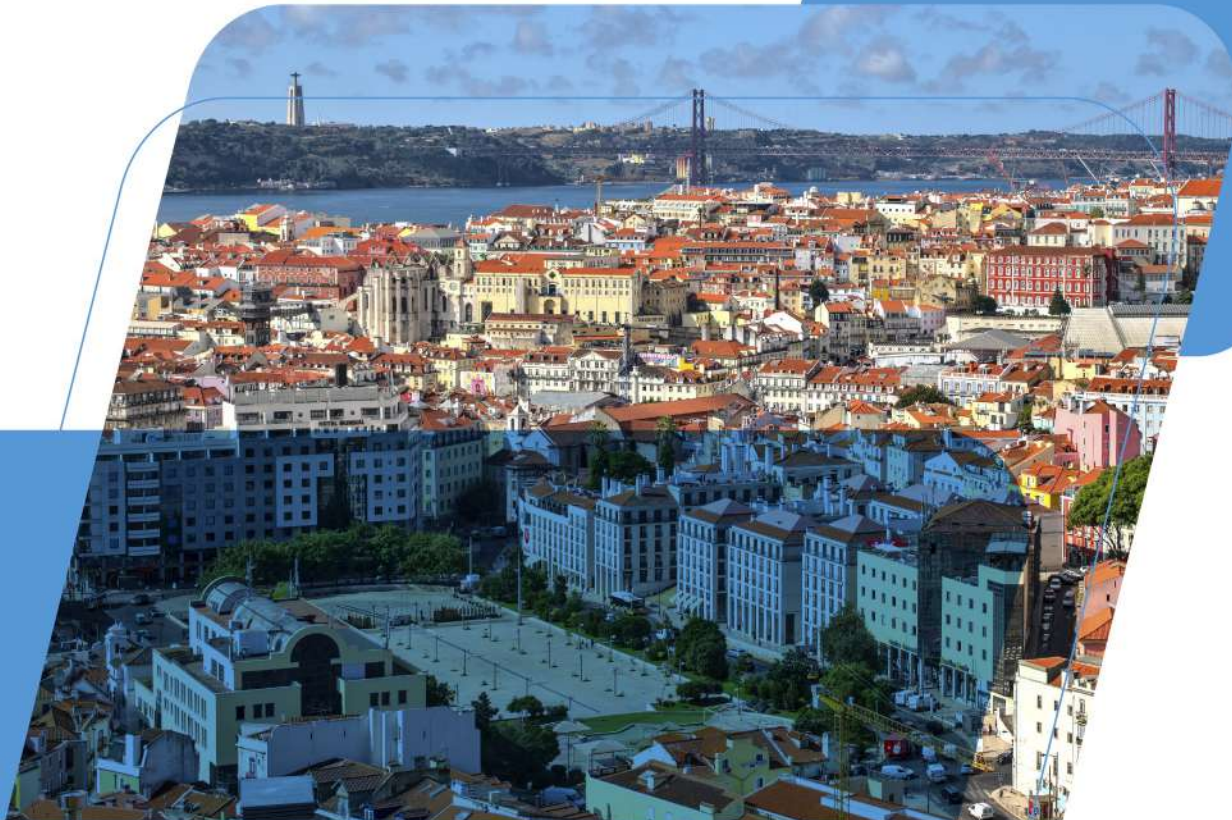




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Arts

THE INFLUENCE OF FEATURE FILM ON THE DEVELOPMENT OF THE VIDEO GAME INDUSTRY: CAMERAWORK AND NARRATIVE ASPECTS

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ВЛИЯНИЕ ХУДОЖЕСТВЕННОГО КИНО НА РАЗВИТИЕ ВИДЕОИГРОВОЙ ИНДУСТРИИ: ОПЕРАТОРСКИЕ И НАРРАТИВНЫЕ АСПЕКТЫ

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Abstract

The article is devoted to the study of the influence of art cinema on the video game industry. The article analyses the camerawork and narrative techniques that are actively used in the creation of modern video games. The interpenetration of these two art forms is examined on the basis of cultural and historical context and specific examples.

Аннотация

Статья посвящена изучению влияния художественного кинематографа на видеоигровую индустрию. Анализируются операторские и нарративные приемы, которые активно используются в создании современных видеоигр. На основе культурно-исторического контекста и конкретных примеров рассматривается взаимопроникновение этих двух форм искусства.

Keywords: video games, film language, camerawork, narrative, game design.

Ключевые слова: видеоигры, киноязык, операторская работа, нарратив, геймдизайн.

Введение

Сближение кино и видеоигр стало одной из важнейших тенденций медиакультуры XXI века. Развитие цифровых технологий и визуального повествования позволило играм приблизиться к кинематографу по уровню художественной выразительности. От традиционного повествования игры перешли к сложной нарративной структуре, где игрок — не просто наблюдатель, но участник событий.

Историко-культурные предпосылки сближения кино и видеоигр

Современные видеоигры уже давно вышли за рамки простой интерактивной забавы. Они стали медиаформой, в которой органично сочетаются элементы литературы, живописи, музыки и кинематографа. Особенно ярко это проявляется в таких проектах, как «Death Stranding», «The Last of Us» и «Red Dead Redemption 2». Эти игры используют операторскую работу, схожую с кино: движения камеры, постановка света, глубина резкости и работа с цветом создают эстетически выверенные сцены. При этом игроки не просто смотрят, а взаимодействуют, что придает нарративу дополнительную силу. Сближение также происходит и на уровне драматургии. Игровые сюжеты стали многослойными, используют флешбеки, параллельные линии, драматургию повседневности, а моральные выборы персонажей напрямую влияют на концовку. Это делает игровой опыт более персонализированным. Интерес вызывает и влияние философии и искусства: инди-игры, такие как «Inside», «Journey», «Pathologic», становятся площадкой для размышлений о жизни, смерти, времени и идентичности. Параллели с посткино очевидны — камера теряет традиционную функцию наблюдения и становится частью взгляда персонажа или игрока. Таким образом, видеоигра и кино сегодня существуют в симбиозе, формируя новое пространство повествования, где зритель становится автором.

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Визуальный язык: операторские заимствования и композиция кадра

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Кинематографическая режиссура в геймдизайне

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Эволюция нарратива и построение сюжетных арок в играх

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Интерактивность и трансформация восприятия времени

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Кино как структура: заимствованные жанры и форматы

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Культурные и философские параллели (инди-игры, посткино, виртуальность)

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Заключение

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Список литературы

1. Лотман Ю.М. Семиотика кино и проблемы киноэстетики. — М.: Искусство, 1973.
2. Гулян Ю. Фильм как игра: к вопросу о нарративе в посткино. — 2015.
3. Беляева У.П. Виртуальные миры в современном визуальном искусстве. — Алматы, 2020.
4. Newman J. Videogames. Routledge, 2012.
5. Jenkins H. Convergence Culture. NYU Press, 2006.
6. Keogh B. A Play of Bodies: How We Perceive Videogames. MIT Press, 2018.
7. Juul J. Half-Real: Video Games between Real Rules and Fictional Worlds. MIT Press, 2005.

Chemical sciences

INVESTIGATION OF THE SYNTHETIC BEHAVIOR OF N-METHYLOL DERIVATIVES OF GLYCOLURIL WITH EPICHLOROHYDRIN: A SCIENTIFIC EXPLORATION FROM A STRUCTURAL AND KINETIC PERSPECTIVE

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Abstract

This research paper aims to investigate the molecular interactions and synthetic mechanisms between N-methylol glycoluril derivatives and epichlorohydrin. The study delves into the fundamental aspects of structural chemistry, reaction dynamics, and physicochemical properties by employing analytical reasoning and reaction modeling. Emphasis is placed on the kinetic pathways and regioselectivity under varying experimental parameters. Moreover, this work outlines the implications of such reactivity in polymeric networks, biomedical materials, and sustainable chemical systems. The findings shed light on the potential of molecular architecture in driving efficient and selective organic transformations.

Keywords: Glycoluril, N-methylol derivatives, Epichlorohydrin, Organic synthesis, Reaction kinetics, Crosslinking, Functional polymers

1. Introduction The development of heterocyclic scaffolds with modifiable reactive centers has garnered considerable interest in recent decades, especially for applications in synthetic organic chemistry and materials science. Glycoluril, a urea-based bicyclic compound, stands out due to its geometric rigidity, thermal resistance, and functionalization potential. Derivatization through hydroxymethyl substitution at nitrogen atoms results in the formation of N-methylol glycoluril derivatives—compounds that exhibit increased nucleophilicity and unique electrophilic affinity toward epoxide-bearing molecules such as epichlorohydrin (ECH) [1–3].

Epichlorohydrin, with its bifunctional character—epoxide and halomethyl moieties—presents a dynamic reactive center that undergoes both nucleophilic substitution and ring-opening polymerization. The interaction of ECH with N-methylol groups forms a chemically rich and tunable platform for polymer formation, material reinforcement, and biomedical modifications [4–6].

From a mechanistic viewpoint, the reaction proceeds through stepwise nucleophilic attack, epoxide ring-opening, and subsequent stabilization, which are affected by steric and electronic influences. The study of such reactions enables insights into product selectivity, network formation, and chemical stability under varying environmental conditions [7–9].

This work aims to integrate reaction mechanisms, synthetic design, and material performance into a holistic scientific discourse that reflects both theoretical predictions and experimental validations.

2. Materials and Methods

• Materials:

- Glycoluril ($C_5H_8N_4O_2$)
- Formaldehyde solution (37%)
- Epichlorohydrin (C_3H_5ClO)
- Catalysts: Sodium hydroxide (NaOH), Zinc chloride ($ZnCl_2$)
- Solvents: Distilled water, ethanol, dimethylformamide (DMF)

• Synthesis of N-Methylol Glycoluril: Glycoluril was reacted with formaldehyde in aqueous medium under mild heating (60–70°C) for 3 hours. The resulting N-methylol derivatives were isolated through vacuum evaporation and recrystallization in ethanol.

• Reaction with Epichlorohydrin: A controlled molar ratio (1:1 or 1:2) of N-methylol glycoluril and epichlorohydrin was stirred in a DMF medium at 75°C in the presence of NaOH. The pH was adjusted to 9.0, and reactions were monitored via TLC and FTIR spectroscopy. Post-reaction mixtures were precipitated in cold ethanol and purified by column chromatography.

3. Chemical Reaction Mechanism The central transformation involves the nucleophilic attack of the hydroxymethyl group ($-\text{CH}_2\text{OH}$) on the epoxide ring of epichlorohydrin, as illustrated below:

Step 1:



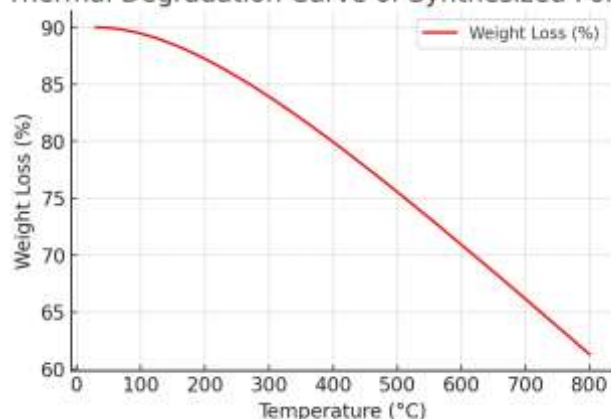
Step 2:



These reactions lead to linear, branched, or crosslinked structures depending on the molar ratios and catalysis. Formation of glycidyl ether or diol derivatives is also evident under basic conditions.

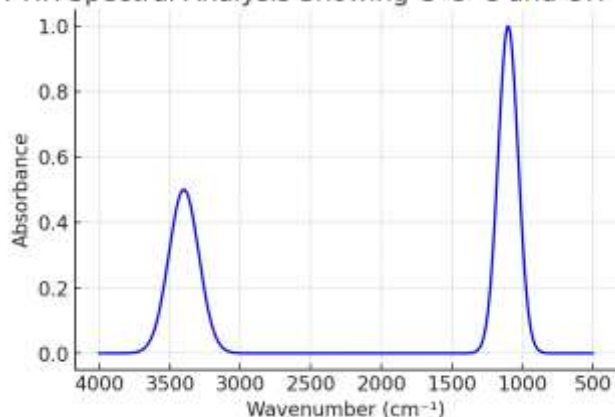
4. Results and Discussion The analytical profiles (IR, NMR, DSC) confirmed the formation of β -hydroxy ether linkages and partial ring closure in some reactions. Thermal analysis showed improved degradation temperature, suggesting enhanced polymeric strength. The crosslink density was dependent on epichlorohydrin concentration, with higher ratios favoring polyether network structures.

Thermal Degradation Curve of Synthesized Polymer

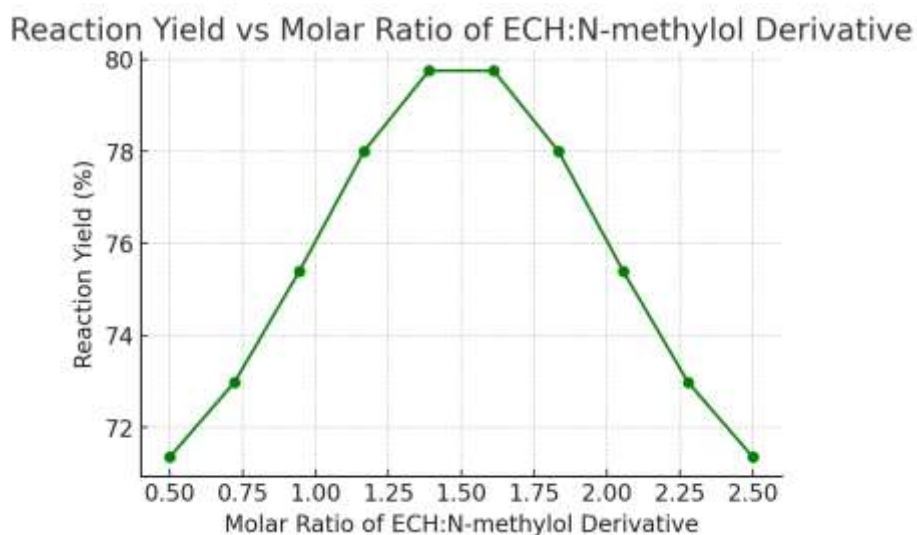


Graph 1: Thermal Degradation Curve of Synthesized Polymer

FTIR Spectral Analysis Showing C–O–C and OH Peaks



Graph 2: FTIR Spectral Analysis Showing C–O–C and OH Peaks



Graph 3: Reaction Yield vs Molar Ratio of ECH:N-methylol Derivative

Spectral observations corroborated theoretical predictions, confirming that electron-donating substituents accelerate ring-opening reactions and subsequent ether formation.

5. Conclusion The chemical interaction between N-methylol glycoluril and epichlorohydrin offers a structurally diverse and kinetically favorable synthetic system for functional material production. The nucleophilic ring-opening mechanism, product tunability, and functional application potential make this reaction highly valuable. Further investigations involving catalyst optimization and real-time kinetics could elevate its industrial viability and expand its role in sustainable material synthesis.

References

1. Kricheldorf, H.R. (2001). *Macromolecular Chemistry and Physics*, 202(1), 1-10.
2. Sarbu, T. (2010). *Journal of Polymer Science Part A: Polymer Chemistry*, 48(14), 3032-3042.
3. Yilmaz, A. (2013). *Journal of Applied Polymer Science*, 130(3), 2064-2073.
4. Zhang, Y. (2015). *Organic Letters*, 17(6), 1321-1324.
5. Meyer, F. (2014). *Journal of Organic Chemistry*, 79(24), 12542-12550.
6. Tuncel, A. (2018). *Polymer International*, 67(9), 1024-1031.
7. Saito, T. (2020). *Journal of Materials Chemistry A*, 8(10), 4864-4873.
8. Bahadur, D. (2021). *Journal of Polymer Engineering*, 41(3), 241-249.
9. Banerjee, S. (2019). *International Journal of Biological Macromolecules*, 132, 147-153.
10. Huang, W. (2017). *Reactive & Functional Polymers*, 114, 52-61.
11. Lee, D. (2016). *Chemistry – A European Journal*, 22(2), 456-464.
12. Sato, K. (2015). *European Polymer Journal*, 66, 231-240.
13. Gao, Y. (2020). *ACS Applied Materials & Interfaces*, 12(12), 13942-13950.
14. Zengin, G. (2021). *Green Chemistry Letters and Reviews*, 14(1), 65-74.
15. Zhan, X. (2022). *Journal of Molecular Catalysis A: Chemical*, 419, 23-30.

SYNTHESIS AND ANTICORROSION PROPERTIES OF N-ARYL-N¹-PYRIDYLTHIOUREAS AND THEIR BENZYLATED PRODUCTS

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Abstract

Thiourea and its derivatives are quite strong inhibitors of acid corrosion [1], the protective effect of which is explained by the donor-acceptor interaction of the multiple bond and heteroatoms with the metal [2]. It is also known that the main factor affecting the effectiveness of most acid corrosion inhibitors is the presence of an ammonium center in their structure, due to which the inhibitor molecules are adsorbed on the metal surface [3]. The introduction of such a center into the structure of thiourea and its derivatives will enhance the overall protective effect of such compounds.

In addition, organic cations, which have a significant shielding effect, will also improve the protection of the metal [3]. In this regard, it is of interest to synthesize compounds of this structure that provide a total inhibitory effect and study their behavior in an acidic medium.

The aim of this work is, firstly, the one-step synthesis of N-aryl-N¹-pyridylthioureas and their benzylation to obtain pyridinium salts, and secondly, the study of the anticorrosion properties of these compounds in an acidic medium.

Keywords: N-Aryl-N¹-pyridylthioureas, benzylated N-aryl-N¹-pyridylthioureas, corrosion, corrosion inhibition coefficient, energy parameters.

Experimental

N-Phenyl-, 1- and 2-naphthyl-N¹-2- and 4-pyridylthioureas were synthesized by the reaction of phenyl-, 1- and 2-naphthylisothiocyanates with 2- and 4-aminopyridines. By benzylation of the latter, their pyridine salts were obtained. The anticorrosion properties of the synthesized compounds were studied gravimetrically in 3M HCl at 80°C using samples of steel 08 kp. The introduction of a benzyl radical into the structure of N-aryl-N¹-pyridylthioureas leads to the appearance of a new adsorption ammonium center, which enhances the overall anticorrosion efficiency of the obtained compounds. The corrosion inhibition coefficient γ when using N-aryl-N¹-pyridylthioureas, having a value from 4.5 to 59.0, increases for their pyridine salts to 90.8 - 629.0.

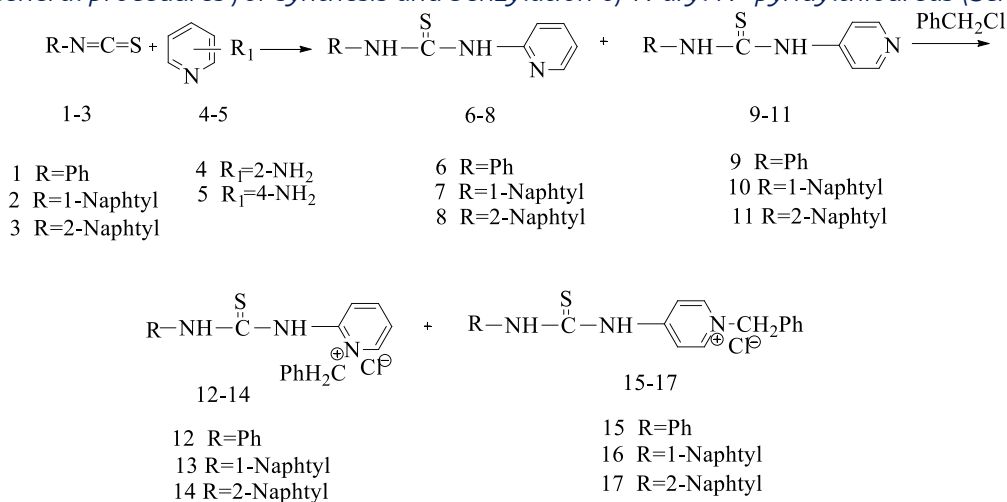
To explain the different anticorrosion activity of N-aryl-N¹-pyridylthioureas and their pyridine salts, quantum-chemical calculations of the energy parameters of E_{HOMO} , E_{LUMO} and $\Delta E = E_{\text{LUMO}} - E_{\text{HOMO}}$ were carried out and the dependences of the reduced corrosion inhibition coefficients $[\gamma]$ on E_{HOMO} , ΔE and $e^{\Delta E}$. A correlation has been established between the inhibitory efficiency and energy parameters of the studied compounds.

¹H-NMR spectra were recorded on a JEOL spectrometer (90 MHz) in DMSO-d₆ with TMS as internal reference, chemical shifts were measured in the δ scale. The purity of the obtained compounds was monitored by TLC and column chromatography on Merck silica gel 60F-254. Reagents for the experiments of

chemically pure grade were used. For quantum chemical calculations the Firefly software package [4] was used, partially based on the GAMESS (US) source code [5], according to the B3LYP method with the basic set 6-31G(d) [6,7], which allows to find the conformation with the minimum energy, determine the energies of the HOMO and LUMO, the charges of the adsorbed centers of cations of structures.

The starting *N*-aryl isothiocyanates (1-3) required for the synthesis of *N*-aryl-*N'*-pyridylthioureas (6-11) were obtained according to [8, 9]. *N*-Phenyl-*N'*-(2-pyridyl)thiourea (6) was obtained by the reaction of *N*-phenylisothiocyanate with 2-aminopyridine according to [10], *N*-aryl-*N'*-pyridylthiourea (7-10) was synthesized by the same method [11] as indicated on the scheme. The physicochemical constants of thioureas (6-10) and the data of their ¹HMR spectra corresponded to the literature data.

General procedures for synthesis and benzylation of *N*-aryl-*N'*-pyridylthioureas (Scheme).



(7-9 Mmol) thiourea (6-11) and (7-14 mmol) benzyl chloride were dissolved in 25-30 ml of dry benzene or CHCl₃, boiled for 10-22 h, the mixture was cooled and the solvent was evaporated in vacuum to a dry residue or precipitated from the reaction, the precipitate was filtered off, dried in a vacuum desiccator, and weighed. The yields of salts (12-17) were 44-98%, after further purification by recrystallization or by TLC or column chromatography, the melting point was determined, elemental analysis and ¹HMR spectrometry were performed. Physicochemical constants of salts 12-17 and data of ¹HMR spectra are shown in Table 1.

Table 1

Physicochemical constants of synthesized salts 12-17

Compound	mp, °C	Found, %		Formula	Calculated, %		¹ HMR, s, (1H) NH	Yield, %
		Cl	N		Cl	N		
12	162	10.74	11.17	C ₁₉ H ₁₈ ClN ₃ S	10.11	11.80	10.88; 13.82	62
13	195	8.83	10.30	C ₂₃ H ₂₀ ClN ₃ S	8.87	10.34	10.09; 11.45	56
14	234	8.82	10.30	C ₂₃ H ₂₀ ClN ₃ S	8.87	10.34	11.63; 11.75	60
15	200	10.09	11.77	C ₁₉ H ₁₈ ClN ₃ S	10.11	11.80	11.47; 12.13	44
16	120	8.83	10.29	C ₂₃ H ₂₀ ClN ₃ S	8.87	10.34	12.58; 13.16	65
17	90	8.82	10.33	C ₂₃ H ₂₀ ClN ₃ S	8.87	10.34	11.75; 12.36	98

Anticorrosion activity

Corrosion tests in 3M HCl at 80° C were carried out by gravimetric method using 08 kp steel samples of cylinder form (diameter of 11mm and height of 20 mm) polished to the 5 class of accuracy. Before being placed in the medium corrosion, the steel samples were cleaned with acetone and dried for 5-6 hours in a silica gel desiccator. After completion of the experiment, the sample was washed with distilled water and dried at 150°C for 0.5 h and weighed by analytical scales, 0.01 mol·L⁻¹ of synthesized compounds were used for inhibition, the tests period was 0.25h. Corrosion inhibition coefficient was calculated using formula $\gamma = i/i'$, i and i' are the corrosion rates in the absence and in the presence of the inhibitor respectively [3]. The reduced corrosion inhibitory coefficient $[\gamma]$, taking into account the molar mass of organic inhibitors, was calculated by the formula $[\gamma] = \gamma/M$, where M is the molar mass of the inhibitor. The results of the tests are presented in Table 2.

Table 2

Influence of thioureas (7-8, 10-11) and products of their benzylation 12-17 on the corrosion of steel 08 kp for 0.25 h in 3M HCl at 80°C

Corrosion inhibition coefficient .	Compound									
	7	8	10	11	12	13	14	15	16	17
γ	10,2	59,1	52,7	4,4	163,8	596,7	629,1	90,8	466,3	421,7
$[\gamma]$	0,04	0,21	0,19	0,02	0,46	1,47	1,55	0,26	1,15	1,04

Results and discussion

N-Aryl-N¹-pyridylthioureas 6-10 were obtained by a one-step synthesis in 63-89% yields, undescribed N-(2-naphthyl)-N¹-(4-pyridyl)thiourea (11) was synthesized by the same method, elemental analysis data corresponded to its empirical formula, the ¹HMR spectrum contained a broadened singlet of 2 protons of the NH groups at 10.27 ppm. For pyridinium salts 12-17 obtained by benzylation of thioureas 6-11, the elemental analysis data also corresponded to their empirical formulas, and their ¹HMR spectra contained signals methylene protons of CH₂- groups of benzyl radicals at 5.87-7.39 ppm, signals of 2 protons of NH groups at 10.09-12.56 and 11.45-13.82 ppm.

To evaluate the anticorrosion properties of the synthesized compounds, we studied their effect on the corrosion of steel 08 kp for 0.25 h in 3 M HCl at 80°C, using them in an amount of 0.01 mol, determined the corrosion inhibition coefficient γ and recalculated it into the reduced corrosion inhibition coefficient $[\gamma]$, taking into account the molecular weight of the tested compounds.

As can be seen from Table 2, the anticorrosion properties of thioureas 6-11 and their pyridinium salts 12-17 differ sharply. The first exhibit a rather weak protective effect, the values of the coefficient γ when they are used range from 4.4 to 59.1. This can be explained by the fact that the ability of the molecules of these thioureas to be adsorbed on the metal surface and protect it from corrosion is limited only by the donor-acceptor interaction n-electrons of a multiple bond and p-electrons of heteroatoms with vacant metal orbitals [2], which is affected by the size and spatial arrangement of the phenyl, naphthyl, and pyridyl radicals.

The introduction of a benzyl radical into the structure of synthesized urea molecules to obtain salts 12-17 leads to the formation of a new, stronger adsorption ammonium center, which creates intramolecular synergy and the inhibitory effect is sharply enhanced (Table 2). In the series of benzylated thioureas, 12-17 are the least active as inhibitors of salts 12 and 15, in the structure of which there is a phenyl radical. In the presence of naphthyl radicals in their structure, the anticorrosion properties naturally increase by almost 4 times and the coefficient γ increases to 421.7-629.1, which can be explained both by the stronger blocking effect of these radicals and by the energy parameters of the cations of such salts adsorbed on the metal surface. It is known from the literature [12] that such parameters can be the energies of the frontier orbitals E_{HOMO} , E_{LUMO} and $\Delta E = E_{LUMO} - E_{HOMO}$.

We carried out quantum-chemical calculations of these parameters for salt cations 12-17 and their results, as well as the values of the coefficients γ and $[\gamma]$ are given in Table 3, from which follows the confirmation of the dependence of inhibitory effects on energy characteristics, proposed by the authors of [12-15].

Table 3

Inhibitory effect and quantum-chemical parameters of cations of compounds 12-17.

Compound	E_{HOMO} , eV	E_{LUMO} , eV	ΔE , eV	$e^{\Delta E}$	γ	$[\gamma]$
12	-11,31	-2,12	9,19	9820	163,81	0,46
13	-8,23	-5,60	2,63	13,90	596,65	1,47
14	-8,06	-5,71	2,35	10,50	629,11	1,55
15	-11,21	-1,92	9,29	10860	90,77	0,26
16	-8,66	-5,34	3,32	27,72	466,33	1,15
17	-8,72	-5,35	3,37	29,14	421,72	1,04

Table 3 shows the dependence of the anticorrosion properties of the studied salts on the E_{HOMO} value of the following order 14> 13> 16> 17> 12 > 15, and the decreasing values of ΔE occur in the series 15> 12 > 17> 16 > 13 > 14, which correlates with values γ and $[\gamma]$. According to Table 3, a graph of the linear dependence $[\gamma] = f(\Delta E)$ was constructed and an approximation was carried out ($R=0.96$), for the dependence graph $[\gamma] = f(e^{\Delta E})$, the correlation coefficient is a more correct value of 0, 99 than in [12, 13] when studying the anticorrosion properties of other amines. When applying the IMCA principle to the processes of metal dissolution and corrosion inhibition, the investigated compounds 12-17 can be attributed to "hard" molecules due to the ΔE values found for them and having the ability to create strong bonds with the metal surface.

Conclusions

N-aryl-*N*¹-pyridylthioureas were obtained by a one-step synthesis, and pyridine salts were synthesized by benzylation in 44-98% yields. The anticorrosive properties of the synthesized compounds were studied in the study of corrosion of steel 08kp in 3M HCl at 80°C for 0.25 h. Introduction into the structure of *N*-aryl-*N*¹-pyridylthioureas of the benzyl fragment leads to the appearance of a new adsorption ammonium center, which enhances the overall anticorrosive efficiency of the obtained compounds. The coefficient of corrosion inhibition γ when using *N*-aryl-*N*¹-pyridylthioureas as inhibitors, having a value from 4.5 to 59.0, increases for their pyridinium salts to 90.8-629.0. For the latter, the reduced corrosion inhibition coefficient $[\gamma]=\gamma/M$, where *M* is the molecular weight of the inhibitor, correlates better than the coefficient γ with such energy characteristics of the cations of these salts as E_{HOMO} and $\Delta E=E_{LUMO}-E_{HOMO}$.

References

1. Reshetnikov S.M. *Ingibitory kislотноj korrozii metallov*. Leningrad: Khimiya; 1986. 144 p. (in Russian)
2. Fiziko-khimicheskie aspekty zashity metallov ingibitorami korrozii klassa azolov. Kuznetsov Yu.J., Kazanskii L.P. // *Uspehi khimii*.-2008.-Vol.77.-N3.-pp.227-241 (in Russian).
3. Antropov L.I., Makushin E.M., Panasenkov V.F. *Ingibitory korrozii metallov*. Kiev: Technika; 1981. 183p. (in Russian)
4. Granovsky A.A., Firefly version 8. <http://classic.chem.msk.su/gran/firefly.index.html> [Internet]
5. Computational methods for large systems / Schmidt M.W., Baldrige K/K., Boatz J.A. // *J. Comput. Chem.* -1993.-Vol. 14.-P. 1347-1363.
6. Theoretical aspects of chemical reactivity / Parr R.G., Donnelly R.A., Levy M., Palke W.E. // *J. Chem.Phys.*-1978.-Vol.68.-P.3801-3807.7. Absolute hardness: companion parameter to absolute /Parr R.G., Pearson R.G. // *J. Am.Chem.Soc.*-1983- Vol.105.-P.7512-7516.
8. A new efficient synthesis of isothiocyanates / Munch H., Hansen J.S., Pittelkow M., Cristensen J.B. et al // *Tetrahedron Lett.*-2008.-Vol.49.- P.3117-3119.
9. Organophosphine – free cooper catalyzed isothiocyanation of amines with sodium bromodifluoroacetate and sulfur / Wei F., Xing-Guo Z. // *Chem.Comm.*-2019.-Vol.55.-N8.- P. 1144-1147.
10. Synthesis and in vitro urease activity of *N,N*¹ –disubstituted thioureas / Khan K.M., Naz F., Taha M., Khan A. et al // *Eur.Med.Chem.*-2014.-Vol.74.-P.314-323.
11. *N,N*¹ –Diarylthioureas and related compounds of potential biological interest / Buk-Hoi, Xuong, Nam.// *J.Chem Soc.*-1955.- P. 1573-1580.
12. Molecular orbital theoretical studies of some organic corrosion inhibitors / Sastri V.S., Perumareddi J.R. // *Corrosion.*-1997.-Vol.53.-N 8.- P.617-622.
13. DFT-study of new bipyrazole derivatives and their potential activity as corrosion inhibitors / Wang He., Wang X., Wang Li, Lui Ai // *J.Mol.Model.*-2007.-Vol. 13.-P.147-153.
14. Corrosion inhibitors: quantitative structure –activity relationships / Lukovits J., Shaban A., Kalman E. // *Russ.J.Electrochem.*- 2003.-Vol.39.-P.177-181.
15. Dependence of anti-corrosion properties on the energy characteristics of benzylated *N*-aryl nicotinamides / D.A.Pisanenko, Yu.E.Klimko, A.V.Gaidai, S.V.Dubskaja // *Pharm. Chem.J.*-2020.-Vol.7-N2.-P.64-67.

Economic sciences

MECHANISMS OF INTERNATIONAL FINANCIAL RELATIONS IN THE CONDITIONS OF THE GLOBALIZATION CRISIS

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Abstract

In recent years, the development of the world economy and world finance has been characterized by such concepts as "deglobalization," "regionalization," and "politicization," as climatic, structural, and geopolitical transformations have had a destructive impact on international financial relations that mediate the movement of international liquidity between countries. Regulatory impulses for the activation of certain mechanisms for stimulating international financial relations are set by the leading consultative forums of the emerging multipolar world, such as the G20 and the BRICS, as well as classical multilateral institutions – the IMF and the World Bank Group. Meanwhile, productive interaction between countries at G20 venues is extremely complicated by the lack of consensus on a wide range of pressing issues – from financing measures to mitigate the effects of climate change in developing countries to reforming the IMF and WTO. The BRICS countries are taking cautious steps towards implementing collective initiatives in the international financial sphere, which is connected with the still very serious dependence on the markets and financial infrastructure of the most developed Western countries and the fear of becoming dependent on a new reserve currency. In the Bretton Woods institutions, the G7 countries account for two-fifths of the votes, which effectively allows them to block any decisions taken in favor of developing countries. Currently, new mechanisms of international financial relations are being formed, based on the use of digital financial technologies to service foreign economic activity. At the same time, the United States, as the world leader in cryptocurrency mining, demonstrates a rather passive attitude towards the need to introduce its own digital currency, striving not so much to implement the latest digital financial technologies, but to maintain control over the establishment of global rules of the game in the financial markets. Thus, crisis of globalization could be attributed to the crisis in international financial relations due to the diversity of interests between the bloc of developed countries centered in the United States and the bloc of developing countries centered in China. With ever-increasing production volumes, the group of fastest-growing countries contin-

ues to be discriminated against when it comes to the creation and distribution of international liquidity, which is invariably denominated predominantly in US domestic currency. In the context of global geopolitical confrontation, Russia's role in international financial relations is also changing. Today, Russia's access to the global banking system, opportunities to replenish international liquidity through swap lines of central banks, and the use of credit mechanisms of leading international financial organizations are blocked. Nevertheless, Russia continues to fulfill its financial obligations within the G20, the IMF, the World Bank Group and BRICS financial institutions. This position is becoming increasingly vulnerable and costly given the seizure of Russian foreign assets and threats of their confiscation, as well as the almost complete suspension of the inflow of foreign capital into the Russian Federation in the context of growing secondary sanctions, including those with respect to new international financial mechanisms.

Keywords: global financial system, international liquidity, G20, BRICS, multipolarity, digital financial technologies, isolation of Russia, secondary sanctions.

Introduction

In recent years, such concepts as "deglobalization" [1,2; source 1] and "regionalization" [3] have increasingly appeared in the characteristics of the development of the global economy and global finance. The climatic [4], structural [5] and geopolitical [6, 7] transformations unfolding on the planet have a destabilizing effect on international financial relations (IFIs) that mediate the movement of international liquidity between countries. The creation of a decentralized and distributed international settlement network that meets the trends in the formation of a multipolar financial system and the transition to new digital technologies is becoming increasingly relevant. One of the main sources of the globalization crisis is the disproportion between the contribution of the BRICS countries to the real sector of the global economy and their participation in the creation and distribution of international liquidity within the global financial system, which is dominated by the US national currency. To eliminate existing financial asymmetries, it is necessary to introduce new mechanisms of multilateral financial cooperation adequate to modern challenges. We conducted a comprehensive analysis of the risks of deglobalization of the global financial system and the potential for maintaining the globalization trend back in. 2016 and most of the findings are still relevant today [8, p. 47]. This study focuses on examining the problems of institutional organization of international financial relations that hinder the achievement of a consensus in the interests of mature and emerging leaders of the global economy, with the aim of ensuring conditions for long-term global development on a more fair and equitable basis.

Discussion

The Erosion of Global Governance Institutions

In this article, the mechanisms of international financial relations are understood as a set of institutions and instruments of transnational regulation of the economy related to the creation, distribution and redistribution of international liquidity between countries to ensure the circulation of goods and services with acceptable means of payment and settlement. In this area, global institutions play a key role, the effectiveness of whose decision-making determines the degree of use of available and potential international liquidity in the process of forming a multipolar world order and the exit of the world economy to the trajectory of sustainable, stable, balanced and inclusive growth.

Regulatory impulses for the activation of certain mechanisms for stimulating IFIs are set by the leading consultative forums of the emerging multipolar world. These are primarily the G20 (Group of Twenty), BRICS, as well as classical multilateral institutions - the IMF and the World Bank. To determine the effectiveness of decision-making by these institutions, we will consider the features of the interaction of countries in resolving a set of global problems, including those related to the current geopolitical confrontation. The G20 continues to position itself as the main international forum that shapes the global agenda on the most important IFI issues, but is increasingly criticized for its political bias and decision-making in the interests of developed countries. The G20 summit in Bali (2022) exposed the growing contradictions between developed and developing countries, as well as over the recognition of developing countries as equal subjects of international economic relations. The disagreements are mainly caused by the confrontational approaches and actions of the G7 ("Group of Seven") of the most developed countries, which see a threat in the excessive expansion of the influence of developing countries in the global economy. Productive interaction at the G20 venues is extremely complicated by the lack of consensus on

a wide range of pressing issues - from financing measures to mitigate the effects of climate change in developing countries to reforming the IMF and WTO (Table 1)

Table 1.

Effectiveness of decisions made within the G20 based on the ratio of positions of member countries

Initiatives in the field of international financial relations		Initiatives in the field of international financial relations
Unity of positions	Divergence of positions	
A total allocation of \$465 billion in IMF SDRs in 2021. Commitments to address the crisis and accelerate implementation of the UN Sustainable Development Goals. Establishment of a new Recovery and Resilience Trust. Agreement between the OECD and G20 Inclusive Framework on a minimum level of taxation and rules for the transfer of excess profits taxes across jurisdictions. Agreement on Common Principles for Debt Workouts after the end of the Debt Service Forbearance Initiative (DSSI).	Lack of consensus on mobilizing \$100 billion in climate finance annually until 2025 to meet the climate mitigation needs of developing countries. Financing the armed conflict in Ukraine. Debt restructuring to avoid sovereign debt crises in low-income countries. Recognizing the need for cooperation to create a supportive, inclusive, open, fair and non-discriminatory digital economy. Setting a target date for achieving net zero greenhouse gas emissions globally. Reforming the WTO and the IMF	
General conclusion: there is a growing divergence in positions between developed and developing countries on the implementation of the most significant multilateral international cooperation initiatives		

Compiled by the author based on data from: [9, 10].

BRICS. As an interregional non-integration association, BRICS promotes the priorities of developing countries and emerging market states in global governance systems. BRICS is becoming increasingly politically influential, and its member states are increasingly contrasted with the Group of Seven in terms of their combined economic power. When the acronym BRIC (Brazil, Russia, India, China) first appeared in 2001, its author, Goldman Sachs chief economist D. O'Neill, proposed transforming the composition of the Group of Seven by adding countries from this group. This meant combining the efforts of leading developed and developing countries in resolving the problems of global imbalances [11, p. 10]. At that time, this proposal was not developed. Meanwhile, after two waves of expansion (in 2010 and 2024), the official composition of BRICS has doubled. It is known that several dozen more countries have expressed interest in joining this forum. The four founding members of BRICS are characterized by significant GDP sizes and high rates of economic growth. They participate in the expansion of the Global Financial Safety Net by owning the largest gold and foreign exchange reserves in the world, concluding numerous central bank swap agreements, and creating the BRICS Currency Reserve Pool, which has the third largest international liquidity after the IMF and the Multilateral Chiang Mai Initiative. BRICS participants consistently advocate for the reform of the global financial system, and are developing alternative credit, payment, and settlement systems in national currencies, including using modern digital technologies. However, there is still no consensus within BRICS on the creation of a collective currency to counterbalance the reserve status of the US dollar. Of the 933 collective commitments made at BRICS summits during 2009–2021, the overall level of implementation was 77%. The highest level was achieved in the areas of macroeconomics and healthcare (90%), and the lowest was recorded in the area of reform of international financial institutions and human rights – 62 and 60%, respectively [12, pp. 24-26]. The lack of unity in the BRICS position on the de-dollarization of international settlements is due to the significant dependence of the largest economies in the association – China and India – on the US and European markets. The existing disagreements complicate the movement of BRICS in a single direction and create centrifugal risks. At the same time, BRICS participants support the G20 initiatives on macroeconomic coordination, overcoming the global financial crisis, financial regulation, countering base erosion and profit shifting (BEPS). They also demonstrate a commitment to achieving the SDGs and promoting the objectives of the UN Framework Convention on Climate Change. Overall, the focus on decisions taken within the G20 complicates the development of a unified BRICS agenda in the area of IFIs, given the growing differences between developed and developing countries in their positions on many key issues (Table 2).

Table 2.

Effectiveness of decisions made within BRICS based on the ratio of positions of member countries

BRICS initiatives in the field of international financial relations	
Unity of positions	Divergence of positions
Moral support for Russia in the context of sanctions and isolation pressure. Consistent advocacy for reform of the global financial system. Expanding the membership of the New Development Bank. Increasing the flexibility of the BRICS Contingent Reserve Arrangement mechanism. Promoting a number of G20 initiatives. Supporting the global sustainable development agenda. Opposing the introduction of the EU cross-border carbon tax (CBAM). Supporting the expansion of BRICS+ members.	Lack of unity against sanctions against Russia (only China has taken a clearly uncompromising position). Decision to suspend NBR operations in Russia in March 2022. Lack of BRICS+ unity on voting in the UN General Assembly. Introduction of BRICS+ reserve currencies. Creation of a single settlement system. Creation of a single bond market.
General conclusion: cautious movement towards the implementation of collective initiatives in the international financial sphere, which is associated with the still very serious dependence on the markets and financial infrastructure of the most developed Western countries and fears of becoming dependent on a new reserve currency	

Compiled by the author.

International Monetary Fund and the World Bank Group. Despite growing criticism of the IMF, the latter continues to act as a key institution of the global financial system, primarily as a global anti-crisis creditor. The Fund has significant operational capabilities and carries out supervisory activities in the area of macroeconomic policy in 90 member countries. The IMF follows the recommendations of the G20 in terms of expanding supervisory initiatives and increasing available financial resources provided on a bilateral and multilateral basis. Critics of the Fund accuse this institution of bias in favor of private creditors and open support for countries with a dubious political reputation, deviation from the statutory goals of its activities, biased attitude towards developing markets, ineffective use of available credit resources [13, pp. 30-33; 14]. Unlike other organizations of the UN system, where all decisions are made on the principle of "one country – one vote", in the IMF and other Bretton Woods institutions votes are distributed among countries depending on their share of capital. In accordance with the articles of the IMF agreement, decisions on the most significant issues are taken by a special (qualified) majority of votes – 85%. Since the beginning of the Fund's activity, the only member with veto power is the United States, which imposes significant restrictions on the ability of developing countries to advance their own interests in it. The reform of IMF quotas and governance, carried out in 2010–2015, did not lead to a change in the existing state of affairs. Repeated demands by BRICS countries to revise the current formula for calculating IMF quotas are constantly postponed (currently until June 2025). A similar situation has developed in the governance system of the World Bank Group. Today, the G7 countries account for 2/5 of the votes in the Bretton Woods institutions, which effectively allows them to block any decisions made in favor of developing countries (Table 3).

Table 3.

Ratio of votes of the USA, G7 countries and BRICS+ countries in the IMF and the World Bank Group, %

	IMF (21.02.2024)	World Bank Group			
		IBRD (09.02.2024)	MFC (05.02.2024)	MAR (22.01.2024)	MAGES (01.11.2023)
USA	16.50	15.51	17.97	9.63	14.81
Total G7	41.25	39.68	46.15	38.96	35.89
Total BRICS-5	14.15	14.46	12.25	4.60	9.90
Total BRICS-10	17.91	19.24	15.33	8.74	14.41

Compiled based on data from: [sources 2, 3].

These and other factors indicate, in general, the negative impact of the current global institutions on the effectiveness of decisions made in the sphere of international financial relations..

Digitalization of International Settlements

The current crisis of globalization objectively requires the creation of a global governance system for the transition to a new stage of economic integration [15, p. 25]. The trigger for such a transition can be active collective actions of states interested in resolving the problem of the United States abusing its dominant position in international financial relations. Currently, new mechanisms for servicing foreign economic activity based on the use of digital financial technologies are being formed. The main work in this area is carried out at the national level.

To circumvent sanctions, some countries are experimenting with non-traditional instruments of international settlements (crypto assets, stablecoins). Unlike stablecoins, the value of which is tied to fiat currencies (mainly the US dollar), cryptocurrencies, given their high volatility, are used as temporary intermediaries in the exchange between two fiat currencies [16]. The increasingly active involvement of crypto assets of private issuers in cross-border transactions is driving the growing interest of central

banks in issuing their own digital currencies (CDCs) and using them in international settlements. The most high-profile initiatives of this kind include projects organized on the digital platforms of the Innovation Center of the Bank for International Settlements (IC BIS), which has its branches in Europe and Asia. Although the possibility of replacing the US dollar at the global level as a key carrier of international liquidity is questionable, the creation of multi-platform CDCs is seen as one of the main mechanisms in moving towards this goal [17].

Today, there are about 500 crypto exchanges operating in the world [source 4], with over 10 thousand cryptocurrencies circulating [source 5]. Electricity costs for global bitcoin mining range from 0.2 to 0.9% of global electricity consumption in 2023 [source 6].

In the period 2020–2024, the number of countries studying the possibility of creating a CBDC increased from 37 to 134 [source 7]. Thus, the digitalization of MFIs objectively requires the development of uniform standards for regulating digital platforms for the purpose of compatibility of various payment systems and their mutual recognition by regulators. It is characteristic that, although the United States is the world leader in cryptocurrency mining, American officials demonstrate a rather passive attitude towards the introduction of their own digital currency. They strive not so much to introduce the latest digital financial technologies into their national payment system, but to maintain control over the establishment of global rules of the game in the global financial market [source 8]. In turn, the BRICS countries are creating their own prototypes of crypto assets for foreign economic activity (New Silk Road Token, BRICS Food Token), as well as a single digital payment system (BRICS Pay), independent of SWIFT and American card payment systems (Visa and Mastercard). As for the Chinese, their efforts are focused not so much on developing international cooperation, but on taking a leading position in creating a financial ecosystem based on their own international payment system (CIPS) and an independent central bank (e-CNY).

In the context of the globalization crisis, the role of some developing countries in the IFIs is also changing. The rejection of these countries by the collective West as an equal international partner and the desire of the United States and its allies to isolate these countries from all global financial and economic structures has become systemic. We are talking primarily about such important international financial institutions as the Basel Committee on Banking Standards, the Bank for International Settlements, the G20, the International Organization of Securities Commissions, and the International Association of Insurance Supervisors. The US defense budget for 2023 even included special articles to finance the relevant work [18].

Today, these countries are blocked from accessing the global banking system, the ability to replenish international liquidity through central bank swap lines, and the use of credit mechanisms from leading international financial organizations. Since 2021, the US and EU have imposed a number of sanctions that have limited these countries' access to digital financial assets on cryptocurrency platforms and crypto exchanges. These developing countries have also been suspended from participating in projects to implement cross-border payments on digital platforms, the testing of which is taking place under the auspices of the BIS IC. The exclusion of these countries from global financial structures complicates the possibilities of improving the methodological aspects of the development of payment infrastructure and information and communication technology infrastructure. Despite the intensification of geopolitical confrontation, these countries continue to fulfill their financial obligations within the G20, the IMF, the World Bank Group, the BIS and the financial institutions of the BRICS. This position is becoming increasingly vulnerable and costly, as well as the almost complete suspension of the inflow of foreign capital into these countries in the context of the growing use of sanctions, including in relation to new international financial mechanisms.

The search by the governments of these countries for other forms of IFIs through the formation of alliances within the BRICS, SCO, EAEU and the development of alternative mechanisms for trade and financial interaction are encountering consistent restrictions from counterparties from partner countries.

Given the deterioration of the situation with the use of traditional international settlement and payment mechanisms, starting in 2024. Banks of these countries are authorized to establish experimental legal regimes within the framework of foreign trade activities for transactions with digital currencies [source 16]. The adoption of such an emergency measure in addition to the existing problems raises issues related to the regulation of high exchange rate volatility of crypto assets, control over the corresponding inflation risks and maintaining the balance of energy supply of the Russian economy.

Results and Conclusions

The current crisis of globalization is caused by the different vectors of interests of the bloc of developed countries, headed by the USA, and the bloc of developing countries, whose leader is objectively China. Despite the constant increase in the volume of manufactured goods, the group of the most dynamically developing countries is still in a discriminatory position when it comes to the creation and distribution of international liquidity, which is invariably expressed mainly in the national currency of the USA. Limited opportunities for creating their own stable and reliable cross-border settlement and payment systems, not connected with the institutions of the current global financial system, hinder the development of highly liquid financial markets of developing countries, adequate to their contribution to the development of the real sector of the world economy. Without levers of control over international liquidity, the states grouped around BRICS, SCO, and the EAEU are essentially deprived of the opportunity to influence the rules of the game established in the global financial market. There are no clear solutions to this problem. China is too dependent on the external financial situation to guarantee any partner stability and reliability of bilateral settlement relations, not to mention their multilateral format. Beijing should have proposed creating a collective monetary and financial infrastructure. However, such initiatives are not yet clearly visible. On the contrary, China prefers to play alone, giving priority to initiatives aimed at realizing its own production and innovation potential (for example, within the framework of the Belt and Road and the digitalization of the yuan).

The use of national digital currencies as an alternative to international liquidity is not entirely suitable for a long-term solution to the problem under discussion. Firstly, there is a dependence on the financial system of countries with more developed industrial potential, in this case, on China. Secondly, the possibilities of control over digital technologies by national regulators seem even less transparent and understandable than the existing mechanisms of IFIs, the operation of which seemed quite predictable and safe before the introduction of sanctions. Therefore, it would be premature to rely on innovative digital platforms to organize the issuance of international liquidity on their basis.

The international isolation of these countries will apparently only increase. Consequently, a way out of the current situation must be sought within the national economy, and not outside. Until these countries have a parity production and technological base capable of offering their constituent states real protection from secondary sanctions and any other pressure, the problems that arise today with the refusal of these countries to conduct settlements with each other will only worsen. In this regard, despite the enormous expenses, it is necessary to continue to restore the foundations for the fully self-sufficient development of the domestic economy in the financial, technological, information and legal spheres. And for this, it is advisable to redirect all possible forces and resources from the outside inward, abandoning the idea of "outplaying" the enemy on his own field.

References

1. Orucov M.M. "Prospects for international settlements in digital currencies of Central Banks on a platform basis in foreign countries and Azerbaijan", XVIII international scientific conference. Paris. France. 18-19.03.2025
2. Di Sano M., Gunnella V. Deglobalisation: Risk or Reality? European Central Bank, 12.07. 2023. Available at: <https://www.ecb.europa.eu/press/blog/date/2023/html/ecb.blog230712~085871737a.en.html> (accessed 11.07.2024).
3. Barrowclough D., Kozul-Wright R., Kring W.N., Gallagher K.P., eds. South-South Regional Financial Arrangements. Collaboration towards Resilience. New York, Palgrave MacMillan, 2022. 389 p. Available at: <https://doi.org/10.1007/978-3-030-64576-2>
4. Orucov M.M. Forecast of global economy development I international scientific conference. Marseille. France. 20-21.02.2025
5. Orucov M.M, Characteristics of preparatory measures for membership in the World Trade Organization, , Scientific and Pedagogical News of Odlar Yurdu University, 2019, № 51, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
6. Orucov M.M, Modern development model of the national economy, Scientific and Pedagogical News of Odlar Yurdu University, 2020, № 54, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
7. Orucov M.M, Diagnostiks of the main therats to agro-food industry and food safety, Scientific and Pedagogical News of Odlar Yurdu University, 2020, № 58, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552.
8. (2021). Azərbaycanın statistik göstəriciləri. Azərbaycan Respublikası Dövlət Statistika Komitəsi. Bakı: 9 № - li kiçik müəssisə.

9. Orucov M.M, *Directions of development of export-oriented agriculture*, Odlar Yurdu University *Integration of territories liberated from occupation after the Patriotic War into the Azerbaijani Economy: a conceptual view*. Materials of the Republican Scientific-Practical Conference, February 10, 2021.
10. *Best Crypto Exchanges of August 2024*. Forbes Advisor, 29.07.2024. Available at: <https://www.forbes.com/advisor/investing/cryptocurrency/best-crypto-exchanges/> (accessed 03.09.2024).
11. *Digital Dollar Is a Long Way from Reality, US Treasury Official Says*. Bloomberg, 21.12.2022. Available at: <https://www.bloomberg.com/news/articles/2022-12-21/digital-dollar-gets-little-urgency-from-treasury-s-liang> (accessed 11.04.2024).
12. Atlantic Council: *США ощутимо отстают в гонке по цифровизации нацвалют*. Рамблер/Финансы, 14.03.2024. Atlantic Council: *The US Is Noticeably Lagging behind in the Race to Digitalize National Currencies*. Rambler/ Finances, 14.03.2024. (In Russ.) Available at: <https://finance.rambler.ru/economics/52429459/?utm>
13. *US Bitcoin Miners Use as Much Electricity as Everyone in Utah*. Bloomberg, 02.02.2024. Available at: <https://www.bloomberg.com/news/articles/2024-02-01/bitcoin-miners-in-us-consume-up-to-2-3-of-nation-s-electricity> (accessed 03.09.2024).
14. Orucov M.M. *Prospects for international settlements in digital currencies of Central Banks on a platform basis in foreign countries and Azerbaijan*, XVIII International Scientific and Practical Conference. Paris. France. 18-19.03.2025, ISBN 978-91-65424-12-8 DOI <https://doi.org/10.5281/zenodo.15095044>
15. Orucov M.M. *Global dynamics of socially responsible investing (SRI): analysis motivating MNCS to use SRI strategies*. XVIII international scientific conference. Madrid. Spain. 25-26.03.2025.
16. Orucov M.M. *Directions for improving the new insurance consortium for the development of agricultural leasing in the Republic of Azerbaijan*, Scientific and Pedagogical News of Odlar Yurdu University, 2018, № 66, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
17. Orucov M.M, *The current state of the Azerbaijani economy against the backdrop of changes in the world economy*, Scientific and Pedagogical News of Odlar Yurdu University, 2018, № 50, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
18. Orucov M.M, *Analysis of the current state of the oil industry processing network and the modern state of marketing in this field*, International Scientific Conference on the topic "IV Industrial Revolution and Digitalization of the Economy" Odlar Yurdu University, 2023
19. Orucov M.M, *The level of organization of the oil and gas complex in the modern era, "IV sənaye inqilabı və iqtisadiyyatın rəqəmsallaşdırılması" IV Industrial Revolution and Digitalization of the Economy* Odlar Yurdu University, 2023
20. Orucov M.M, *Analysis of structural changes in the national agricultural sector and assessment of import dependence*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
21. Orucov M.M, *Assessment of the level of readiness of Azerbaijan's agri-food market on the eve of WTO accession*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
22. Orucov M.M. *Modernization of marketing improvement in the oil refining industry in Azerbaijan*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
23. Orucov M.M. *Prospects for the development of marketing in the management of market processes in the oil refining sector*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
24. (1995). *Azərbaycan Respublikasının Konstitusiyası* (12 noyabr 1995-ci il). <https://e-qanun.az/framework/897>
25. (2000). *«Dövlət əmlakının özəlləşdirilməsi haqqında» Azərbaycan Respublikasının Qanunu*. <https://e-qanun.az/framework/26044>
26. Orucov M.M. *Diagnostics of the agri-food market and main threats to food security in the Republic of Azerbaijan*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
27. (2021). *«Azərbaycan 2030: sosial-iqtisadi inkişafa dair Milli Prioritetlər» haqqında Azərbaycan Respublikası Prezidentinin Sərəncamı*. Bakı. 40
28. Orucov M.M. *Civil-legal contractual relations in business activities*, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 62, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552

29. Orucov M.M. *Import substitution in the agri-food sector in Azerbaijan, Heydar Aliyev-100. Import substitution, localization of production. Sustainable and preventive development. OYU. Scientific research work*
30. Orucov M.M. *Fundamentals of National Security of the Republic of Azerbaijan, Textbook -2024*
31. Orucov M.M. *The Wreath of Victory, a book dedicated to Mr. Ilham Aliyev's 20 years as President-2024*
32. Orucov M.M. *Parameters for long-term forecasting of the world economy, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 63, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552*
33. Orucov M.M. *Azerbaijani economy during Ilham Aliyev's presidency: a long way traveled in 20 years, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 63, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552*
34. Orucov M.M. *Theoretical and methodological aspekts, characterizing innovative development of the agricultural industry, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 63, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552*
35. Orucov M.M. *Foreign experience in stimulating the development of innovation activity in agriculture, Scientific and Pedagogical News of Odlar Yurdu University, 2023, № 63, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552*
36. Orucov M.M. *The concept of the "energy trilemma" as an expression of the energy aspect of sustainable development of Azerbaijan, International Conference on Smart Environment and green Technologies ICSGET2024, Springer.ISBN978-3-031-81563-8 https://doi.org/10.1007/978-3-031-81564-5_43*
37. Orucov M.M. *"Green economy" in the Republic of Azerbaijan: prerequisites and directions of development, International Conference on Smart Environment and green Technologies ICSGET2024, Springer ISBN-978-3-031-81567-6 <https://doi.org/10.1007/978-3-031-81567-6>*
38. Orucov M.M. *Algorithm for determining priority directions of innovative development of agricultural production, XV International Scientific and Practical Conference «New problems of science and ways of their solution», October 22-23, 2024, Paris. France, ISBN 978-91-65423-91-6. DOI <https://doi.org/10.5281/zenodo.14003470>.*
39. Orucov M.M. *Analysis of structural change in the national agricultural field and assessment of dependence imports, XV International scientific conference Madrid Spain 29-30/ 10/2024, ISBN 978-91-65423-92-3 DOI <https://doi.org/10.5281/zenodo.14040024>*
40. Orucov M.M. *Monetary stabilization policy the financial crisis, XIV international scientific conference. Tokyo. Japan. 31.10-01.11.2024 ISBN 978-92-44514-26-9 DOI <https://doi.org/10.5281/zenodo.14046748>*
41. Orucov M.M. *Level of organization of oil and gaz refining complex in the modern period, XVI international scientific conference. Manchester United. 05-06.11.2024, ISBN 978-91-65423-93-0 DOI- <https://doi.org/10.5281/zenodo.14091395>*
42. Orucov M.M. *Analysis of foreign investment in Azerbaijani economy and directions to increase, XVII International Scientific Conference. Dortmund. Germany. 07-08.11.2024, ISBN 978-92-44514-27-6 DOI <https://doi.org/10.5281/zenodo.14136799>*
43. Orucov M.M. *The role of and gaz resources in enusiring socio-economic development of the Republic of Azerbaijan, Norwegian Journal of development of the International Science No 144/2024, ISSN 3453-9875*
44. Orucov M.M. *The role of the oil sector in ensuring sustainable development of the economi of Azerbaijan, German International Journal of Modern Science, 20246 No92, ISBN 978-92-44514-27-6 DOI <https://doi.org/10.5281/zenodo.14136799>*
45. Orucov M.M. *Formation of the consumer market in the Repiblic of Azerbaijan az a factor in ensuring food security, XII International Scientific Conference Beijing China. 12-13.11.2024, ISBN 978-91-65423-94-7 DOI <https://doi.org/10.5281/zenodo.14178599>*
45. Orucov M.M. *The role of the consumer market in ensuring food safety of the Republic of Azerbaijan, The scientific heritage No 149 (2024) ECONOMIC SCIENCES, ISSN 9215 — 0365*
46. Orucov M.M. *Diversification of economy the Republics Azerbaijan on the base sustainable development of non-oil sector, XIV international scientific conference. Toronto. Canada. 14-15.11.2024, ISBN 978-92-44514-28-3 DOI <https://doi.org/10.5281/zenodo.14199182>*
47. Orucov M.M. *Elements of credit policy and stimulation of credit investments in the real economy, Sciences of Europe (Praha, Czech Republic) No 153 (2024, ISSN 3162-2364*

48. Orucov M.M. *Efficiency problems of the energy sector of Azerbaijan in the background of the green economy*, XVII international scientific conference. Philadelphia. USA. 21-22. 11.2024, ISBN 978-92-44514-22-1 DOI <https://doi.org/10.5281/zenodo.13929032>
49. Orucov M.M. *Current status of education in the Republic of Azerbaijan in the context of global education challenges*, XII international scientific conferences Roma, Italy. 19-20. 2024, ISBN 978-91-65423-95-4 DOI <https://doi.org/10.5281/zenodo.14218224>
50. Orucov M.M. *Increasing the competitiveness of agricultural production*, XIX International Scientific Conference. London. UK. 12-13.12.2024, ISBN 978-92-44514-32-0 DOI <https://doi.org/10.5281/zenodo.14518424>
51. Orucov M.M. *Priority directions of state regulation of the agricultural and food market*, XVI International Scientific Conference Madrid. Spain 17-18 2024, ISBN 978-91-65423-92-3 DOI <https://doi.org/10.5281/zenodo.14040024>
52. Orucov M.M. *Concept, theories and legal basis of the succession of states*, XIII International Scientific Conference Beijing China. 30-31.12. 2024, ISBN 978-91-65424-01-2 DOI <https://doi.org/10.5281/zenodo.14609837>
53. Orucov M.M. *Civil legal contractual relations in the field of entrepreneurial activity in the Republic of Azerbaijan*, XVIII international scientific conference - Philadelphia. USA. 09-10.01.2025, ISBN 978-92-44514-36-8 DOI <https://doi.org/10.5281/zenodo.14646632>
54. Orucov M.M. *Evaluation of the membership process of the Republic of Azerbaijan to the world trade organization*, XIII international scientific conference. Toronto. Canada. 14-15.01.2025, ISBN 978-91-65424-03-6 DOI <https://doi.org/10.5281/zenodo.14699449>
55. Orucov M.M. *Impact of the oil and gaz industry on the economy of the Azerbaijan Republic*, XV international scientific conference. Vienna. Austria. 16-17.01.2025, ISBN 978-92-44514-37-5 DOI <https://doi.org/10.5281/zenodo.147182310>
56. Orucov M.M. *New trends and challenges to the global economy*, XIV international scientific conference. Stockholm. Sweden. 21-22.01.2025, ISBN 978-91-65424-04-3 DOI <https://doi.org/10.5281/zenodo.14749265>
57. Orucov M.M. *Methods of assessing the impact of education on economic growth*, XVIII international scientific conference. Tallinn. Estonia. 23-24.01.2025, ISBN 978-92-44514-38-2 DOI <https://doi.org/10.5281/zenodo.14754776>
58. Orucov M.M. *Reducing transaction costs in the digital economy*, XVII International Scientific and Practical Conference 28-29. 01. 2025, Paris. France, ISBN 978-91-65424-05-0 DOI <https://doi.org/10.5281/zenodo.14794434>
59. Orucov M.M. *Artificial systems in today's economic environment*, XIX international scientific conference. Dortmund. Germany. 13-14.02.2025, ISBN 978-92-44514-41-2 DOI <https://doi.org/10.5281/zenodo.14894330>
60. Orucov M.M. *Forecast of global economy development*, I international scientific conference. Marseille. France. 20-21.02.2025, ISBN 978-92-44514-42-9 DOI <https://doi.org/10.5281/zenodo.14932296>
61. Orucov M.M. *Application of money supply targeting regime within the framework of monetary policy*, I international scientific conference. Seoul. South Korea. 06-07.03.2025, ISBN 978-92-44514-44-3 DOI <https://doi.org/10.5281/zenodo.15020702>
62. Orucov M.M. *Prospects for the formation of economic multipolarity*, I international scientific conference. Helsinki. Finland. 13-14.03.2025, ISBN 978-92-44514-45-0 DOI <https://doi.org/10.5281/zenodo.15075323>
67. Orucov M.M. *Directions for improving the new insurance consortium for the development of agricultural leasing in the Republic of Azerbaijan*, Scientific and Pedagogical News of Odlar Yurdu University, 2018, №, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552
68. Orucov M.M. *The current state of the Azerbaijani economy against the backdrop of changes in the world economy*, Scientific and Pedagogical News of Odlar Yurdu University, 2018, № 50, ISSN: 1682-9123 DOI: 10.0318/OYU.2023735552

THE FOURTH INDUSTRIAL REVOLUTION

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Abstract

The global industry is experiencing rapid changes driven by technological innovations, economic disruptions, and the transition towards sustainability. Key sectors like manufacturing, energy, and transportation are being transformed by automation, AI, and renewable energy, while businesses are rethinking supply chains to address vulnerabilities exposed by geopolitical tensions and the pandemic.

Xülasə

Qlobal sənaye texnoloji innovasiyalar, iqtisadi pozulmalar və davamlılığa keçid səbəbindən sürətli dəyişikliklər yaşayır. Avtomatlaşdırma, süni intellekt və bərpa olunan enerji kimi sahələr istehsalat, enerji və nəqliyyat sektorlarını dəyişdirir, bizneslər isə geosiyasi gərginliklər və pandemiya ilə üzə çıxan zəiflikləri aradan qaldırmaq üçün təchizat zəncirlərini yenidən nəzərdən keçirirlər.

Аннотация

Глобальная индустрия переживает стремительные изменения, вызванные технологическими инновациями, экономическими потрясениями и переходом к устойчивому развитию. Ключевые сектора, такие как производство, энергетика и транспорт, трансформируются благодаря автоматизации, ИИ и возобновляемым источникам энергии, в то время как компании пересматривают цепочки поставок, чтобы устранить уязвимости, выявленные геополитическими напряжениями и пандемией.

Keywords: Global industry, technological innovation, automation, AI, sustainability, renewable energy

Açar sözlər: Qlobal sənaye, texnoloji innovasiya, avtomatlaşdırma, süni intellekt, davamlılıq, bərpa olunan enerji

Ключевые слова: Глобальная индустрия, технологические инновации, автоматизация, ИИ, устойчивое развитие, возобновляемая энергия

The Fourth Industrial Revolution or Industry 4.0 is a merging of digital, physical, and biological systems. Digital technologies such as AI, machine learning, 3D printing, and robotics are among the heart of the revolution that is dramatically changing industrial manufacturing processes, supply chains, and business approaches in many industries.

Robotics and automation have completely changed the face of the manufacturing industry. IFR, in 2023, reported that 670,000 industrial robots were installed versus an increase of 40% in five years. China, Japan, and South Korea are among the leading countries with regard to robot density; manufacturing giants increasingly automate their operations to reduce human error, cut costs, and boost production.

One major player using automation is Foxconn, the Taiwanese company that assembles iPhones. Foxconn has been working toward the concept of a "lights-out factory"-factories without the need for human labor. By 2022, they have installed over 100,000 robots in their facilities, and the goal is to automate 70% of their assembly lines by 2025. Moving toward automation not only cuts the cost of labor but also guarantees a consistent quality standard in highly complex production processes.

Meanwhile, 3D printing has emerged, in one way or another, in areas like aerospace, automobiles, and healthcare. Companies can now make complex components much faster and at lower costs than ever before by adopting additive manufacturing technologies.

The global market of 3D printing, which was valued at approximately \$17 billion in 2022, was projected to reach \$34 billion by 2026. Fuel nozzles for its jet engines are manufactured by 3D printing, reducing the number of parts from 20 to just one and cutting the production time in half.

AI and machine learning are also changing the face of industries with predictive analytics, intelligent automation, and optimizations of processes. AI is finding increased uses in industries like pharmaceuticals, where it can speed up the drug discovery process. For instance, Pfizer, in collaboration

with IBM Watson, applied AI in oncology drug research and reduced promising compound identification time. Beyond manufacturing, AI is rapidly changing industries like logistics and transport. For instance, in the trucking industry, companies like Einride and Waymo pioneer autonomous vehicles that will change the face of freight transport by reducing the cost of moving goods and minimizing road accidents. According to a 2023 report McKinsey did, "autonomous trucks could save costs of about 30% through reduced fuel consumption and lower employment."

Supply chains are vulnerable, and disruptions in the economy are some of the surest things that have taken a heavy toll on global industries. Geopolitical tensions, natural calamities, and the COVID-19 pandemic have already woken businesses up in order to revamp their tactics and operations, showing that global supply chains can just be so fragile. The COVID-19 pandemic saw one of the most disastrous economic downturns in modern times—an unprecedented supply chain disruption. A report by the World Trade Organization termed that, indeed, worldwide trade contracted 5.3% in 2020, due to the fact that most factories closed down and transported and labored slowly. The hit was particularly devastating in industries such as automotive manufacturing, where just-in-time inventory models left companies with little room for shortage.

Drastically, for example, the 2020-2022 worldwide semiconductor shortage reached into manufacturing within the automotive industry, at one stage forcing companies such as Ford, General Motors, and Toyota to reduce production. It is estimated that because of the shortage, 7.7 million fewer vehicles had been made globally in 2021—a figure calculated to mean the loss of revenue valued at over \$210 billion. This situation has forced many carmakers to reconsider their supply chain strategies and bring production closer to home while hoarding key components.

Besides the pandemic, geopolitical tensions have continued to unhinge industries. The U.S.-China trade war, launched in 2018, has disrupted supply chains with the imposition of tariffs and further export restrictions. This has driven many companies to look for ways to diversify their production bases, foregoing a dangerous dependence on China. A 2023 survey by the Institute for Supply Management showed that 72% of companies are actively working on supply chain diversification efforts, with Southeast Asia, India, and Mexico appearing as places where production hubs can be diversified.

Another major stellar trend shaping industries today is the increasing focus on sustainability and, correspondingly, a low-carbon economy. The 2015 Paris Agreement set a universal ambiguity to keep global warming below 2 degrees Celsius, aiming for net-zero emissions by 2050, which was joined by various country and corporate commitments.

The greening of one of the major sectors is the car industry.

Yet, consumer demand and government regulations accelerated the shift away from the internal combustion engine toward electric cars. In the year 2022, electric vehicles collectively reached 10.5 million in global sales, as compared to 3.1 million cars sold in 2020. The EU, European, and Asian governments have targeted aggressive dates for the banning of sales of fossil fuel cars.

Meanwhile, Tesla—the world's leading EV maker—continues to top the market with deliveries of over 1.3 million vehicles in the year 2022, a 40% year-over-year increase. Competing billion-dollar investments have joined the frenzy from such legacy automakers as Volkswagen, General Motors, and Ford in electrifying their fleets. In fact, Ford announced a \$22 billion investment in electric vehicle production through 2025, while Volkswagen plans to make 50% of its global sales electric by 2030.

Aside from the automotive industry, the world of energy is also in the midst of an unprecedented transition towards renewable sources. According to the International Energy Agency, capacity for renewable energy grew by 8% in 2022—solar and wind at the forefront among all. All in all, solar energy investments reached \$300 billion in 2022, while another \$180 billion was invested in wind energy. Companies like Iberdrola, Enel, and NextEra Energy lead in this transition by developing large-scale renewable projects around the world.

The move to sustainability affects industries such as fashion and consumables, which also see a growing consumer request for 'green' products. The sustainable fashion market, which reached \$8.25 billion in 2022, is anticipated to see a 9.1% annual growth over the next decade. Patagonia and Adidas, two of the leading companies in this respect, have embraced circular economy approaches whereby materials are recycled or reused to throttle down waste. For example, Adidas announced plans to make 17 million pairs of shoes out of recycled ocean plastic by 2025.

Economic Disruptions and Global Supply Chains

On the other hand, economic disruptions and weaknesses in supply chains have greatly affected industries around the world. Geopolitical conflicts, natural disasters, and the COVID-19 pandemic have

revealed the vulnerabilities of global supply chains, prompting businesses to reevaluate their strategies and operations.

The COVID-19 pandemic resulted in one of the most severe economic downturns in recent memory, leading to extensive disruptions in supply chains. A report from the World Trade Organization (WTO) highlighted that global trade dropped by 5.3% in 2020, with many industries experiencing major delays due to factory shutdowns, transportation challenges, and labor shortages. The automotive sector was particularly hard-hit, where just-in-time inventory systems left manufacturers exposed to supply shortages.

Another critical issue affecting global industries is the transformation of the labor market. As automation, AI, and robotics continue to be integrated into industrial processes, many low-skilled jobs are being displaced. According to the World Economic Forum (WEF), by 2025, 85 million jobs may be displaced by automation, while 97 million new roles could emerge that are more adapted to the new division of labor between humans, machines, and algorithms.

The demand for digital skills is on the rise, particularly in sectors such as information technology, data science, and engineering. In the manufacturing sector, there is a growing need for workers who are proficient in operating and maintaining advanced machinery. However, many industries are experiencing a skills gap, where the demand for skilled labor outpaces supply. A 2022 report by Deloitte projected that there could be a 2.1 million worker shortage in manufacturing by 2030, costing the U.S. economy approximately \$1 trillion.

To address these challenges, companies and governments are investing in upskilling and reskilling initiatives. In 2023, the European Commission announced a €6 billion investment in vocational training programs to prepare workers for jobs in emerging industries such as green energy and digital technology. Meanwhile, companies like Siemens and GE are collaborating with educational institutions to create specialized training programs for workers in advanced manufacturing.

The global industry is undergoing a period of rapid change, driven by technological advancements, economic disruptions, and a growing focus on sustainability. As businesses navigate this new industrial era, they must embrace digital transformation while also addressing the challenges posed by supply chain vulnerabilities, labor market shifts, and environmental regulations.

Technological innovation, particularly in the areas of AI, automation, and renewable energy, offers significant opportunities for companies to improve productivity, reduce costs, and meet consumer demand for sustainable products. However, these changes also come with risks, including potential job displacement, cyber threats, and economic instability.[4]

In the coming years, industries that are able to adapt to these changes by investing in technology, diversifying their supply chains, and prioritizing sustainability will be best positioned to thrive in the evolving global landscape. Policymakers will also play a crucial role by creating frameworks that support innovation, protect workers, and ensure a fair transition to a low-carbon economy. Ultimately, the success of the global industry will depend on the ability of businesses, governments, and workers to collaborate in shaping a more resilient and sustainable future.

References

1. Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*.
2. Schwab, K. (2016). *The Fourth Industrial Revolution*.
3. Christopher, M. (2016). *Logistics and Supply Chain Management* (5th ed.).
4. Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*.
5. Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2007). *Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies* (3rd ed.).
6. Pisano, G. P., & Shih, W. C. (2012). *Producing Prosperity: Why America Needs a Manufacturing Renaissance*.
7. Sweeney, E. (2011). *Supply Chain Management: A Logistics Perspective*.

THE EVOLUTION AND FUTURE OF CORPORATE REPORTING: DUAL CHANGES DRIVEN BY TECHNOLOGY AND STAKEHOLDERS' NEEDS

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Abstract

With the development of information technology and the improvement of stakeholders' expectations, corporate reporting is undergoing a profound transformation driven by technology and shaped by institutional transformation. This paper takes Kazakhstan's corporate reporting reform as the research object, analyzes its progress in XBRL standardization and ESG information disclosure, and explores the evolution path of reporting under the influence of institutional environment and stakeholders. The research results will provide experience for emerging market countries to achieve the synergy of technology adoption and institutional adaptation.

Аннотация

С развитием информационных технологий и повышением ожиданий заинтересованных сторон корпоративная отчетность претерпевает глубокую трансформацию, обусловленную технологиями и сформированную институциональной трансформацией. В данной статье в качестве объекта исследования рассматривается реформа корпоративной отчетности Казахстана, анализируется ее прогресс в стандартизации XBRL и раскрытии информации ESG, а также исследуется путь эволюции отчетности под влиянием институциональной среды и заинтересованных сторон. Результаты исследования предоставят опыт странам с формирующимся рынком для достижения синергии внедрения технологий и институциональной адаптации.

Keywords: corporate reporting; technological change; stakeholders; XBRL; Sustainability Disclosure

Ключевые слова: корпоративная отчетность; технологические изменения; заинтересованные стороны; XBRL; Раскрытие информации об устойчивом развитии

Introduction

As a core tool for corporate governance and value delivery, corporate reporting is undergoing a paradigm shift from static financial disclosure to dynamic, multi-dimensional information integration. This change is driven by two forces: technological innovation and upgrading of stakeholder needs. Under the wave of global digital transformation and sustainable development, corporate reporting is undergoing a paradigm shift from static financial disclosure to multi-dimensional value communication. The implementation of the European Union's Corporate Sustainability Reporting Directive (CSRD) and the International Financial Reporting Standards (IFRS) sustainability disclosure standards marks the acceleration of this transformation [1]. As a resource-dependent economy, Kazakhstan faces unique institutional and technical adaptability challenges in responding to this global trend.

As a member of the Eurasian Economic Union (EAEU), Kazakhstan's corporate reporting system needs to respond to the union's unified environmental disclosure requirements and be feasible under the country's economic structure with a high proportion of small and medium-sized enterprises and a dominant energy industry[2]. Based on Kazakhstan's corporate reporting practices, this study focuses on two core issues: first, how technical standardization (such as XBRL) promotes reporting efficiency, and second, how the needs of multiple stakeholders reshape the content of disclosure. The research results not only enrich the empirical evidence of corporate reporting transformation in Central Asia, but also provide policy references for similar economies. The following will analyze from three aspects: digital technology adoption, stakeholder disclosure transformation and institutional adaptability.

Digital transformation of corporate reporting driven by technology

Globally, the digital transformation of corporate reporting has become an irreversible trend. Kazakhstan has performed outstandingly in this process and has made significant progress, but it also faces some unique challenges. Since 2020, under the active promotion of the National Bank and the Ministry of Finance, Kazakhstan has gradually adopted XBRL as the standardized format for corporate financial reports [3]. This move has brought about significant changes: data shows that the adoption rate of XBRL has climbed from 35% in 2020 to 72% in 2024 (see Table 1 for details). This growth clearly shows that automated reporting has been widely popularized among listed companies and has achieved important phased results.

Table 1

XBRL adoption rate of companies in Kazakhstan (2020–2024)

Years	Proportion of corporate reports submitted using XBRL
2020	35%
2021	48%
2022	59%
2023	65%
2024	72%

Data source: XBRL Implementation Report (2024) of the Ministry of Finance of Kazakhstan

This automation trend not only improves the efficiency of information processing, but also provides technical support for regulatory agencies to implement electronic auditing and early warning.

Evolution of stakeholder-oriented information disclosure

As the concept of global sustainable development continues to deepen and become more popular, corporate reporting is undergoing a profound paradigm shift, from the past "shareholder primacy" model to the "stakeholder co-governance" model. This shift means that when companies prepare reports, they not only focus on the interests of shareholders, but also fully consider the needs and expectations of other stakeholders, such as employees, customers, communities and the environment.

In Kazakhstan, corporate ESG (environmental, social and governance) information disclosure has shown a clear acceleration. According to the latest data, between 2020 and 2023, the ESG report disclosure rate of large companies has increased significantly from the initial 27% to 61% (see Table 2 for details). This significant change is mainly driven by the following three factors:

Table 2

Growth trend of ESG disclosure by Kazakhstan companies

Years	Proportion of companies disclosing ESG content	Major new disclosures
2020	27%	Basic environmental protection measures
2021	39%	Employee Health and Safety
2022	52%	Supply Chain Carbon Footprint
2023	61%	Diversity and Inclusion

Data source: Deloitte Kazakhstan "Annual Reporting Trends in Kazakhstan" (2023) [1]

First, the widespread dissemination and in-depth influence of the global sustainable development concept have made more and more companies and investors realize the importance of ESG factors in the long-term development and risk management of enterprises. Kazakhstan's enterprises have also begun to actively respond to this trend and take the initiative to strengthen the disclosure of ESG information to meet the requirements of the international market and investors.

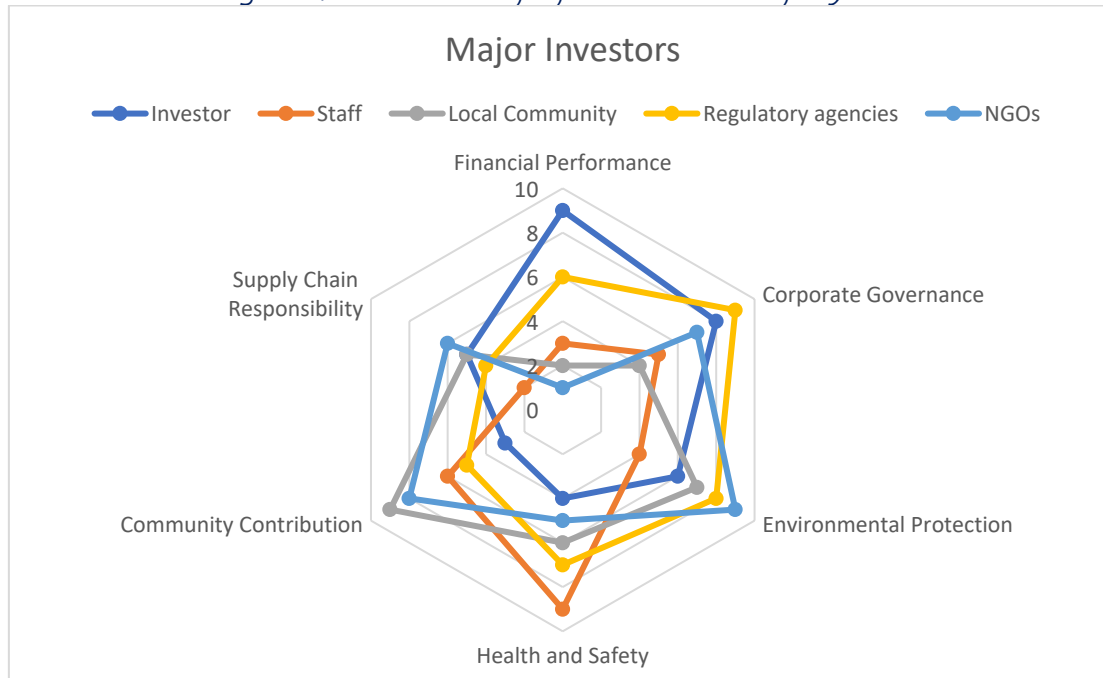
Secondly, the policy guidance and support of the government and relevant regulatory agencies are also important factors in promoting the acceleration of ESG information disclosure by Kazakhstan's enterprises. The government has formulated a series of policies and regulations to encourage enterprises to pay attention to sustainable development, strengthen ESG management and disclosure, and improve the transparency and responsibility of enterprises.

Finally, the pressure of market competition and the change in consumer demand have also prompted Kazakhstan's enterprises to pay more attention to ESG information disclosure. In today's market, consumers and investors are paying more and more attention to the social responsibility and sustainable development performance of enterprises. A company's excellent performance in ESG can often enhance its brand image and market competitiveness, thereby attracting more consumers and investors.

In short, the accelerated trend of Kazakhstan's enterprises in ESG information disclosure is the result of the combined effect of multiple factors, which not only helps to improve the transparency and responsibility of enterprises, but also lays a solid foundation for the long-term sustainable development of enterprises. This transformation is not only driven by regulation (e.g. the Eurasian Economic Union has put forward new requirements for environmental information), but also a proactive response by companies to social responsibility, transparency and reputation management [5].

As shown in Figure 1, there are obvious differences in the focus of different stakeholders on corporate reporting. Investors are particularly concerned about financial performance (9 out of 10), while non-governmental organizations (NGOs) pay more attention to the environmental impact of companies (also 9 out of 10). This significant difference in focus requires companies to make corresponding adjustments in their communication strategies to better meet the needs of different groups.

Figure 1: Prioritization of information needs of key stakeholders



Data source: Kazakhstan Corporate Governance Research Center Survey (2023)

The future of reporting in the dual environment of system and culture

Despite the increasingly improved technical conditions, the quality and transparency of corporate reports are still largely limited by the local legal enforcement and the cultural environment for information disclosure. For example, although the Accounting and Financial Reporting Law (2021 Revised Edition) clearly stipulates the information elements that must be disclosed in the legal text, its enforcement and coverage of small and medium-sized enterprises still need to be improved in the actual implementation process. At the same time, Kazakhstan has gradually introduced the International Financial Reporting Standards (IFRS) framework and adopted the corporate governance guidelines of the Organization for Economic Cooperation and Development (OECD), showing a strong willingness to align with international standards. In the future, the key challenges are how to find a balance between international standards and local realities, how to enhance the technology adoption capabilities of small and medium-sized enterprises, and how to build a reporting ecosystem based on value creation.

At the institutional adaptation level, Kazakhstan's reporting reform is also limited by the fragmentation of the multi-level regulatory system and the regional imbalance of policy implementation. Although a unified regulatory system has been issued at the national level, there are still differences in implementation standards and regulatory technologies in different regions, especially in resource-based provinces. For example, some small and medium-sized enterprises are limited by the lack of financial capabilities and professional talents and cannot effectively meet the dual disclosure requirements of XBRL and ESG, resulting in a large gap between the quality of reports and international standards.

In addition, cultural factors cannot be ignored. For a long time, companies' cognition of "reporting" is still mainly "compliance-oriented" and lacks "value-oriented" awareness. Within companies, reporting is often regarded as an afterthought rather than a strategic tool. The rooting of this concept makes it difficult for companies to actively embrace the trend of transparency and responsibility disclosure in execution, even if technical conditions and regulatory environment are gradually improved. To achieve a cultural transformation from "passive compliance" to "active communication", it is necessary to start from multiple aspects such as corporate governance structure, education and training, and executive incentive mechanisms.

At the same time, regional institutional coordination will also become a key task for the evolution of corporate reporting in the future. As Kazakhstan's economic integration with other countries in Central Asia deepens, how to promote regional consistency in corporate reporting standards, especially to achieve cross-border comparability and compatibility under the EAEU framework, has become the key to achieving high-quality information disclosure in the context of regional integration.

Finally, the future of corporate reporting also faces challenges brought about by external uncertainties, such as global climate change policies, geopolitical conflicts, and data sovereignty regulations. This requires Kazakhstan to establish a more flexible corporate reporting response mechanism while improving its internal governance system to cope with dynamic changes in the external environment.

In summary, the future evolution of corporate reporting not only depends on technology updates and standard upgrades, but is also rooted in institutional design and cultural change. Only by achieving multi-level coordination and concept updates can we build a reporting system that is truly future-oriented and serves the interests of multiple parties.

Conclusion

As a bridge between enterprises and external stakeholders, corporate reporting is in a critical period of profound change. Emerging economies represented by Kazakhstan, driven by the global digital transformation and sustainable development agenda, have gradually built a new reporting system that combines compliance, strategy and transparency.

This paper finds through empirical analysis of XBRL standardization and ESG information disclosure that the introduction of technical tools has greatly improved the efficiency and consistency of reporting, while the stakeholder-oriented information structure has strengthened the social function and responsibility logic of reporting. However, this transformation has also exposed many bottlenecks such as insufficient institutional enforcement, strong cultural inertia, and serious differentiation of corporate capabilities.

Therefore, the future development of corporate reporting should not only stay at the level of "technology empowerment" or "standard promotion", but should move towards a more systematic and coordinated development path: at the technical level, data infrastructure construction should be strengthened to promote the popularization of automation tools, especially to provide technical support in small and medium-sized enterprises; at the institutional level, legislation, regulatory coordination and standard system construction are needed to achieve effective connection between national level and regional cooperation; at the cultural level, enterprises should be encouraged to move from "disclosure obligations" to "communication strategies" and cultivate internal sense of responsibility through training and incentive mechanisms; at the international cooperation level, it is recommended that Kazakhstan actively participate in rule-making under multilateral mechanisms such as EAEU and OECD to enhance the international comparability of its corporate reports.

In general, the future of corporate reporting is not only about the speed of technology adoption, but also about the quality of a country's system, the strategic vision of enterprises and the public's common pursuit of transparency, fairness and sustainability. Only when enterprises, regulatory agencies and the society work together can the transition from "compliance reporting" to "value-creating reporting" be truly realized.

References

1. Zhang Wenxian, Li Xiaomin, Liu Zhiwei. *Research on the Digital Transformation of Financial Reporting*[J]. *Accounting Research*, 2022(5): 1-12.
2. Ministry of Finance of Kazakhstan. *XBRL Implementation Report*[R]. Astana: Ministry Publications, 2024.
3. Deloitte Kazakhstan. *Annual Reporting Trends in Kazakhstan*[R]. Deloitte Insights, 2023.
4. Eurasian Economic Commission. *Environmental Disclosure Requirements under EAEU Guidelines*[R]. Moscow: EEC Publishing, 2021.
5. IFRS Foundation. *Sustainability Reporting Standards Overview*[R]. IFRS Publications, 2023.
6. OECD. *Corporate Governance Factbook*[EB/OL]. 2022. <https://www.oecd.org>.

ANALYSIS OF THE CURRENT STATUS OF THE IMPLEMENTATION OF THE BUSINESS DIVERSIFICATION STRATEGY IN AZERBAIJAN

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Abstract

The article examines the basics of the importance of choosing a diversification business strategy for economic entities of the business sector in Azerbaijan. A possible analysis of the activities of business entities based on the characteristics of the economic environment and the requirements for diversification was carried out. The analysis confirms the necessity of implementing an appropriate strategy based on the results of the diversified activities of companies covering different areas of activity included in the same holding. In general, the study includes the necessary conditions for implementing a diversification strategy in accordance with the state of the country's economy.

Keywords: *integration, strategy, market share, digital development, diversification activity.*

Integration and diversification strategies are widely used in the country's economy. However, as experience shows, the use of these strategies, along with the success achieved, also leads to certain losses. Of course, one of the reasons for this situation is the lack of methodological justification for the selection of these strategies in a number of business entities. Although in most scientific works on management and in the practical activities of business entities, growth strategies are presented as undeniable advantages. However, quantitative justifications and, in particular, models for the selection of such strategies are not widely developed [1, p. 234]. As one of the unresolved issues of strategic management of a business portfolio, the question of how to maintain or even increase the integrity of many business processes that must be managed when implementing diversification and integration strategies remains. First of all, even if business development strategies do not involve the separation, merger or change of activity of a business entity, it is difficult to maintain its integrity in certain economic conditions [3, p. 79].

Business restructuring often involves the liquidation of previous business entities and the creation or acquisition of new ones as part of a diversification strategy. Typically, weak or unstable businesses that have lost their strategic importance are excluded. Enterprises operating in unattractive industries can also be candidates for removal from the enterprise portfolio. In a constantly changing and competitive business environment, the ability of business entities to adapt and thrive is paramount [2, p. 103]. Implementing a diversification strategy has emerged as the most important approach for business entities seeking to increase their adaptability and resilience. Diversification, defined as the process of expanding a company's product and service offerings or markets, not only serves as a mechanism for risk reduction, but also drives innovation and growth.

As consumer preferences evolve and market dynamics change, businesses must actively seek new opportunities to remain relevant and competitive. They must examine the theoretical frameworks underlying diversification and continually examine how they can use their core capabilities to identify and capitalize on new market opportunities. In addition, strategic planning, resource allocation, and organizational culture are also important in the successful implementation of diversification initiatives [4, p. 67]. An important step in promoting the adaptability of diversification in our country's business environment, ensuring long-term sustainability, and uncovering the specifics of the diversification policy of PASHA Holding Limited Liability Company, which operates in various fields of activity, will be examined. It should be noted that the holding has been operating since 2006. Here, business activities are organized based on effective corporate governance, as well as comprehensively analyzed investment decisions. The investment direction of the holding is determined by two investment portfolios. These are controlling shares in Pasha Holding, including Pasha Group, that is, subsidiaries, as well as small

individual capital investments. A number of indicators of the holding for 2022 and 2023 are reflected in table 1 below. The indicators were obtained from the official internet resource.

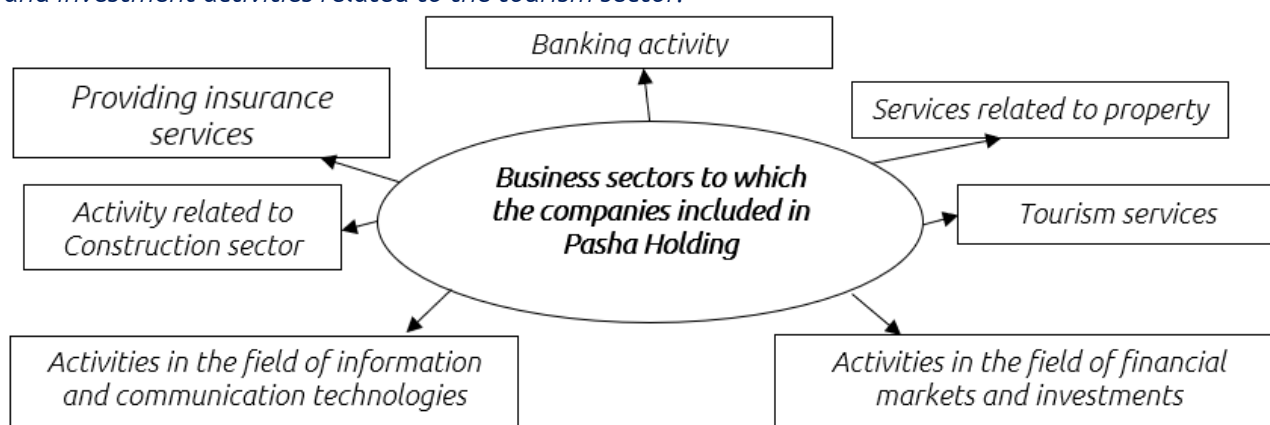
Table 1		
Key indicators of Pasha Holding for 2022-2023		
Indicators	2022	2023
Total assets	19.3 billion Azn	20.5 billion Azn
Total capital	2.45 billion. Azn	2.83 billion Azn
Gross revenue	2.1 billion Azn	2.4 billion. Azn
Market share	34.7%	35.2%
Number of employees	19,500+	20,000+

Source: [5]

Continuing the analysis based on the data in the table, it can be noted that in 2023, there was an increase in total assets of 1.2 billion manats or 6.2 percent compared to 2022. Such an increase indicates a general increase in assets in the holding, including an increase in their value. There was also an increase in capital, and the amount of the increase was 380 million manats or 15.5 percent. The increase in total capital can also be interpreted as an improvement in the financial capabilities of the economic entity, including the registration of economic stability, and in addition, the presence of additional capital investments.

The holding's revenues also increased in 2023, and this increase amounted to 300 million manats or 14.3 percent. The increase in total revenue should be assessed as a result of increased profitability of the activity. This means an improvement in the market position as a result of both sales and services. Logically, the improvement in the market position led to an increase in market share. Although the increase was 0.5 percent, the fact that this indicator was achieved as a result of fierce competition is an advantageous indicator of the competitiveness of the companies included in the holding. Along with other indicators, the increase in the number of employees, reaching 20 thousand employees, is an expression of an important role in the country's labor market. The fact that the companies included in Pasha Holding belong to various fields of activity strengthens its sustainable development and sustainability.

The prepared scheme 1 reflects the business spheres covered as a result of diversification of activities. From the scheme we have compiled based on the information mentioned from the official internet resource, it is also possible to determine that "PASHA Holding" LLC, through its subsidiary economic entities, operates in the fields of banking and insurance activities, the construction sector, as well as information and communication technologies. In addition, there are real estate-related services and investment activities related to the tourism sector.



Scheme 1. Pasha Holding's areas of activity Source: [5]

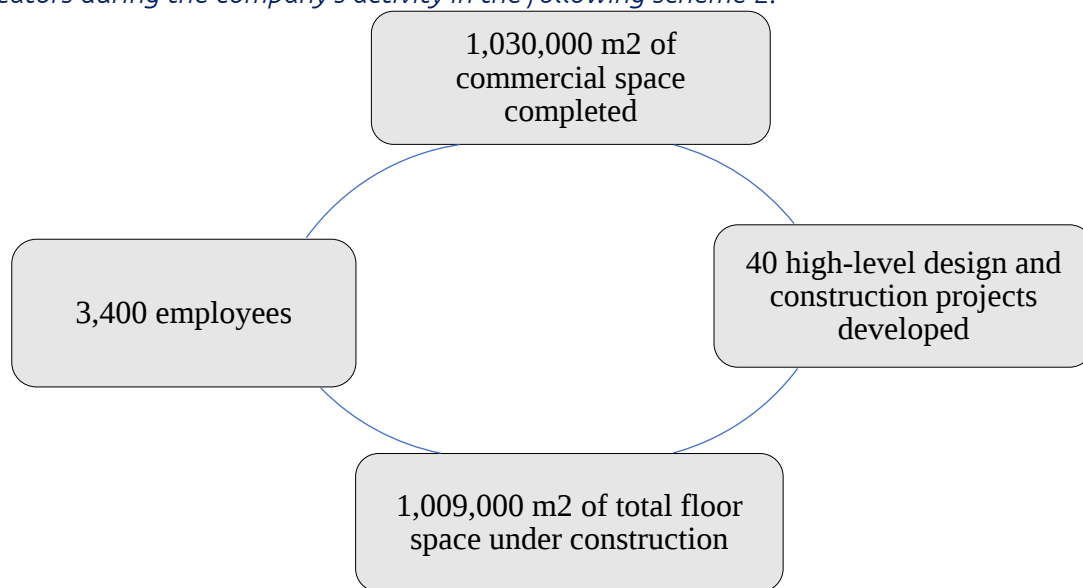
The diversity of the holding's activities stimulates professional business activity by applying strict integrity, a favorable corporate governance environment, as well as modern digital solutions. This stimulation is managed through high-quality human resources that allow for the sustainability of economic growth, as well as deepening cooperation in order to improve business activity outside the country. One of the main goals is to increase macroeconomic profitability, as well as to become a leading, sustainable strategic investor in the context of protecting the corporate image, strengthening the economic position and business relations, as well as to develop rapidly in this direction. In particular, at a time when the development of business spheres related to the non-oil sector in the country is a priority, the activities of the relevant economic entity gain serious importance. Thus, the companies included in the holding make

significant investments in various areas of activity related to the non-oil sector of Azerbaijan in their areas of responsibility. Investment activity in certain areas is also continued outside Azerbaijan. All this is very important to meet the growing linear investment need and support economic activity. In addition to economic factors, it improves advanced corporate practice by promoting innovative development.

As we mentioned earlier, it is necessary to divide the investment portfolio of Pasha Holding into two types. First, this is a controlling stake. The other is a share investment in private stocks, which is a minority. The number of companies included in the holding exceeds 20. Business entities included in the holding, operating only in the banking sector, cover 3 countries. These countries are Azerbaijan, Georgia and Turkey.

Investment activities in foreign countries are carried out by "Pasha Investments" LLC. This investment company is a fund that includes capital increase investments for economic entities with medium capital in the countries listed above. The investment fund is to identify business entities with development opportunities and potential and support their development in the prospective period. In this process, the investment fund provides business structures with comprehensive analysis, financial support and a strategic approach. According to the information provided on the official Internet resource, the total fund assets of the company are one hundred million manats [6].

An important direction of the non-oil sector in Azerbaijan, as well as a sector with significant economic opportunities in terms of prospects, is, of course, the construction sector. Numerous individuals and legal entities are engaged in business activities in this sector. "Pasha Construction" is also one of the business entities that performs important work in the construction sector and creates added value. Thus, this company implements the most comprehensive and innovative construction projects in the country's construction sector. It should be noted that the company has been operating since 2006. We present the indicators during the company's activity in the following scheme 2.



Scheme 2. General performance indicators of "Pasha Construction" Source: [7]

In general, "Pasha Construction" is a specialized business entity that carries out the construction of residential and non-residential infrastructure facilities in our country in accordance with relevant industry standards.

As we mentioned earlier, Pasha Holding can be cited as an example of the best business entity that has implemented diversification activities in Azerbaijan to achieve the efficiency of economic activity. This diversification covers not only traditional areas, including construction, but also modern areas such as ICT and digital development. Thus, "PASHA Technology" Limited Liability Company was established in 2018 as a provider of services in the field of information technologies. The company's scope of activity is mainly to provide information technology services to business entities included in the holding, to ensure cybersecurity, and to perform cloud computing operations, as well as information center management. The company's net profit for 2023 was 2 million manat. In addition, in 2023, the company's revenue exceeded 24 million manats with an increase of 93 percent. The company's assets and total capital exceeded 38 million and 12.6 million manats, respectively. The company mainly has the following areas of activity [8]:

- preparation of data center projects, their establishment and management;
- strategically becoming a reliable digital company with ISO certification in our country;
- having the ability to meet all requirements by providing continuous and high-quality uninterrupted operations;
- implementing an action plan for services for the strategic period;
- improving the quality of human capital;
- offering open infrastructure and end-user services on both sides.

References

1. Dirk G. Baur. *Diversification is not free lunch* // *Journal of risk and financial management (JRFM)* – 2024.17 - p. 225-238.
2. Han Le, *Literature review on diversification strategy, enterprise core competence and enterprise performance* // *American Journal of Industrial and Business Management* - 2019.9 - p. 91-108.
3. Ihsan Yigit, Nihal Kartaltepe-Behrama, Emre Isci *An assessment of the diversification performance linkage: An empirical comparison* // *Tékhne* - Volume 11, Issue 2, July-December 2013, p. 76-82.
4. Kannan Paulraj, Saravanan Rangaswamy. *Diversification-strategies for managing a business* // *Excel International Journal of Multidisciplinary Management Studies* - Vol. 2 Issue 5, May 2012 - p. 64-73.
5. <https://pasha-holding.az/az/about-us/pasha-holding-group-in-brief/> 21
6. <https://www.pashainvestments.az/az/pages/portfolio> 21
7. <https://www.pashaconstruction.com/az/about-us/> 21
8. <https://pasha-holding.az/az/technology/pasha-technology/> 21

THE MULTIPLICATIVE ROLE OF FREE ECONOMIC ZONES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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Abstract

The article examines the role of free economic zones in ensuring sustainable development in Azerbaijan. The main conditions and priorities of sustainable development are explained. Taking into account the socio-economic development goals and principles of sustainable development in the country, the issues of diversifying the economy and increasing investment attractiveness are examined. The multifunctional role and importance of free economic zones in these processes are substantiated. The impact of free economic zones in strengthening the country's economic and regional security is examined. In particular, the issues of establishing and developing free economic zones in post-conflict areas are examined. Proposals are made on the effective use of free economic zones in strengthening sustainable development in Azerbaijan in the near future.

Keywords: Azerbaijan, free economic zones, sustainable development, sustainable development principles, sustainable development conditions, multiplicative effect of free economic zones, development prospects of free economic zones.

In modern times, the sustainable development of the country's economy is attracting the attention of international experts and world specialists. In the last ten years, Azerbaijan has been able to determine development priorities in a number of non-oil sectors, in addition to the extractive industry. Large amounts of domestic and foreign investments are being directed to the development of many new economic sectors in Azerbaijan, including the transport and construction sectors, information and communication technologies and tourism sectors. A wide network of infrastructure facilities has been established in all regions of the country and these works are ongoing. Competitive processing enterprises have been put into operation in many regions. Most of the products of such enterprises are directed not only to the domestic market, but also to export. Work is underway to rehabilitate and modernize a number of traditional economic sectors. For example, the enterprises of the non-ferrous metallurgy industry in the city of Sumgayit have been reconstructed on the basis of modern technologies, and a new steelmaking complex and aluminum production areas are being created near the city of Ganja. Important decisions have been made to reconstruct the chemical and petrochemical complex, and in the near future it is planned to achieve the construction of a number of modern production facilities on the basis of high technologies. The Sumgayit Technology Park, which specializes in electric power and electrical goods and equipment and includes about 20 production areas, is in operation. The expansion of this technopark is among the priority tasks of the coming years. The number of residents operating in the Sumgayit Chemical Industrial Park has reached 44.

It should be noted that, based on the instructions and decisions of the country's leadership and the government, State Programs and other important decisions are adopted for the sustainable development and innovation of individual sectors of the economy, preferential economic regimes are determined, financial assistance is allocated to necessary sectors, etc. Along with all this, the experience of developed and currently high-growth countries of the world shows that in order to ensure the sustainable development of various priority sectors of the national economy and the maintenance of the pace of economic growth, as well as the application of effective economic tools in real practical areas, there is a need to apply more progressive and productive economic tools in addition to existing economic mechanisms. Many countries of the world have been able to successfully use free economic zones for these purposes [1]. While studying the experience of free economic zones in countries around the world, we did not consider it appropriate to provide repeated materials on this subject, since we were familiar with a group of examples on this subject. In Azerbaijan, the use of free economic zones to accelerate economic development processes has already taken place in the economic policy of our country [2; 3]. In

our country, the model of free economic zones of such zones has been accepted as a priority, the appropriate legislative framework has been prepared, and the priority is to achieve a solution to the problems of applying such zones to real economic processes [4].

The factors that determine the use of free economic zones in Azerbaijan in increasing the non-oil sector and especially the export potential can be grouped as follows:

- stimulation of the attraction of large capital and foreign investors, along with the financial resources allocated by the state to these sectors in order to reconstruct and modernize a number of non-oil sectors of the country (chemistry and petrochemicals, textiles, instrument-making, etc.);

- In order to ensure the development of rapidly developing information and communication technologies, military-industrial complex and aerospace sector in Azerbaijan based on more modern and high technologies, organizing the arrival of famous world companies to our country, as well as ensuring the direction of national scientific and technical resources to these areas;

- In order to make the entrepreneurship and business environment, which is gaining momentum in the country from year to year, the importance of forming a more diverse economic environment, encouraging the introduction of investments and foreign management methods, and creating a network of separate production areas;

- Ensuring the comprehensive development of Azerbaijan's foreign trade activity in the non-oil sector, diversifying foreign trade turnover, for this purpose, increasing the interest of local and foreign entrepreneurs and investors in these areas for the organization of production areas (service areas) for the production of export-oriented products and the provision of services, and increasing economic activity in general through free economic zones;

- To more effectively use the country's sufficiently productive labor resources, to form adequate economic activity areas in accordance with the requirements of the labor market through free economic zones, to establish a wide network of production and service enterprises, to increase services and trade turnover, to increase the income of the population, to reduce poverty, to accelerate the solution of socio-economic problems, to obtain a new economic mechanism, in particular, to provide citizens with jobs, etc.

In the economic development priorities of the world's free economic zones for the last 30 years, priority has been given to science-intensive and innovation-oriented areas of activity [5; 6]. We have already talked about various forms of science-intensive and innovation-oriented free economic zones with high productivity in many countries [7]. These include technoparks (technopolises) with cluster functions and rich in innovation elements, which organize the connection of educational and scientific-research institutions with practical production processes, production-export technical application zones with a wide network of science and high-tech production areas, high-tech industrial zones and others [8]. In the developed countries of the world, it can be said that mainly science-intensive and innovation-oriented models of free economic zones are used. Currently, most countries with rapid economic development use such variants of free economic zones. For example, the results achieved by science-intensive and high-tech free economic zones in countries such as China, South Korea, Singapore have attracted the attention of experts from all over the world. Since we have given a number of examples of these, as well as highly effective technoparks (technopolises) in the USA, Western European countries and Japan in the previous chapters, we will suffice by noting that they play a significant role in the economic system of their countries in the modern era [9].

Although a number of works have been carried out in Azerbaijan in recent years to accelerate the development of science and technology, expand the application of innovations to various sectors of the country's economy, and effectively organize the work of other designated areas of activity, there are still many problems in these areas [10]. Thus, the expenditures allocated to science in the country are less than the real demand, there is a need to determine new priorities in financing and organizing the processes of applying the results of scientific research to production, there is a serious need to stimulate the processes of obtaining scientific inventions and achieving scientific discoveries, etc. In addition, although considerable funds have been allocated to establish a modern structure in the field of information and communication technologies in the country, and State Programs have been consistently implemented in this direction, the volume and variety of innovative products in Azerbaijan are quite small [11]. On the other hand, the processes of creating appropriate production areas capable of organizing the production and sale of innovative products and ensuring their access to sales markets are slow. There is a need to apply economic tools with a more diverse and flexible mechanism to accelerate all these processes and organize the production of high-standard, science-intensive, innovative products. Based on the conducted research and existing priority areas, the use of free economic zones in the development of

science-intensive and innovative sectors in Azerbaijan can be explained as follows: science-intensive and innovation-oriented free economic zones act as a favorable economic environment for organizing scientific research and their application in production; science-intensive and innovation-oriented free economic zones, having a certain system of privileges, are able to solve problems related to the development, preparation and application cycles of high technologies that go through complex processes; Since Azerbaijan has a large number of scientific and research institutions with high potential, as well as the presence of higher education institutions in this field, it is considered appropriate to organize a complex form of a scientific and technical park with high technology designation, or a science park, or models of export-production and scientific and technical free economic zones around Baku in the near future, etc.

In many countries of the world, serious attention has been paid to the development of the tourism sector over the past 10-20 years. Many countries receive a large amount of income from tourism. In Turkey, which is a strategic partner and brotherly country of Azerbaijan, tourism is one of the main priority economic sectors of the country. In neighboring Georgia, consistent measures have been taken for many years to develop tourism. New ones are being added to the traditional tourism services of this country. Large-scale tourism projects are being implemented in various regions of Russia, another large neighboring country. Free economic zone models have begun to be used to organize a wide range of tourism and recreation services around Lake Baikal, which has unique natural resources. Similar tourism-recreation free economic zones have been organized in Altai, Stavropol, Krasnodar and other regions of Russia. Another neighboring country, Turkmenistan, has also launched a large international project in the form of tourism-recreation free economic zones on the shores of the Caspian Sea. In many Western European and Asian countries, free economic zones are also being effectively used to develop tourism and provide tourist services all year round. Again, one cannot fail to mention an example related to Russia. In the city of Sochi of this country, applications to the institute of free economic zones are increasing in order to further expand and increase the efficiency of tourism-recreation and tourism-sanatorium services [12].

It should be noted that in Azerbaijan, tourism has become one of the country's main priority non-oil sectors [13]. A strategic approach to tourism-related issues has been formed in the economic policy of the head of state and the government. In addition, serious importance is attached to the construction of necessary infrastructure facilities in areas favorable for tourism within the framework of regional socio-economic development programs. High-standard tourism facilities, hotels and campsites are already being put into operation in a number of western, northern and southern regions of Azerbaijan. High-standard hotels have been put into operation in cities such as Baku, Ganja, Lankaran, Sheki, Zagatala and Gabala. The implementation of a large project such as the "Shahdag" winter sports and tourism complex in Gusar is continuing rapidly. All conditions have been created in the city of Gabala for organizing international events and cultural forums, etc.

Along with all this, the presence of opportunities for more efficient use of tourism potential in Azerbaijan attracts attention. There are also many problems in this area. The level of service of most tourism facilities is low. There are no complex tourism centers capable of serving more tourists at the same time. Despite the favorable conditions along the Caspian Sea coast of the country, there is a need to create tourism facilities that fully meet international standards [14]. Many regions that are ecologically and naturally rich have the potential to build tourism and recreation centers that meet world standards. Of course, the implementation of all this requires a large amount of investment resources and capital. On the other hand, considering that tourism and recreation services in our country are mainly seasonal, it is important to take into account the costs of tourism enterprises and solve the problems of operating with income. Many countries in the world have managed to partially solve such problems by introducing free economic zones [15]. The prospects for the application of free economic zone models for the development of tourism in Azerbaijan and the improvement of the level of services in this field are attracting attention. The creation of such a zone for the purpose of tourism and recreation services could provide additional incentives for investors from other countries and companies with sufficient experience in the field of tourism to come to Azerbaijan and would create conditions for the diversification of tourism services [16].

The delay in the implementation of free economic zones in real economic processes in Azerbaijan is due to a number of objective and subjective factors [17]. Even 10-15 years ago, most of the problems in the implementation of such zones were characterized as objective difficulties [18]. The most problematic of these was the difficulties in financing measures related to the creation and operation of such a complex economic mechanism as free economic zones. In recent years, Azerbaijan has gained

prestige in the region and among the countries of the world as a country with strong financial resources. Our country even allocates financial assistance and credit resources to other states. Along with this, as we have seen earlier, the legislative framework of free economic zones in Azerbaijan has been fully formed, and the necessary laws and regulatory documents have been developed and adopted to organize the practical activities of such zones [19]. On the other hand, the country's legislative acts have been harmonized in terms of the provisions arising from the Law on Free Economic Zones, and regulatory documents and rules have been approved in these areas, including the creation, registration, organization of such zones, ensuring economic activity, tax and customs regimes. At the same time, the world experience in free economic zones and other modifications of such zones has been studied extensively, and the priority areas in which such zones will be applied to the economic system of our country have been largely determined [20; 21].

After the Great Karabakh Victory, the prospects for the revival of our lands and the rehabilitation and development of the territories liberated from occupation have come to the fore. These territories have sufficient underground and surface resources, a large number of ores and non-ores. There are strong resources here for the development of various economic sectors. In general, these territories - the Karabakh territory and the adjacent territories - have strong prospects for the development of most sectors of agriculture, especially agriculture and crop production [22]. At the same time, there are significant and sufficient resources here for the development of the agro-industrial complex. It is interesting that 2 new economic regions - the Karabakh and East Zangezur economic regions - have been organized precisely in the territories liberated from occupation [23]. The economic potential of both regions is quite high. In Karabakh, as we have already mentioned, there is a potential for the development of most areas of agriculture and the agrarian sector as a whole. In addition, there are prospects for using the tourism and recreation potential of Karabakh, especially in the city of Shusha, the creation of sanatorium complexes and the commissioning of modern hotel brands, and the active attraction of tourists from all over the world. At the same time, there are wide opportunities for the production of building materials, especially the prospects for the creation of a building materials production complex or a building materials cluster in the Agdam region are noteworthy [24].

We believe that it is impossible to ignore the existing light industry potential and its opportunities in Karabakh. The opportunities for the development of cotton growing here, the high potential for wool supply, the availability of opportunities for procurement of leather products, and, as we have already noted, the development of cocoon farming allow us to conclude that it is possible to develop the light industry in Karabakh in a comprehensive manner, and at the root of this development, of course, through the creation of free economic zones, for example, the creation of such economic zones in the direction of the development of light industries promises very great prospects [25]. There are also sufficient resources in the East Zangezur economic region, and the opportunities for the development of agriculture, its main directions, livestock breeding and farming, are of greater interest here. In particular, there are very strong resources for the development of livestock breeding. In the Lachin and Kalbajar regions, it should be noted the presence of pastures and pastures necessary for the development of livestock breeding, the presence of pastures, and the abundance of fodder resources. In general, there are prospects for organizing the production of a large number of livestock products in the meat and dairy sectors, and creating a network of agro-processing industry enterprises through free economic zones [26; 27].

At the same time, another important issue in the Karabakh and East Zangezur economic regions is the complex development of transport and logistics infrastructure. This issue is important because in most countries of the world, free economic zones are created at international airports and at the intersections of transport hubs, and the goal is to accelerate the intensity and turnover of goods in these areas and directions, to ensure import and export operations free of bureaucracy, and to carry out the movement of high technologies, investments, financial resources, and capital more quickly [28; 29; 30]. Diversification of foreign economic relations, further facilitation of import and export operations, autonomous operation of free economic zones outside of suffocating tax regimes and independent of bureaucratic customs regimes, the role of free economic zones in accelerating economic development processes in transport hubs, border zones, promising regions of the country, including the Karabakh and East Zangezur economic regions, can provide considerable advantages. At the same time, the organization of free economic zones can create serious grounds for attracting existing resources to economic and financial circulation, and for the formation of additional resources, gross domestic product, and additional sources of growth for the socio-economic development of the country.

When talking about the transport-logistics junction, it is impossible not to touch upon the opportunities of the Zangezur International Transport-Logistics Corridor, which is quite promising. This

transport corridor is expected to unite the geography of the Turkic world. New opportunities will be formed in strengthening the mutual integration of the Turkic-speaking states that have been separated from each other for many years, and at the same time, in the efficient use of the resources available here. It is no coincidence that among the implemented projects, the creation of the "Araz Valley Economic Zone" in Jabrayil attracts attention [31]. Currently, the processes of creating high-tech production-industrial and transport-logistics infrastructure in the revival of the territories liberated from occupation are accelerating. The main directions of activity of these free economic zones that will operate in the Jabrayil region are the processing of agricultural products and the production of competitive industrial products. At the same time, it is planned to form a strong logistics-trade center. After the implementation of the Zangezur corridor, the potential for strengthening trade-economic relations will be created here on a larger scale. In particular, thanks to the integration of Turkic-speaking countries, trade and economic relations in the region will expand and trade turnover will increase significantly.

Through this economic zone, it will be possible to attract international investors and operate here, actively participate in the economic construction of Karabakh and East Zangezur, make investments, and bring technologies to this region [32]. On the other hand, 17 transport projects implemented in the liberated territories will be of great importance, and the presence of 3 international airports among them will generally provide additional incentives for the very rapid development of that region. Active organization of free economic zones allows for the development of technologies and the attraction of more investments. There are favorable conditions for the development and application of innovations in these zones [33; 34; 35; 36]. Thus, state support mechanisms are applied for investment in similar zones and tax breaks are determined [37; 38; 39; 40; 41]. On the other hand, free economic zones have a positive impact on the socio-economic development of the area in which they are located and accelerate the creation of a network of enterprises [42; 43; 44]. The role of such zones in increasing the competitiveness of various sectors of the economy, developing and implementing new innovations is quite high [45; 46; 47]. At the same time, tax and customs privileges applied in free economic zones have a positive effect on the more efficient operation of enterprises in a market economy, attracting additional investments and expanding their activities. [4; 49; 50]. In view of the above, the use of various effective forms of free economic zones can be beneficial in increasing the investment attractiveness of the territories liberated from occupation, revitalizing devastated areas, solving employment problems of the population and diversifying their incomes, developing the financial services market, and creating an infrastructure for financial and credit services [51; 52; 53].

Thus, in the near future, it can be predicted that the influence of free economic zones in ensuring sustainable development in Azerbaijan will increase:

- There is a need for in-depth study of international experience in the effective use of free economic zones;
- The creation of free economic zones in areas of the economy of Azerbaijan with promising and strong resource potential can be effective;
- The creation of free economic zones in post-conflict areas will provide additional incentives to accelerate the processes of revival and strengthen sustainable development there, etc.

References

1. Ziedina, D. & Pelse, M. Main Characteristics of Economic Zones Types: Latvia's Experience. 2017. –p. 212-218.
2. Xüsusi iqtisadi zonalar haqqında Azərbaycan Respublikasının Qanunu (14 aprel 2009-cu il).
3. Səmədzadə Z.Ə. "Dünya iqtisadiyyatı. Çin "iqtisadi möcüzəsi". Bakı, Gənclik, 2001. – 324 s.
4. Əliyev Ş.T. «Xüsusi iqtisadi zonaların tətbiqi problemləri». Monoqrafiya. (Azərbaycan Respublikasının Prezidenti yanında Elmin İnkişafı Fondunun 2011-ci il I "Qrant" müsabiqəsinin əsasında layihəsi hazırlanmışdır). Bakı, 2012.-360 s.
5. Ambroziak A., Hartwell C. The impact of investments in special economic zones on regional development: the case of Poland. *Regional Studies*, Taylor & Francis Journals, vol. 52(10), 2018.–p. 1322-1331.
6. Əliyev Ş.T. Xüsusi iqtisadi zonalar: konseptual əsaslar və strateji istiqamətlər. Bakı: «Elm və təhsil», 2012.-196 s.
7. Зименков Р.Н. Свободные экономические зоны. Изд-во Юнити-Дана, Москва, 2005.– 223 с.
8. Ələt azad iqtisadi zonası haqqında Azərbaycan Respublikasının qanunu. Bakı şəhəri, 18 may 2018-ci il. № 1143-VQ - <https://e-qanun.az/framework/39078>

9. Əliyev, Ş.T. Azad iqtisadi zonaların inkişafının aktual aspektləri. Monoqrafiya. Sumqayıt. SDU-nun Redaksiya və nəşr işləri şöbəsi. 2022 - 422 s.
10. "Araz Vadisi İqtisadi Zonası" Sənaye Parkının yaradılması haqqında Azərbaycan Respublikası Prezidentinin Fərmanı. Bakı şəhəri, 4 oktyabr 2021-ci il. - <https://president.az/az/articles/view/53319>
11. Əliyev Ş.T. «Azad iqtisadi zonalar». Dərslik. Sumqayıt Dövlət Universiteti, "Bilik" PM- 2013.- 280 s.
12. Səmədzadə, Z.Ə. Qarabağ iqtisadiyyatı 100 ildə: 5 cild/ Z. Səmədzadə; [baş red. A. Səmədzadə; red. Y. Məmmədova]. Bakı: Kitab Çapı, 2022. – 856 s.
13. Əliyev, Ş.T. Qarabağ və Şərqi Zəngəzur iqtisadi rayonlarının yaradılmasının strateji aspektləri. // Geostrategiya jurnalı, – 2021. № 04 (64), – s.67-72.
14. İqtisadi Zonaların İnkişafı Agentliyi <https://economiczones.gov.az/haqqimizda/haqqimizda2>
15. Алиев Ш. Т. Экономика Азербайджана. Сумгайт, 2018 – 376 с.
16. Gulbis, I. Foreign Direct Investment and Special Economic Zones in Latvia. *Baltic Journal of Real Estate Economics and Construction Management*, 2018– p. 240–252.
17. Əliyev, Ş. Qarabağ və Şərqi Zəngəzur iqtisadi rayonlarının yaradılmasının strateji aspektləri. *Geostrategiya jurnalı*, – sentyabr-oktyabr 2020. № 05/06 (59/60), – s.67-72.
18. Aliyev, Sh.T., Babayev F., Gafarli G., Galandarova U., Balajayeva T. Economic security of regions: A prerequisite for diversifying the Azerbaijan economy// *Journal of East European and Central Asian Research (JEECAR)*. 2023. September. Vol. 10 No. 5 (2023), p. 827-840.– <http://dx.doi.org/10.15549/jeecar.v10i5.1480>.
19. Алиев, Ш.Т., Меликова, Л.А. Актуальные проблемы и объективные реалии мирового опыта в восстановлении освобожденных от оккупации территорий/ IX Международная Научно-Практическая Конференция «Развитие науки и практики в глобально меняющемся мире в условиях рисков».– Россия, г. Москва. 28 марта 2022 года- С.277-286.
20. Агаев С.Г., Алиев Ш.Т. Проблемы и перспективы торгово-экономических связей Азербайджана с Россией. Баку: Элм, 2004.-280 с.
21. Алиев, Ш.Т. Стратегическая важность возрождения Карабахского и Восточно-Зангезурского экономических районов Азербайджана// «Вопросы Истории» (Москва), № 6, 2022. – с.148-155.
22. Smirnov M.A. Analysis of the Polish Special Economic Zone Development: Implications for Russia. *Financial journal*, no. 5.- 216. –p. 82-93.
23. Алиев, Ш.Т. Роль специальных экономических зон в развитии предпринимательства и инвестиционной активности// Российское предпринимательство.- Москва, 2012. № 7 (205), – с. 180-184.
24. Алиев Ш.Т. Проблемы организации и перспективы развития особых экономических зон. — Баку: Наука. – 2008. - 252 с.
25. European Special Economic Zones. Research spin-off project of "The World in Europe: Global FDI flows towards Europe (ESPON FDI)"-Policy Brief // November 2020. – 43 p.
26. Алиев Ш.Т. Важность особых экономических зон в формировании экономической модели Азербайджана // Журнал «Проблемы современной экономики», Санкт Петербург, №2, 2009, С.277-278.
27. Алиев Ш.Т. Важность применения новых экономических инструментов в экономических процессах Азербайджана// Национальные интересы: приоритеты и безопасность. 2009, № 12. С. 80–90.
28. Əliyev, Ş.T. Qarabağ iqtisadi rayonunda yaşıl enerji resurslarından səmərəli istifadənin aktual aspektləri // "Geostrategiya" jurnalı, Bakı 2024 - №04(82). – s. 124 - 128. <https://geostrategiya.az/pdf/2024/0482.pdf>.
29. Alguliyev, R.M., Aliyev A.G., Aliyev Sh.T., Shahverdiyeva R.O. Development of information support systems for management of innovative structures / *The 8th IEEE International Conference on Application of Information and Communication Technologies (AICT2014)*, Astana, 2014. – 378-382.
30. Piana V., Aliyev, Sh.T. and etc. 2009 – Innovative Economic Policies for Climate Change Mitigation. *Economics Web Institute*, Rome.
31. Aliyev, S., Gulaliyev, M., Purhani, S., Mehdiyeva, G., & Mustafayev, E. (2024). Comparative Assessment of Energy Security Level: The Case of the South Caucasus Countries. *International Journal of Energy Economics and Policy*, 14(1), 651–662. <https://doi.org/10.32479/ijeep.14984>.
32. Алиев, Ш.Т. Внешнеэкономическая политика Азербайджана. Сумгаит: Изд-во Сумгаитского государственного университета, 2015, – 185 с.

33. Алиев, Ш.Т., Сазмани Н.Э. Проблемы диверсификации экспортного потенциала Азербайджана в современных условиях // *International scientific review*. 2017. № 2 (33). – С. 41-45.
34. Jensen, C. *The employment impact of Poland's special economic zones policy*. *Regional Studies*, Taylor & Francis Journals, vol. 52(7), 2018- p. 877-889.
35. Алиев Ш.Т. Перспективы развития свободных экономических зон в странах СНГ в контексте опыта Турции/ Шафа Алиев// *Zarubejye*. – Стамбул, 2009. – январь. – с. 1-9.
36. Inshakov, O.V. Kryukova, E.V. *Special economic zones as a nanoindustry development institute: failures, problems and prospects* *Vestnik Volgogradskogo gosudarstvennogo universiteta. Seriya 3, Ekonomika. Ekologiya [Science Journal of Volgograd State University. Global Economic System]* no. 1.- 2015. – P. 6-17.
37. Aliyev, Sh.T. (2010). *The Problems of the Variety of Formation and Functioning of the Special Economic Zones in Azerbaijan in the Context of the World Experience*. *Marketing and Management of Innovations*, 1, 144-148.
38. Алиев, Ш., Маммадов, Э., & Ахмедова, Т. Актуальные вопросы развития предпринимательства на освобождённых от оккупации землях Азербайджана. *Scientific Collection «InterConf»*, 2022, (122), 26–32. <https://archive.interconf.center/index.php/conference-proceeding/article/view/1183>.
39. Aliyev Sh. T. *The Perspectives of Enforcement of the Special Economic Zones Role in Acceleration of Extension of the Social–Economic Problems in Azerbaijan in the Context of the Experience of Poland*. *Materials X International Scientific Conference of Economics – E-society in Central and Eastern Europe*, Nalchenov. May 11–13, 2009. P.409–412.
40. Алиев, Ш.Т. *Экономическая дипломатия*. Баку, «Наука и образование», 2012. – 196 с.
41. Leong, C., 2013. *Special economic zones and growth in China and India: An empirical investigation*. *International Economics and Economic Policy*, 10(4), pp. 549-567.
42. Herrera, A. *La Zona Especial Canaria: luces y sombras*. *Hacienda Canaria*. 2011. – Volume 33, p. 93-108.
43. Алиев Ш.Т. Важность управления процессом создания и функционирования особых экономических зон в странах СНГ // *Журнал «Менеджмент в России и за рубежом»*, Москва, № 3-2009, С.69-72.
44. Diamond, W.H., *Free Trade Zones Offer Worldwide Opportunities*. *Area Development Series*, University of Miami, December 1979, p. 33-47.
45. Алиев Ш.Т. Проблемы конкурентоспособности реального сектора экономики Азербайджана в условиях глобализации// *Журнал «Доклады» НАНА*. – 2008. – № 6. – С. 135–143.
46. Aliyev, Sh.T. (2014). *Economics of Azerbaijan: upgrading and implementation of effective instruments*. *Life Science Journal*, 11, 321-326.
47. Алиев Ш.Т. Моделирование инноватизации национальной экономики в современных условиях // *Научное обозрение*, 2014, № 06, С. 342-346.
48. Aliyev, Sh.T. *Strategic role of Sumgayit in the development of petrochemical industry of Azerbaijan / The International Conference on Actual Problems of Chemical Engineering - APCE 2020*. - Azerbaijan State of Oil and Industry University. 24-25 december 2020. – p.430-435.
49. Əliyev, Ş.T. *Azərbaycanda maliyyə sabitliyinin təmin edilməsi problemləri və maliyyə-kredit sisteminin inkişafının müasir aspektləri* // *Audit*, – 2017. № 03, – s. 26-40.
50. Алиев, Ш.Т., Гусейнова, Н.Э., Яхьяева, А.Ю. Проблемы повышения инвестиционной привлекательности Карабахского региона Азербайджана и пути их решения/ *II International Scientific and Practical Conference Current Issues And Prospects for the Development of Scientific Research held on in Orléans, France, May 7-8, 2021*, p.13-19. - <https://ojs.ukrlogos.in.ua/index.php/interconf/issue/view/7-8.05.2021/534>. DOI: <https://doi.org/10.51582/interconf.7-8.05.2021.002>.
51. Алиев, Ш.Т., Аббасова, Ч.И., Гамидова, А.М. Оценка потенциала и пути развития Карабахского экономического района Азербайджана / *VIII International Scientific and Practical Conference International forum: problems and scientific solutions held in Melbourne, Australia*. *Scientific collection «interconf»*, September 6-8, 2021, № 73, p. 7-15. <https://ojs.ukrlogos.in.ua/index.php/interconf/article/view/14257/13074>.
52. Алиев, Ш.Т. Стратегическая важность возрождения Шуша в интенсификации социально-экономического развития Карабахского экономического района/ Ш.Т. Алиев, Л.А. Меликова// *Современные тенденции развития науки и мирового сообщества в эпоху*

цифровизации: Сборник материалов VII Международной научно-практической конференции, Москва, 30 июня 2022. – с. 321-329.

53. Алиев, Ш.Т., Азимова, А.Р., Гурбанова, Р.В. Стратегические аспекты развития банковской инфраструктуры в Карабахском и Восточно-Зангезурском экономических районах Азербайджана/ III International Scientific and Practical Conference Recent Scientific Investigation held in Oslo, Norway. InterConf, (74), September 16-18, 2021. – p.18-27. <https://ojs.ukrlogos.in.ua/index.php/interconf/article/view/14492>.

THE ROLE OF MANAGEMENT IN HUMANS MANAGE POLICY**Asmat Shamugia**

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Abstract

The purpose of this report is to analyze the Role of management in Humans Manage Policy at the modern stage and to search ways for further development. The theoretical and methodological basis of the research is the relevant publications, as well as Internet Resources, which reflect the analysis and assessment of the practical experience of Georgia and the European Union countries.

Theses discuss the importance of power and influence, as well as the leadership mechanism for management. There are presented the causes of stress. There are identified the positive and negative aspects of conflict behavior, changes and innovations in innovative organizations at the modern stage; also, as a conclusion, there are formulated the criteria for their effectiveness.

Keywords: Management, Manager, Innovations, Organization, Power, Influence, Changes.

There is intense competition in the world for highly qualified talents and professionals. Over the next two decades, filling vacant positions in organizations with new competent Human Resources will become increasingly problematic in the context of Management development. 34% of companies in the world are already experiencing a shortage of competent talents. In 2025, this statistic will increase by 35%. This crisis is Global in nature and currently affects 81% of employers in Japan, 71% in Brazil, 50% in Australia, 49% in the USA, 48% in India and 85% in Georgia.

The main factor in selecting an Innovative Manager is the combination of Leadership qualities with special knowledge. Preference is given to such character traits as: organizational talent, logical thinking, purposefulness, perseverance, a high sense of responsibility, efficiency, the ability to make optimal decisions in difficult situations, punctuality, a friendly attitude towards others and the ability to establish Business Contacts. A Creative Manager should be distinguished by: non-standardity, unexpectedness, an Innovative approach when solving professional tasks, trying not only to learn something new, but also to independently understand the essence of future processes. He needs to be able to transform his activities in accordance with the situation, to show creative Motivation. That is why modern companies pay due attention to Leadership Trainings.

It is known that Humans associate power with force and aggression. But power is not necessarily a sign of power. Power is the ability to influence the behavior of others.

Influence refers to any action of one individual that will lead to changes in the behavior, feelings, relationships, etc. of another individual.

A person can also influence another person through an idea. Power and influence are the tools that Managers use to solve specific tasks. If a manager does not have sufficient power to influence talents, he will obviously not be able to direct them to achieve the goals of the organization. Power is a necessary condition for the successful functioning of Innovative Organizations, although sometimes it is used incorrectly.

The Leadership Mechanism is also of great Importance for Management. Leadership refers to the ability to influence individuals and groups, ensuring that their efforts are directed towards achieving the goals of an Innovative Organization. If Managers do not have the ability to Lead properly, they will not be able to effectively Manage the Organization.

Power and influence manifest themselves in various forms that force people to act in accordance with the interests of others. The following are used to influence individuals: coercion, encouragement, traditions, personal authority, etc.

One form of power is government based on the authority of a person, or charismatic power.

Charisma is a power that is based not on logic, but on the strength of a person's personal qualities or Leadership skills. Unlike tradition, charismatic influence is completely personal, even when the Employee and the Leader have never met. At this time, the Talent often imagines that he has a lot in common with the Leader.

Using the method of persuasion does not mean abandoning other tools of influence. For example, charisma only contributes to persuasion, tradition and encouragement strengthen the power of persuasion, increasing faith in the Manager. The power of persuasion increases significantly when the Manager can force the Employee, but he avoids him and tries to convince him of the necessity of this or that action. If the Manager does not achieve the desired goal with persuasion, he resorts to other means of influence.

One of the methods of influence is to attract Talents to participate in Management. This method is used when the Motivating Factors of Employees are: Power, Competence, Success and Self-expression.

The results of one of the studies confirmed the effectiveness of talent participation in the decision-making process. When employees of a garment factory were given the right to participate in discussing the expected changes, their resistance to change was significantly reduced, and labor productivity increased. However, the participation of Human Resources in the decision-making process is not always effective. This applies to those talents who do not like uncertainty, are not independent and prefer situations that are controlled by managers.

Human Resources Management in Innovative Organizations is based on the breakdown of old paradigms, which gives rise to stressful situations, contradictory situations and negative psychological and social reactions on the part of individual people. In such conditions, conflict is common - a clash of opposing tendencies, both in the psyche of an individual and in people's relationships, which is due to their different views, positions, and interests regarding various problems. An unfamiliar situation can cause different reactions, including panic and strong tension.

The following factors can play a large role in reducing stress: the manager's proper assessment of the abilities and dedication of employees, taking their opinions into account, encouraging worthy talents, distributing Human Resources and others. In the case of proper management of stressful situations, the results of the employees' work and the effectiveness of the entire organization's activities in general increase significantly. The task of managers is to determine in the control process what and how to evaluate. If it is envisaged that talents will receive a reward for performing planned tasks, then the planned norms should correspond as much as possible to the nature of the work and its magnitude should be precisely and clearly defined so that both managers and employees can determine whether the work they have performed corresponds to the established norms. Maintaining a healthy diet, physical exercise and maintaining overall balance can play a positive role in reducing stress.

Conclusion

The first reaction of most people to innovations is misunderstanding and non-acceptance of novelty, which is followed by a stage of gradual adaptation to the idea. Sometimes, complete non-acceptance, strong resistance and even disruption of processes are possible. In order to self-preservation and maintain the past situation, negative psychological reactions may also appear, which develop against the background of stresses and conflicts. Conflict behaviors sharply exacerbate the emotional background of the process, and emotions, in turn, stimulate conflict behaviors. At the same time, conflict also has a positive side: during conflict behaviors, the parties confront existing realities, which correct their initial a priori imaginary images. As a result, the parties more adequately assess the existing situation, which, in turn, contributes to the resolution of the conflict. Perception, individuality and needs influence resistance to change. People often perceive change as a threat, thinking that they may not be able to master new skills and lose their jobs.

THE CURRENT STATE OF FINANCIAL CONTROL AND AUDIT**Murad Huseynov***Azerbaijan Academy of Labour and Social Relations Master's student**Scientific supervisor: Quiyeva.S.R.**i.ü.f.d, Docent***СОВРЕМЕННОЕ СОСТОЯНИЕ ФИНАНСОВОГО КОНТРОЛЯ И АУДИТА****Мурад Гусейнов***Азербайджанская Академия Труда и Социальных Отношений Магистрант**Научный руководитель: Куйева .С.Р.**i.ü.f.d. Доцент***MALİYYƏ NƏZARƏTİ VƏ AUDİTİN MÜASİR VƏZİYYƏTİ****Murad Hüseynov***Azərbaycan Əmək və Sosial Münasibətlər Akademiyası, magistrant**Elmi rəhbər: Quiyeva.S.R.**i.ü.f.d., dosent***Abstract**

In the modern economic environment, the significance of financial control and audit is increasing. The purpose of this research is to examine contemporary changes in financial control and audit, assessing their impact on transparency, accountability, and efficiency. A key focus is on exploring the influence of technology (artificial intelligence, automated systems, blockchain, etc.) in this field, as well as the application of international standards. The research employs comparative analysis and statistical methods. The legal framework of financial control and audit, their compliance with international standards, and technological applications have been analyzed. In the context of Azerbaijan, the activities of institutions such as the State Financial Control Service, the Chamber of Auditors, and the Accounts Chamber have been studied. The application of international standards (IFRS and ISA) positively impacts the development of audit and financial control in Azerbaijan. Artificial intelligence and automated audit systems help minimize human errors and prevent fraud. Although there has been progress in financial control and audit in Azerbaijan, challenges remain in terms of personnel training and adaptation to new technologies. This research particularly emphasizes the role of modern technologies in financial control and audit, proposing new approaches for Azerbaijan based on international best practices. Additionally, it provides an in-depth analysis of the digital transformation of audit and financial control, identifying strategic directions for the future development of the sector.

Xülasə

Müasir iqtisadi şəraitdə maliyyə nəzarəti və auditin əhəmiyyəti getdikcə artır. Bu tədqiqatın məqsədi maliyyə nəzarəti və audit sahəsində müasir dəyişiklikləri araşdırmaq, onların şəffaflıq, hesabatlılıq və effektivliyə təsirini qiymətləndirməkdir. Xüsusilə, texnologiyanın (süni intellekt, avtomatlaşdırılmış sistemlər, blokçeyn və s.) bu sahəyə təsirini, həmçinin beynəlxalq standartların tətbiqini öyrənmək əsas hədəflərdəndir. Tədqiqat çərçivəsində müqayisəli təhlil və statistik analiz metodlarından istifadə olunmuşdur. Maliyyə nəzarəti və auditin hüquqi bazası, beynəlxalq standartlarla uyğunluğu və texnoloji tətbiqləri təhlil edilmişdir. Azərbaycan kontekstində isə Dövlət Maliyyə Nəzarəti Xidməti, Auditorlar Palatası və Hesablama Palatası kimi qurumların fəaliyyəti araşdırılmışdır. Beynəlxalq standartların (IFRS və ISA) tətbiqi Azərbaycanda audit və maliyyə nəzarətinin inkişafına müsbət təsir göstərir. Süni intellekt və avtomatlaşdırılmış audit sistemləri bu sahədə insan səhvlərini minimuma endirir və saxtakarlığın qarşısını almağa kömək edir. Azərbaycanda maliyyə nəzarəti və audit sahəsində inkişaf olsa da, kadr hazırlığı və texnologiyalara uyğunlaşma sahəsində problemlər qalmaqdadır. Bu tədqiqat, maliyyə nəzarəti və audit sahəsində müasir texnologiyaların rolunu xüsusi vurğulayaraq, Azərbaycan üçün beynəlxalq təcrübəyə əsaslanan yeni yanaşmalar təklif edir. Bundan əlavə, tədqiqat audit və maliyyə nəzarətinin rəqəmsal transformasiyasını dərinliklə təhlil edərək, sahənin gələcək inkişafına dair strateji istiqamətləri müəyyənləşdirir.

Аннотация

В современных экономических условиях значение финансового контроля и аудита неуклонно возрастает. Цель данного исследования – изучить современные изменения в сфере финансового контроля и аудита, оценить их влияние на прозрачность, подотчетность и эффективность. Особое внимание уделяется влиянию технологий (искусственный интеллект, автоматизированные системы, блокчейн и др.) на эту сферу, а также применению международных стандартов. В рамках исследования использованы методы сравнительного анализа и статистического исследования. Были проанализированы правовая база финансового контроля и аудита, их соответствие международным стандартам и технологические приложения. В контексте Азербайджана изучена деятельность таких организаций, как Служба государственного финансового контроля, Палата аудиторов и Счетная палата. Применение международных стандартов (IFRS и ISA) оказывает положительное влияние на развитие аудита и финансового контроля в Азербайджане. Искусственный интеллект и автоматизированные системы аудита помогают минимизировать человеческие ошибки и предотвращать мошенничество. Несмотря на прогресс в области финансового контроля и аудита в Азербайджане, остаются проблемы, связанные с подготовкой кадров и адаптацией к новым технологиям. Данное исследование особо подчеркивает роль современных технологий в сфере финансового контроля и аудита, предлагая новые подходы для Азербайджана на основе международного опыта. Кроме того, в исследовании проводится глубокий анализ цифровой трансформации аудита и финансового контроля, а также определяются стратегические направления будущего развития отрасли.

Keywords: Financial control, audit, international standards, digital transformation, risk management.

Açar sözlər: Maliyyə nəzarəti, audit, beynəlxalq standartlar, rəqəmsal transformasiya, risklərin idarə olunması

Ключевые слова: Финансовый контроль, аудит, международные стандарты, цифровая трансформация, управление рисками.

Giriş

Maliyyə nəzarəti müəssisənin maliyyə vəsaitlərinin düzgün idarə olunmasını təmin etmək məqsədi daşıyan mühüm funksiyadır. Əsas məqsədləri bunlardır: Maliyyə intizamının təmin edilməsi, Büdcə qaydalarına riayət olunması, Resursların səmərəliliyi, Xərclərin optimallaşdırılması və gəlirlərin artırılması, Korupsiyanın qarşısının alınması, Maliyyə saxtakarlıqlarının aşkarlanması. Risklərin idarə olunması-Potensial maliyyə itkilərinin qarşısının alınması. Audit isə maliyyə hesabatlarının dəqiqliyini və obyektivliyini yoxlamaqla, maraqlı tərəflərin maliyyə vəziyyətinə dair etibarlı məlumat almasına imkan yaradır maliyyə hesabatlarının və əməliyyatların müstəqil şəkildə yoxlayır. Əsas məqsəd təşkilatın maliyyə fəaliyyətinin düzgünlüyünü və qanunvericiliyə uyğunluğunu təsdiqləməkdir.

Audit Növləri: Daxili Audit-Şirkət daxilində həyata keçirilir, əsas məqsəd daxili proseslərin optimallaşdırılmasıdır. Xarici Audit-Müstəqil təşkilatlar tərəfindən həyata keçirilir, maliyyə hesabatlarının düzgünlüyünü yoxlayır.

Son illərdə maliyyə nəzarəti və audit sahəsində texnologiyanın təsiri əhəmiyyətli olmuşdur. Blokçeyn, süni intellekt və məlumat analitikası kimi texnologiyalar bu sahədə şəffaflığı və effektivliyi artırmışdır. Bu alətlər sayəsində audit yoxlamaları daha sürətli və dəqiq aparılır, risklər daha əvvəlcədən müəyyən olunur. Avtomatlaşdırılmış Nəzarət Sistemləri: ERP sistemləri (Enterprise Resource Planning)-Müəssisələrə maliyyə əməliyyatlarını avtomatlaşdırmağa və məlumatların real vaxtda izlənilməsinə imkan yaradır. Real vaxtda monitoring alətləri-Maliyyə əməliyyatlarında hər hansı uyğunsuzluqları dərhal aşkarlayır və xəbərdarlıq edir. Blokçeyn Texnologiyası-blokçeyn vasitəsilə maliyyə əməliyyatlarının dəyişməz və şəffaf qeydiyyatı aparılır, saxtakarlıq və məlumat manipulyasiyasının qarşısını alır, tərəflər arasında etimadı artırır.

Risklərin Proqnozlaşdırılması və İdarə Olunması-Süni intellekt və maşın öyrənməsi vasitəsilə potensial riskləri əvvəlcədən müəyyən etmək mümkündür, məlumat analitikası qərar qəbul etmə prosesini təkmilləşdirir.

Auditi inkişaf etdirən Müasir Texnologiyalar

a) Süni İntellekt (AI) Süni intellekt texnologiyaları müasir audit sistemlərinin inkişafında mühüm rol oynayır. Bu texnologiya, insan beyni kimi düşünmək və qərar qəbul etmək qabiliyyətinə malik proqram təminatlarını əhatə edir. Audit sahəsində AI-nin tətbiqi ilə məlumatların daha dərin təhlili mümkün olur. Ənənəvi üsullarla günlərlə davam edən təhlilləri süni intellekt sənayələr ərzində həyata keçirə bilər.

Birinci mərhələdə AI əsasən məlumat analitikası sahəsində tətbiq olunur. Audit zamanı böyük həcmli maliyyə məlumatları sistemə daxil edilir və AI bu məlumatlar arasında əlaqələri, nümunələri və anomalionaları avtomatik olaraq təhlil edir. Bu, auditorun insan kimi gözlə qaçırdığı detalları üzə çıxarmağa imkan verir.

Digər tərəfdən, AI-nin saxtakarlığın aşkarlanması istiqamətində tətbiqi də genişlənməkdədir. AI alqoritmləri qeyri-adi əməliyyat nümunələrini, hesabatlarda olan ziddiyyətləri və potensial maliyyə saxtakarlıqlarını yüksək dəqiqliklə müəyyən edir. Bu da müəssisənin risklərə qarşı daha çevik müdaxilə etməsinə təmin edir.

Bundan əlavə, proqnozlaşdırıcı analitika imkanları vasitəsilə AI, keçmiş və hazırkı maliyyə göstəricilərini analiz edərək, gələcəkdə yaranması ehtimal olunan maliyyə çətinliklərini əvvəlcədən xəbər verə bilər. Bu isə auditin sadəcə yoxlayıcı deyil, eyni zamanda qabaqlayıcı funksiyasını da ön plana çıxarır.

b) RPA (Robotik Proses Avtomatlaşdırılması) RPA, yəni Robotik Proses Avtomatlaşdırılması, audit sahəsində təkrarlanan və standart işlərin avtomatlaşdırılmasını təmin edən texnologiyadır. Bu texnologiya insan tərəfindən yerinə yetirilən, lakin dəyişməz qaydalara əsaslanan fəaliyyətləri proqramlaşdırılmış robotların öhdəsinə verir.

Audit zamanı tez-tez təkrarlanan tapşırıqlar – məsələn, sənədlərin yoxlanması, məlumatların sistemə daxil edilməsi, uyğunluq yoxlamaları və ilkin analizlər – RPA vasitəsilə avtomatik olaraq həyata keçirilə bilər. Bu da insan resurslarına olan ehtiyacı azaldır və işin dəqiqliyini artırır.

Eyni zamanda, RPA audit hesabatlarının hazırlanmasında da istifadə olunur. Əvvəllər əllə toplanmalı və formatlaşdırılmalı olan məlumatlar indi avtomatik olaraq birləşdirilir, kateqoriyalasdırılır və hesabat halına salınır. Bu yanaşma auditorlara vaxt və resurs baxımından ciddi üstünlüklər verir, çünki proses daha sürətli və şəxsi yerinə yetirilir.

c) Məlumat Təhlükəsizliyi Texnologiyaları Audit fəaliyyətində məlumatların qorunması olduqca önəmlidir. Çünki auditorlar əllərində olan maliyyə məlumatlarının məxfiliyini və bütövlüyünü təmin etməlidirlər. Məlumat təhlükəsizliyi texnologiyaları bu baxımdan həlledici rol oynayır.

Ən vacib texnologiyalardan biri **kibertəhlükəsizlik** tədbirləridir. Audit proseslərində istifadə edilən sistemlər kənar müdaxilələrə və siber hücumlara qarşı davamlı olmalıdır. Bunun üçün firewall, antivirus sistemləri, çoxsəviyyəli autentifikasiya və digər qoruma üsullarından istifadə olunur. Bu tədbirlər maliyyə məlumatlarının qorunması və məlumat itkisi risklərinin azaldılması baxımından həyati əhəmiyyət daşıyır.

Bundan əlavə, **şifrələmə texnologiyaları** da mühüm yer tutur. Audit zamanı ötürülən və saxlanılan məlumatların yalnız icazəli şəxslər tərəfindən oxuna bilməsi üçün bu məlumatlar xüsusi alqoritmlərlə şifrələnir. Beləliklə, üçüncü şəxslərin məlumatlara çıxış imkanları məhdudlaşdırılır, bu da şəffaf və etibarlı audit mühitinin formalaşmasına kömək edir.

d) Audit Softverləri (Proqram Təminatları) Audit softverləri, yəni auditə xüsusi proqram təminatları, auditorların gündəlik işini daha səmərəli və sistemli şəkildə aparmalarına imkan verir. Bu proqramlar müxtəlif məlumat bazaları ilə integrasiya olunaraq məlumatların analizini və hesabatların tərtibini asanlaşdırır. Məsələn, **IDEA** və **ACL** kimi proqramlar böyük həcmli məlumatların təhlili və statistik emalı üçün hazırlanmışdır. Bu proqramlar vasitəsilə auditorlar müxtəlif mənbələrdən gələn məlumatları rahatlıqla bir araya gətirib, çoxsaylı yoxlamalar apararaq nəticələr çıxara bilirlər.

Digər tərəfdən, **CaseWare** kimi proqram təminatları isə daha çox avtomatlaşdırılmış audit yoxlamaları üçün nəzərdə tutulmuşdur. Bu proqram vasitəsilə audit sənədlərinin yaradılması, təhlili, saxlanması və paylaşılması çox daha asan şəkildə baş verir. Auditorlar bu platformada həm əməkdaşlıq edə, həm də beynəlxalq standartlara uyğun hesabatlar hazırlaya bilirlər.

Müasir Texnologiyaların Tətbiqinin Üstünlükləri Yeni texnologiyaların audita integrasiyası, həm effektivliyin artırılması, həm də əməliyyatların şəffaflığının gücləndirilməsi baxımından bir çox üstünlüklər təqdim edir.

Birinci növbədə, texnologiyaların tətbiqi dəqiqliyi və effektivliyi əhəmiyyətli dərəcədə yüksəldir. Avtomatlaşdırılmış sistemlər insan səhvlərini minimuma endirir, nəticədə audit nəticələri daha obyektiv olur.

İkinci olaraq, vaxta qənaət əldə edilir. Süni intellekt və RPA texnologiyaları sayəsində təkrarlanan işlər tez və ardıcıl şəkildə yerinə yetirilir, bu isə auditorlara daha vacib və analitik tapşırıqlara fokuslanmaq imkanı yaradır.

Bundan əlavə, texnologiyalar əməliyyatlarda real vaxtda nəzarət imkanını təmin edir. Yəni, müəssisələr maliyyə əməliyyatlarını birbaşa olaraq izləyə və qeyri-adi vəziyyətlərə vaxtında müdaxilə edə bilirlər.

Nəhayət, texnologiyalar şəffaflığı və ictimai inamı artırır. Avtomatlaşdırılmış hesabatların təqdim etdiyi obyektiv nəticələr, müəssisələrin və auditorların etibarlılığını artırır, bu da həm investorlar, həm də ictimaiyyət üçün əhəmiyyətli mesaj verir.

PROBLEMLƏR VƏ ÇAĞIRIŞLAR

Müasir texnologiyaların audit və maliyyə nəzarətinə inteqrasiyası ilə bir çox üstünlüklər əldə olunsada, bu proseslə bağlı müəyyən çətinliklər və risklər də meydana çıxır. Texnoloji inkişafların tətbiqi həm təşkilati, həm də hüquqi baxımdan bir sıra çağırışları özü ilə gətirir.

Kibertəhlükəsizlik Riskləri: Rəqəmsal platformaların geniş istifadəsi, maliyyə məlumatlarının təhlükəsizliyini birbaşa gündəmə gətirir. Xüsusilə bulud əsaslı sistemlər və uzaqdan idarə olunan texnologiyalar vasitəsilə həyata keçirilən əməliyyatlar nəticəsində, məlumatların icazəsiz əldə olunması, dəyişdirilməsi və ya yayılması kimi risklər artır. Haker hücumları, fişinq (phishing) və zərərli proqram təminatları vasitəsilə maliyyə və audit sistemlərinə müdaxilə riski təşkil edir. Buna görə də, kibertəhlükəsizlik tədbirləri yalnız texniki deyil, həm də strateji səviyyədə planlaşdırılmalı və davamlı şəkildə yenilənməlidir.

İnsan Resurslarının Yeni Texnologiyalara Adaptasiyası: Yeni texnoloji həllərin uğurla tətbiqi üçün işçi heyətinin bu sistemlərə uyğunlaşması əsas şərtidir. Bunun üçün əməkdaşlara mütəmadi təlimlər keçirilməli, onların bilik və bacarıqları artırılmalıdır. Əks halda, yeni texnologiyaların səmərəli istifadəsi mümkün olmaya bilər. İnsan resurslarının dəyişən rəqəmsal tələblərə adaptasiya olunmaması müəssisələrdə texnologiyaların tətbiqini ləngidə və əlavə xərclərə səbəb ola bilər.

Normativ-Hüquqi Tənzimləmə və Uyğunluq: Yeni texnologiyaların tətbiqi həm yerli, həm də beynəlxalq hüquqi çərçivəyə uyğunlaşdırılmalıdır. Rəqəmsal həllərin istifadəsi zamanı məlumatların idarə olunması, məxfiliyin qorunması və məlumat ötürmələrinin qanunvericiliyə uyğunluğu mühüm əhəmiyyət kəsb edir. Bu baxımdan, hüquqi bazanın mütəmadi olaraq yenilənməsi və texnoloji yeniliklərə adekvat cavab verə bilməsi tələb olunur.

Beynəlxalq Standartların Rolu-Qloballaşan iqtisadiyyat şəraitində maliyyə nəzarəti və audit fəaliyyətinin effektiv və şəffaf şəkildə həyata keçirilməsi üçün beynəlxalq standartların rolu danılmazdır. Bu standartlar, müxtəlif ölkələrdə fəaliyyət göstərən təşkilatların maliyyə hesabatlarının oxşar formatda təqdim olunmasını, audit yoxlamalarının isə vahid metodologiya əsasında aparılmasını təmin edir. **Şəffaflıq:** Beynəlxalq standartlar maliyyə məlumatlarının açıq və başa düşülən şəkildə təqdim edilməsini təşviq edir. Bu, həm auditorlar, həm investorlar, həm də digər maraqlı tərəflər üçün hesabatların analizini asanlaşdırır. Hesabatların hər kəsə eyni səviyyədə anlaşılan formatda olması, qərar qəbul etmədə səhvlərin azalmasına və daha obyektiv yanaşmalara səbəb olur. **Müqayisə edilə bilənlik:** Müxtəlif ölkələrdə fəaliyyət göstərən şirkətlərin hesabatlarının oxşar prinsiplərlə hazırlanması, onların maliyyə göstəricilərinin bir-biri ilə müqayisəsini mümkün edir. Bu, xüsusilə global sərmayə bazarlarında fəaliyyət göstərən investorlar üçün mühüm əhəmiyyət daşıyır. Beləliklə, hər hansı bir şirkətin maliyyə durumu digər ölkədəki oxşar müəssisə ilə müqayisə edilə bilər. **Hesabatlılıq və Etibarlılıq:** Beynəlxalq standartlar müəssisələrin fəaliyyətlərini daha şəffaf və hesabatlı etməyə kömək edir. Hesabatlılıq yalnız dövlət orqanları qarşısında deyil, həm də ictimaiyyət və investorlar qarşısında məsuliyyət deməkdir. Eyni zamanda, bu standartlar vasitəsilə təqdim edilən maliyyə məlumatları daha obyektiv və dəqiq olur. a) IFRS – Beynəlxalq Maliyyə Hesabatı Standartları

IFRS-International Financial Reporting Standards, yəni Beynəlxalq Maliyyə Hesabatı Standartları, dünyanın əksər ölkələrində tətbiq olunan maliyyə hesabatı çərçivəsini təyin edir. Bu standartlar, müxtəlif coğrafiyalarda fəaliyyət göstərən şirkətlərin eyni hesabatlaşdırma prinsipləri ilə işləməsinə təmin edir.

Bu standartların əsas məqsədi – müəssisələrin maliyyə məlumatlarının etibarlı, şəffaf və müqayisə edilə bilən formada təqdim olunmasını təmin etməkdir. IFRS əsasən aşağıdakı sahələri əhatə edir:

- Aktivlərin və öhdəliklərin dəyərləndirilməsi
- Gəlir və xərclərin tanınması prinsipləri
- Maliyyə axınlarının və likvidliyin hesabatı

- *Konsolidə olunmuş hesabatların tərtibi*

Bu standartların tətbiqi, investorlar üçün daha dəqiq məlumat əldə etmək və riskləri qiymətləndirmək baxımından olduqca vacibdir.

B) ISA – BEYNƏLXALQ AUDIT STANDARTLARI

ISA – International Standards on Auditing, yəni Beynəlxalq Audit Standartları, audit prosesinin keyfiyyətini yüksəltmək və obyektivliyi təmin etmək məqsədilə hazırlanmış normativ çərçivədir. Bu standartlar auditorlara auditin planlaşdırılması, icrası və nəticələrinin qiymətləndirilməsi prosesində bələdçilik edir.

Əsas istiqamətləri aşağıdakılardır:

- *Maliyyə hesabatlarındakı risklərin qiymətləndirilməsi*
- *Müəssisənin daxili nəzarət sisteminin təhlili*
- *Audit sübutlarının toplanması və təhlili*
- *Audit hesabatının hazırlanması və rəyin verilməsi*

ISA-nın tətbiqi nəticəsində audit prosesinin obyektivliyi və şəffaflığı artır, maliyyə hesabatlarının etibarlılığı daha da möhkəmlənir.

C) COSO ÇƏRÇİVƏSİ

COSO (Committee of Sponsoring Organizations of the Treadway Commission) çərçivəsi risklərin idarə olunması və daxili nəzarətin təşkili üçün geniş istifadə olunan beynəlxalq platformadır. Bu çərçivə müəssisələrə öz fəaliyyətlərini sistemli şəkildə təhlil etmək və potensial risklərə qarşı adekvat cavab vermək imkanı yaradır.

Əsas prinsiplərinə aşağıdakılar daxildir:

- *Risklərin tanınması və qiymətləndirilməsi*
- *Nəzarət fəaliyyətlərinin müəyyənləşdirilməsi və icrası*
- *Məlumat və kommunikasiyanın effektivliyi*
- *Monitorinq və davamlı təkmilləşmə*

COSO çərçivəsinin məqsədi təşkilatların fəaliyyətindəki zəif nöqtələri aşkarlamaq və proaktiv nəzarət mexanizmləri qurmaqdır.

D) OECD ŞƏFFAFLIQ VƏ HESABATLILIQ STANDARTLARI

OECD (Organisation for Economic Co-operation and Development) tərəfindən hazırlanan şəffaflıq və hesabatlılıq standartları, əsasən dövlət maliyyəsinin və ictimai vəsaitlərin düzgün idarə olunmasına yönəlmişdir. Bu standartlar dövlət qurumlarının fəaliyyətində şəffaflığı artırmaq və vətəndaşlara qarşı məsuliyyət hissini gücləndirmək məqsədi daşıyır.

Bu prinsiplər dövlət büdcəsinin hazırlanması, xərclənməsi və hesabatlandırılması mərhələlərində şəffaflığın təmin olunmasına və korrupsiya risklərinin azaldılmasına xidmət edir. Eyni zamanda özəl sektor da bu prinsiplərdən faydalanaraq etimad və reputasiya qazanır.

BEYNƏLXALQ STANDARTLARIN TƏTBIQININ ÜSTÜNLÜKLƏRİ:

Beynəlxalq maliyyə və audit standartlarının tətbiqi müəssisələr üçün bir sıra mühüm strateji üstünlüklər təqdim edir. Bu standartlar yalnız texniki tələblərlə məhdudlaşmayaraq, həmçinin korporativ idarəetmənin keyfiyyətini artırmaq, maraqlı tərəflərlə münasibətləri möhkəmləndirmək və global integrasiyanı sürətləndirmək baxımından əhəmiyyətli rol oynayır.

***Qlobal İntegrasiya imkanları:** Beynəlxalq standartların tətbiqi, yerli müəssisələrin global iqtisadi sistemə daha rahat daxil olmasına şərait yaradır. Müəssisələr maliyyə hesabatlarını universal qaydalara əsasən hazırlamaqla beynəlxalq bazarlarda fəaliyyət göstərən investorlar, tərəfdaşlar və kredit təşkilatları üçün daha anlaşılan və qəbul edilən format təqdim etmiş olurlar. Bu isə həm ixrac potensialını genişləndirir, həm də xarici investisiya cəlb etmə imkanlarını artırır.*

***İnvestorların Güvəninə Artması:** Maliyyə hesabatlarının standartlaşdırılması və şəffaf şəkildə təqdim olunması potensial investorlar üçün daha etibarlı qərar vermə mühiti formalaşdırır. Əldə olunan maliyyə məlumatlarının keyfiyyətli və müqayisə oluna bilən olması, risk analizinin daha dəqiq aparılmasına və düzgün investisiya qərarlarının verilməsinə imkan yaradır. Bu, xüsusilə korporativ səviyyədə uzunmüddətli maliyyə sabitliyi üçün əhəmiyyətlidir.*

***Auditor Xidmətlərinin Keyfiyyətinin Yüksəlməsi:** Beynəlxalq audit standartlarına əsaslanan yoxlamalar daha sistemli, obyektiv və riskə əsaslanan yanaşmalarla aparılır. Bu isə auditin nəticələrinin etibarlılığını və qəbul olunma səviyyəsini yüksəldir. Nəticədə, həm müəssisənin daxilində qərar qəbul edən menecerlər, həm də kənar maraqlı tərəflər bu nəticələrə əsaslanaraq daha düzgün strategiyalar müəyyən edə bilirlər.*

Risqlərin idarə olunmasının Təkmilləşdirilməsi: Beynəlxalq standartlar çərçivəsində aparılan maliyyə nəzarəti və audit, risklərin yalnız müəyyən edilməsini deyil, həm də onların təhlili, prioritetləşdirilməsi və idarə olunması proseslərini optimallaşdırır. Bu da müəssisələrin maliyyə sabitliyini qoruyaraq potensial itkilərin qarşısını almaqda mühüm rol oynayır.

Müasir Dövrə Problemlər və Çağırışlar: Texnoloji transformasiyanın sürətləndiyi müasir dövrdə maliyyə nəzarəti və audit sistemləri qarşısında bir sıra aktual problemlər və çağırışlar meydana çıxır. Bu çətinliklər əsasən insan faktoru, texnoloji risklər və normativ-hüquqi uyğunluq məsələləri ilə əlaqədardır.

İnsan Resurslarının Adaptasiya Problemləri: Yeni texnologiyaların tətbiqi ilə yanaşı, ənənəvi audit və maliyyə nəzarəti ilə məşğul olan kadrların bu dəyişikliklərə uyğunlaşması zəruri olur. Əməkdaşlar tez-tez dəyişən rəqəmsal sistemlərə və proqram təminatlarına adekvat reaksiya verməkdə çətinlik çəkə bilərlər. Bu isə təlim proqramlarının genişləndirilməsini, rəqəmsal savadlılığın artırılmasını və texnologiyaya əsaslanan yeni iş mədəniyyətinin formalaşdırılmasını tələb edir.

Kibertəhlükəsizlik və Məlumat Qorunması: Rəqəmsal sistemlərin geniş tətbiqi eyni zamanda məlumatların təhlükəsizliyi ilə bağlı ciddi narahatlıqları gündəmə gətirir. Məlumatların sızması, manipulyasiyası və ya icazəsizəldə edilməsi həm müəssisənin reputasiyasına zərbə vura bilər, həm də hüquqi və maliyyə baxımından itkilərlə nəticələnə bilər. Bu səbəbdən kibertəhlükəsizlik siyasətləri təşkilat səviyyəsində prioritet istiqamətlərdən biri olmalı və daim yenilənən texnologiyalarla uyğunlaşdırılmalıdır.

Hüquqi və Normativ Uyğunluq Məsələləri: Texnologiyanın tətbiqi ilə bağlı olan digər vacib çağırış isə yeni sistemlərin milli və beynəlxalq hüquqi çərçivəyə uyğunlaşdırılmasıdır. Maliyyə məlumatlarının qorunması, məlumat ötürmələrinin təhlükəsizliyi və audit nəticələrinin etibarlılığı ilə bağlı hüquqi tələblər daim dəyişdiyi üçün təşkilatlar bu dəyişikliklərə çevik şəkildə uyğunlaşmalıdır.

Azərbaycan Konteksti: Azərbaycan Respublikasında maliyyə nəzarəti və audit sahəsində son illər ərzində nəzərəcarpacaq islahatlar həyata keçirilmişdir. Bu sahənin həm hüquqi, həm də texnoloji əsaslarının gücləndirilməsi istiqamətində ciddi addımlar atılmışdır ki, bu da ölkədə şəffaflıq, hesabatlılıq və idarəetmə keyfiyyətinin artırılmasına xidmət edir.

"Audit Fəaliyyəti Haqqında" Qanun: Azərbaycanda audit fəaliyyətinin hüquqi əsaslarını müəyyən edən əsas sənəd məhz bu qanundur. Burada auditorların hüquq və vəzifələri, audit yoxlamalarının prinsipləri, peşə etikası və standartlara uyğunluq tələbləri ətraflı şəkildə əks etdirilmişdir. Bu qanun vasitəsilə ölkədə audit xidmətlərinin keyfiyyətinə nəzarət təmin edilir.

Azərbaycan Respublikasının Hesablama Palatası: Dövlətin ali audit orqanı olan Hesablama Palatası, büdcə vəsaitlərinin səmərəli istifadəsinə nəzarət edir, dövlət müəssisələrinin maliyyə fəaliyyəti üzərində audit həyata keçirir və dövlət sektorunda şəffaflıq səviyyəsini artırmaq üçün strateji fəaliyyət göstərir. Palatanın fəaliyyəti həm milli qanunvericiliyə, həm də beynəlxalq standartlara əsaslanır.

Şəffaflıq və Hesabatlılıq Təşəbbüsləri: Son illərdə həm dövlət, həm də özəl sektorda şəffaflıq səviyyəsinin artırılması məqsədilə bir sıra beynəlxalq təşəbbüslərə qoşulma müşahidə olunur. Xüsusilə "Açıq Hökumət Tərəfdaşlığı" (OGP), korrupsiyaya qarşı mübarizə strategiyaları və elektron hökumət həlləri vasitəsilə maliyyə məlumatlarının ictimaiyyətə açıq və nəzarət olunan formada təqdim edilməsi məqsəd qoyulmuşdur.

GƏLƏCƏK PERSPEKTİVLƏR

Dünya üzrə olduğu kimi, Azərbaycanda da maliyyə nəzarəti və audit sistemlərinin gələcək inkişafı daha çox rəqəmsallaşma, avtomatlaşdırma və süni intellekt texnologiyalarının tətbiqi ilə bağlı olacaqdır. Bu texnoloji tendensiyalar audit proseslərinin sürətlənməsinə, daha obyektiv və riskə əsaslanan yanaşmaların formalaşmasına şərait yaradacaqdır.

Süni İntellekt və Proqnozlaşdırıcı Analitika: Audit və maliyyə nəzarətində süni intellektin tətbiqi, daha sürətli və dərin təhlil aparmaq, riskləri avtomatik müəyyənləşdirmək və gələcəkdə baş verə biləcək maliyyə problemlərini əvvəlcədən proqnozlaşdırmaq üçün yeni imkanlar açacaqdır. Bu texnologiyalar auditorların yalnız texniki yox, strateji məsləhətçi funksiyasını da yerinə yetirməsinə şərait yaradacaq.

Real Vaxtda Monitoring və Hesabatlılıq: Gələcəkdə audit yoxlamaları artıq yalnız geriye dönük deyil, real vaxtda nəzarət və təhlil imkanları əsasında həyata keçiriləcək. Bu isə müəssisələrin daha çevik qərarlar verməsinə və riskləri vaxtında idarə etməsinə kömək edəcək.

Texnoloji İnfrastrukturun Təkmilləşdirilməsi: Azərbaycanın iqtisadi strategiyasında rəqəmsal iqtisadiyyatın inkişafı prioritet kimi müəyyən olunmuşdur. Bu çərçivədə, maliyyə nəzarəti və audit

sistemlərinin avtomatlaşdırılmış platformalar üzərindən idarə olunması üçün müasir texnoloji infrastrukturun yaradılması vacib hesab olunur.

Nəticə

Maliyyə nəzarəti müəssisənin maliyyə vəsaitlərini düzgün idarə etməyi təmin edir və əsas məqsədləri arasında maliyyə intizamının qorunması, resursların səmərəli istifadəsi, korrupsiyanın qarşısının alınması və risklərin idarə olunması var. Audit isə maliyyə hesabatlarının dəqiqliyini və şəffaflığını yoxlamaq üçün həyata keçirilir və daxili, xarici, uyğunluq və fəaliyyət auditi kimi növlərə bölünür. Müasir texnologiyalar – süni intellekt, blokçeyn, ERP sistemləri və avtomatlaşdırılmış nəzarət vasitələri – audit və maliyyə nəzarətində şəffaflığı, effektivliyi və risklərin proqnozlaşdırılmasını gücləndirir. Bununla yanaşı, kibertəhlükəsizlik, insan resurslarının uyğunlaşması və qanunvericilik tələblərinə riayət etmək kimi problemlər qalmaqdadır. Beynəlxalq standartlar (IFRS, ISA, COSO, OECD) maliyyə hesabatlarının şəffaflığını və global uyğunluğunu təmin edir. Azərbaycanda isə bu sahə inkişaf edir, qanunvericilik və institusional islahatlar aparılır. Gələcəkdə audit və maliyyə nəzarətinin daha çox rəqəmsallaşması və avtomatlaşdırılması gözlənilir.

Ədəbiyyat Siyahısı

1. Audit. Qanunvericilik və normativ sənədlər.- Vahid Novruzov, Qəşəm Bayramov və Arif Eyvazov.
2. "Audit. Qanunvericilik və normativ sənədlər". I cild. Tərtib edənlər: Vahid Novruzov, Qəşəm Bayramov, Arif Eyvazov— B.: "Azərbaycan Ensiklopediyası" NPB, 1998. — 204 s.
3. "Daxili audit standartları". — B.: Azərbaycan Milli Ensiklopediyası Nəşriyyatı, 2001. — 32 s.
4. International Federation of Accountants (IFAC). (2021). International Standards on Auditing (ISA).
5. Deloitte Insights. (2023). Emerging Technologies in Financial Auditing.
6. Maliyyə Nəzarəti və Audit
7. PwC. (2022). The Future of Financial Control and Risk Management.
8. IFRS Foundation. (2023). International Financial Reporting Standards (IFRS).
9. KPMG. (2023). Digital Transformation in Financial Auditing.
10. <https://az.wikipedia.org>

GLOBAL ECONOMY AND FACTORS INFLUENCING THE COMPETITIVENESS OF ENTERPRISES

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Abstract

There are considered the factors influencing the competitiveness of an enterprise, issues of increasing the competitiveness of a modern enterprise, the competitiveness Management system and conditions for their improvement.

Keywords: Globalization, Competitiveness, Competitive Advantages, Economy, Enterprise.

Competitiveness is the key to the market success of a product and its manufacturer, and solving the problem of competitiveness is an important task for any company that produces products that require coordination and targeted activities of all departments. In order to influence the competitiveness of an enterprise, it is necessary to clearly understand the factors that determine it. To do this, it is necessary to analyze the goals of the enterprise and identify key characteristics, or competitiveness indicators, expressing its state in terms of the level of development.

At the first stage, the main task of an enterprise in market conditions is to analyze its accounting, that is, to ensure solvency. This task will be solved by extreme measures, through the sale of already manufactured products. Let us give examples of marketing activities: market analysis, product range, pricing policy, etc. Achieving solvency creates a natural task of profitable activity. At this stage, marketing activities should be supplemented by economic activities (analysis of production costs, cost price, pricing) and organizational technologies (production efficiency, technology, etc.).

The financial well-being of an organization and its sustainability, as a rule, depend on the competitiveness of its products, and, as practice shows, this goal is achieved by enterprises with high competitive potential. The competitive potential of an enterprise is understood as both the real and potential ability of the enterprise to process, produce, sell and service competitive products in a certain market segment that are the best in terms of quality and price parameters and are in priority demand among consumers.

Currently, enterprises in all sectors of the economy carry out their production and agricultural activities in difficult economic conditions. The capabilities of enterprises to produce competitive products are limited, there is a shortage of all types of resources, especially raw materials and material and technical resources. Effective management of the product range and its improvement allow increasing profits and cash flow through short-term investments. In order to get the maximum effect from the goods sold, it is necessary to manipulate the range, that is, to identify which goods should be given priority and in what proportion to produce various types of products.

At the second level, an important issue is the strategic nature of management. After solving current problems, the company's management should pay attention to more important goals and objectives. To do this, after the SWOT analysis and business plan, a strategic concept, enterprise strategy and strategy for each division are developed. The next important task for the company's management is structuring and correctly characterizing this problem, adapting the management system. The term "adaptation

system" should be understood as the compliance of the organizational structure and management methods of the entire enterprise with the goals, functions and structures of the enterprise.

The second pressing issue for the enterprise is financial and management transparency: the presence of financial structures, financial and accounting policies that comply with international principles and accounting standards. To achieve this goal, such tools as financial analysis, financial planning, forecasting and decision-making based on planning, fundraising management, free cash distribution management, investment portfolio management, crisis management, leasing, insurance, etc. will be used.

Currently, we are experiencing an era of globalization of the world economy and internationalization of competition, which is rapidly changing the conditions of the external environment. Management faces new challenges. In the process of its development, production faces such problems as: information, material and others, which lead to a deterioration in the financial situation, weakening of the general organization and many others. The task of choosing resources, sources of financing, forms and methods of investment is the most important problem for each enterprise manager. Therefore, the need to ensure investment attractiveness is the third key condition for the state of the enterprise.

Characterizing the state of the enterprise, its competitiveness and ways to improve it, the following main criteria for determining the competitiveness of the enterprise can be identified:

1. At the operational level, the main indicator of the enterprise's competitiveness is the integral indicator of the product's competitiveness. It is not the product itself that is valuable for consumption, but the benefits it brings from its use. Therefore, when determining the competitiveness of a product, it is assessed how good or bad it is and how well it meets the needs of consumers compared to competitors. The competitiveness of products should be assessed periodically and as the situation arises.

2. At the tactical level, the competitiveness of an enterprise is ensured by its financial and economic position. When analyzing competitiveness indicators, finances are taken into account, but in practice, there are often cases when enterprises with normal financial indicators go bankrupt.

3. At the strategic level, the competitiveness of an enterprise can be characterized by investment attractiveness, the criterion of which is business growth. Indeed, Western and domestic experience shows that companies focused on profit or profitability for the current year suffer from short-sightedness. There are cases when a company becomes insolvent, even if it makes a profit. World practice shows that the increase in the wealth of owners (shares, shares of owners) can be defined as the difference between the value of the capital created by the shareholder when creating the enterprise and the value of his share when it is sold. If the capital has been spent, it means that the management has fulfilled its task. From this we can conclude that managers working to increase the welfare of enterprise owners should analyze their every step. Competitiveness criterion This is a qualitative indicator of the product. The competitiveness factor is the direct cause of a change in one or another competitiveness indicator. Factor analysis, which is part of the competitiveness assessment, can be considered as a separate criterion of product competitiveness.

Competitiveness assessment is always necessary. Its determination involves numerous factors and indicators that need to be characterized at the micro, meso and macro levels and that determine the prospects for the functioning and development of the economic system. The innovation sector can also be considered an element of increasing the competitiveness of the Georgian economy. Competition is the main driving force and a necessary condition for market relations; it forces producers to improve quality and productivity, reduce costs, change the image of the enterprise, etc. Provided that supply exceeds demand and competition is created between manufactured goods, and not between producers.

References

1. Gaganidze Ch., "Problems of Competitive Advantage Research," Tbilisi, 2014
2. Transparency International - Competition Policy in Georgia, Tbilisi, 2012
3. Benashvili K., "Modern Competition Policy. Modern Trends and Challenges. Program Agreement with the European Union and the Importance of Creating Competition Policy", TB. , 2017
4. Baratashvili E., Gechbaia B., Glonti V., "Competitiveness Index of the Georgian Economy," TB., 2018
5. <https://forbes.ge/blogs/saqarthvelo-globaluri-konkurentunarianobis-reitingshi/>
6. <https://tabula.ge/ge/news/543681-globaluri-konkurentunarianobis-indeksshi>

TRANSITION TO A CASE-BASED PAYMENT SYSTEM AND RISK MANAGEMENT IN THE CENTRAL ASIAN REGION

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ПЕРЕХОД К СИСТЕМЕ ОПЛАТЫ ПО ПРОЛЕЧЕННОМУ СЛУЧАЮ И УПРАВЛЕНИЕ РИСКАМИ В ЦЕНТРАЛЬНО-АЗИАТСКОМ РЕГИОНЕ

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Abstract

The article is devoted to the payment system for treated cases and risk management in the Central Asian region to encourage medical organizations to make more rational use of resources and improve the quality of treatment. It is also shown that the implementation of this model is associated with a number of challenges: the need to develop digital infrastructure, review approaches to coding diagnoses and treatment, training, as well as assessing the risks of underfunding complex cases.

Аннотация

Статья посвящена системе оплаты по пролеченному случаю и управлению рисками в центрально-азиатском регионе для стимулирования медицинских организаций к более рациональному использованию ресурсов и повышению качества лечения. Также показано, что внедрение данной модели сопряжено с целым рядом вызовов: необходимость развития цифровой инфраструктуры, пересмотра подходов к кодированию диагнозов и лечению, подготовки кадров, а также оценки рисков недофинансирования сложных случаев.

Keywords: financing, healthcare, treated case, Central Asian region, risk management

Ключевые слова: финансирование, здравоохранение, пролеченный случай, Центрально-Азиатский регион, управление рисками

Введение

Современные реформы здравоохранения в странах постсоветского пространства направлены на повышение эффективности использования ресурсов, улучшение качества медицинской помощи и обеспечение финансовой устойчивости системы. Одним из ключевых направлений этих реформ стало внедрение модели оплаты медицинских услуг по клинко-статистическим группам (КСГ). Эта система, основанная на международной методике DRG (Diagnosis-Related Groups), предлагает механизм, при котором медицинские учреждения получают фиксированную оплату за пролеченный случай в зависимости от клинко-диагностических характеристик пациента.

Переход к оплате по КСГ предполагает изменение принципов финансирования стационарной помощи, стимулируя медицинские организации к более рациональному использованию ресурсов и повышению качества лечения. Однако внедрение данной модели сопряжено с целым рядом вызовов: необходимость развития цифровой инфраструктуры, пересмотра подходов к кодированию диагнозов и лечению, подготовки кадров, а также оценки рисков недофинансирования сложных случаев [1].

Актуальность данной темы обусловлена как глобальной тенденцией к внедрению моделей, ориентированных на результат, так и стремлением стран Центральной Азии — таких как Казахстан и Кыргызстан — модернизировать свои системы здравоохранения в соответствии с международными стандартами. В данной работе рассматриваются предпосылки, особенности и последствия внедрения КСГ в этих странах, а также анализируются международный опыт и перспективы дальнейшего развития модели.

Неофициальные платежи физическим лицам или учреждениям-это платежи наличными или через ОСМС, которые должны покрываться системой общественного здравоохранения. Частные выплаты, подобные этим, государственным служащим создали неофициальный рынок медицинских услуг в сети общественного здравоохранения и являются формой коррупции. В отличие от чаевых, выплачиваемых поставщикам услуг, неофициальные платежи являются обязательными, а не дискреционными[2]. Частично проблема связана с падением доходов без надлежащего сокращения зданий, больничных коек и медицинского персонала, что привело к сокращению заработной платы и хроническому долгу в некоторых странах.: Реформы, направленные на модернизацию систем здравоохранения в регионе, должны конкурировать с личным доходом от неформальных платежей, что затрудняет внесение изменений. Частота неформальных платежей превышает 60% в странах Содружества, для которых доступны данные, достигая 91% - стационарное лечение сопряжено с самыми высокими затратами, но лекарства-это медицинские услуги, которые чаще всего приобретаются и не финансируются государственными поставщиками [3]. Неофициальные платежи стали серьезным препятствием для доступа к медицинским услугам, что привело как к снижению потребления из-за необоснованных затрат, так и к продаже личных активов для финансирования медицинских услуг. Своевременная медицинская помощь в Польше, систематические сообщения о сокращении дородового ухода на 37 процентов в Таджикистане и о том, что 45 процентов сельских пациентов продали активы для финансирования здравоохранения в Кыргызской Республике, указывают на растущую недоступность и сокращение капитала. Решения проблемы включают комплексную антикоррупционную политику, сокращение государственной системы, сокращение субсидируемого государством набора услуг, поощрение разделения затрат теми, кто может себе это позволить, повышение ответственности и продвижение частных альтернатив[4].

Недостатки общих обследований, связанные с их широтой охвата и ограниченностью, привлекают внимание к сектору здравоохранения. Например, в них часто спрашивают, нужны ли незаконные или дополнительные платежи. В странах, привыкших к оплате в виде благодарности или где подарки не считаются платежами, может быть неправильно понято понимание того, что анкеты предоставляются на неформальных рынках здравоохранения. В то время как религиозные исследования могут избежать недооценки этого порядка, их недостаточная сопоставимость позволяет повсеместно осуществлять неформальные платежи между странами. Кроме того, оба типа исследований фокусируются только на пользователях, пренебрегая не менее важными услугами, которые определяет ВОЗ, и используя неофициальные платежные системы.Еще один хороший и потенциально менее дорогостоящий метод наблюдения - это простой опрос пациентов.Такой опрос может быть проведен с помощью опросов, как это делается во Вьетнаме (Всемирный банк, 1992) и на очень ограниченной основе в Украине (КМИС, 1999), или с помощью телефонных опросов (Чавла и др., 1999). Недавний опыт в Польше (Льюис и др. 2000), однако, предполагает, что последние два подхода не всегда могут быть осуществимы в странах ЦА[5]. Опыт Польши включал в себя выездное исследование случайных выборок пациентов после выписки и амбулаторных пациентов после лечения с целью проведения неформальных и официальных платежей, оценки удовлетворенности обслуживанием и незаконных комментариев по другим факторам.Попытки использовать исследования натолкнулись на виртуализацию. История правительственной информации в Польше может объяснить нежелание участников опроса рассматривать официальные платежи, полученные по месту нахождения медицинских учреждений; В некоторых странах юридический характер такой практики дополнительно приводит к меньшему признанию и обсуждению нежелательных тем для пациентов. Одним из вариантов проведения опроса, который становился все более возможным, было выявление пациентов с помощью списков страхования, как это недавно было сделано в Польше. Во многих случаях исследования - это неуклюжий инструмент, который навязывает представления и убеждения, в соответствии с которыми практикуются неформальные платежи. Качественные данные помогут объяснить количество открытий в исследованиях и их мнение, Путем создания участников для распространения информации и перспективные, часто анонимные, диалоги и фокус-группы[6]. Цели сбора данных о качестве пациентов и/или поставщиков медицинских услуг были реализованы в Аргентине (Куркчиян, 1999), Болгарии (Балабанова, 1999; Делчева, Балабанова и Макки, 1994), Грузии (ГОРБИ, 1999), Молдове (Ружица и др., 1999), Польше (Шахриар, Белл и Льюис [aggival]) и Украине (КИИС 1999; Way, 1999), проливает свет на стимулы и процессы случайной оплаты как с точки зрения поставщика, так и с точки зрения пациента.Что касается всех качественных результатов, то собранные данные не должны рассматриваться как

заменители и, как правило, должны оцениваться соответствующим образом [7]. Следующий сравнительный анализ основан на всех приведенных выше источниках, чтобы определить точку зрения на эффективность неформальных платежей и связанные с ними проблемы. Мы надеемся, что анализ отражает творческий подход и широту усилий, предпринятых в последние годы для понимания и измерения феномена неформальных платежей [8].

Методы внедрения финансирования стационаров по пролеченному случаю и их адаптация к различным условиям

Способы и формы внедрения оплаты медицинских услуг по пролеченному случаю, а также их адаптация к внешним и внутренним условиям системы здравоохранения, играют решающую роль в достижении ключевых целей государственной политики в сфере медицины [9].

Среди наиболее значимых аспектов перехода к этой модели финансирования выделяются следующие:

- разработка стратегии перехода на систему оплаты по пролеченному случаю;
- подготовка инструментов для минимизации возможных негативных последствий, связанных с новой системой;
- классификация заболеваний в группы и определение соответствующих коэффициентов, отражающих клиническую неоднородность;
- создание правовой базы, регламентирующей внедрение новой модели финансирования;
- развитие кадрового потенциала, включая управленческий состав в здравоохранении, и обеспечение поддержки со стороны всех заинтересованных участников;
- перестройка систем управления и бухгалтерского учёта в стационарах;
- интеграция новой модели с существующими методами оплаты на других уровнях здравоохранения (например, в амбулаторно-поликлинической и скорой помощи);
- организация постоянного мониторинга и аналитической оценки работы новой системы.

Переход к финансированию по пролеченному случаю рекомендуется осуществлять поэтапно. Это связано как с необходимостью перераспределения ресурсов между учреждениями, так и с нехваткой подготовленного персонала и временем, требуемым для формирования надёжной базы данных [10]. Постепенность поможет снизить финансовую нагрузку на учреждения, позволит им адаптироваться к новым условиям и внедрить эффективные информационные решения для управления данными.

На начальной стадии внедрения практикуется использование тестовых расчетов, имитирующих переход без фактического перераспределения финансов. Этот этап играет важную роль в обучении всех участников — как медицинских организаций, так и регулирующих органов, и формирует понимание будущих изменений [11].

Пробное моделирование позволяет заранее спрогнозировать, как новая модель повлияет на потоки пациентов и финансовые показатели стационаров. Эти данные также используются для усовершенствования информационных систем и создания базы пролеченных случаев, необходимой для корректной оценки перераспределения финансирования. Кроме того, результаты имитационных расчетов можно обсуждать с поставщиками услуг, чтобы подготовить их к реальному внедрению и адаптации управленческих стратегий [12].

Примеры внедрения

В 1995 году в Жезказганской области Казахстана был реализован пилотный проект перехода от советской бюджетной модели к системе оплаты по пролеченному случаю. Сначала больницы перешли на оплату за койко-день, а уже в 2002 году — на оплату по клинико-статистическим группам. Такой поэтапный подход позволил учреждениям модернизировать внутреннее управление и внедрить нужные информационные решения. Изначально оплата осуществлялась по отделениям, а уже в 1998 году — по диагнозам, на основе накопленных данных [13].

В США внедрение модели КСГ в рамках программы «Medicare» началось с разработки единой национальной базовой ставки, в которую входили как исторические затраты конкретной больницы, так и общенациональные параметры. Также учитывались корректирующие коэффициенты, зависящие от профиля учреждения и его географического положения, чтобы избежать резких изменений в финансировании.

Однако в процессе анализа собранных данных выявились случаи, когда учреждения с высокими историческими затратами не имели более сложных пациентов. Например, в Карагандинской области одна из клинических больниц показала самые высокие затраты на

случай, хотя по уровню сложности лечимых пациентов занимала лишь 11-е место из 16. Это указывает на то, что специфические коэффициенты могут отражать не столько сложность клинических случаев, сколько неэффективность использования ресурсов. Поэтому их применение должно быть временным, ограниченным переходным периодом, иначе они могут закрепиться в системе из-за политических факторов [14].

Внедрение в странах Центральной Азии

В Казахстане и Кыргызстане система КСГ начала внедряться в начале 1990-х годов, после распада Советского Союза. Оба государства столкнулись с глубоким кризисом в здравоохранении, вызванным экономическим спадом и неэффективной организацией советской модели. Метод оплаты по пролеченному случаю был выбран как наилучший инструмент для решения ключевых проблем: нехватки эффективности, недостаточной конкуренции, низкой ответственности перед пациентами, а также слабой финансовой прозрачности [15].

Таким образом, внедрение КСГ стало частью более широкой реформы системы здравоохранения и рассматривалось не только как способ перераспределения средств, но и как средство повышения качества и доступности медицинской помощи.

Литература

1. WHO, Declaration of Alma-Ata, International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978 [https://www.who.int/publications/almaata_declaration_en.pdf, accessed 20 March 2023]. 1978, World Health Organization: Geneva.
2. Rifkin S.B. Alma Ata after 40 years: Primary Health Care and Health for All—from consensus to complexity. *BMJ Glob Health*. 2018;3(Suppl 3) doi: 10.1136/bmjgh-2018-001188. [DOI] [PMC free article] [PubMed] [Google Scholar]
3. Sanders D., Nandi S., Labonté R., Vance C., Van Damme W. From primary health care to universal health coverage—one step forward and two steps back. *Lancet*. 2019;394(10199):619–621. doi: 10.1016/S0140-6736(19)31831-8. [DOI] [PubMed] [Google Scholar]
4. WHO, Universal health coverage [https://www.who.int/healthsystems/universal_health_coverage/en/, accessed 19 January 2021]. 2021, World Health Organization: Geneva.
5. UN, Policy Brief: COVID-19 and Universal Health Coverage [https://www.un.org/sites/un2.un.org/files/sq_policy_brief_on_universal_health_coverage.pdf, accessed 19 January 2021]. 2020, United Nations: New York.
6. UN, The 17 Goals [<https://sdgs.un.org/goals>, accessed 24 September 2023]. 2023, United Nations: New York.
7. Papanicolas I. et al., eds. Health system performance assessment: a framework for policy analysis. 2022, World Health Organization (acting as the host organization for, and secretariat of, the European Observatory on Health Systems and Policies): Copenhagen. [PubMed]
8. WHO, Primary health care on the road to universal health coverage: 2019 global monitoring report. 2019, Geneva: World Health Organization.
9. Rechel B, Maresso A, and van Ginneken E. Health Systems in Transition. Template for authors [<https://eurohealthobservatory.who.int/publications/i/health-systems-in-transition-template-for-authors>, accessed 20 March 2023]. 2019, World Health Organization 2019 (acting as the host organization for, and secretariat of, the European Observatory on Health Systems and Policies): Copenhagen.
10. OECD, OECD Reviews of Health Systems: Kazakhstan 2018. 2018, OECD Publishing: Paris.
11. Jacobs E. The politics of the basic benefit package health reforms in Tajikistan. *Glob Health Res Policy*. 2019;4:14. doi: 10.1186/s41256-019-0104-4. [DOI] [PMC free article] [PubMed] [Google Scholar]
12. Gulis G., Aringazina A., Sangilbayeva Z., Zhan K., de Leeuw E., Allegrante J.P. Population Health Status of the Republic of Kazakhstan: Trends and Implications for Public Health Policy. *Int J Environ Res Public Health*. 2021;18(22):12235. doi: 10.3390/ijerph182212235. [DOI] [PMC free article] [PubMed] [Google Scholar]
13. Ahmedov M. et al., Uzbekistan: health system review. *Health Syst Transit*, 2014; 16(5): 1-137, xiii. [PubMed]
14. Fonken P., et al. Keys to Expanding the Rural Healthcare Workforce in Kyrgyzstan. *Front Public Health*. 2020;8:447. doi: 10.3389/fpubh.2020.00447. [DOI] [PMC free article] [PubMed] [Google Scholar]
42. Chukwuma A., Gong E., Latypova M., Fraser-Hurt N. Challenges and opportunities in the continuity of care for hypertension: a mixed-methods study embedded in a primary health care intervention

in Tajikistan. *BMC Health Serv Res.* 2019;19(1) doi: 10.1186/s12913-019-4779-5. [\[DOI\]](#) [\[PMC free article\]](#) [\[PubMed\]](#) [\[Google Scholar\]](#)

15. Fischer F.B., Mengliboeva Z., Karimova G., Abdujabarov N., Prytherch H., Wyss K. Out of pocket expenditures of patients with a chronic condition consulting a primary care provider in Tajikistan: a cross-sectional household survey. *BMC Health Serv Res.* 2020;20(1) doi: 10.1186/s12913-020-05392-2. [\[DOI\]](#) [\[PMC free article\]](#) [\[PubMed\]](#) [\[Google Scholar\]](#)

Geological and mineralogical sciences

DEVELOPMENT OF SMALL HYDROPOWER PLANTS IN WESTERN ASIA: THE CASE OF AZERBAIJAN

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QƏRBI ASİYA ÖLKƏLƏRİNDƏ KİÇİK SU ELEKTRİK STANSİYALARININ İNKİŞAFI: AZƏRBAYCAN NÜMUNƏSİ

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РАЗВИТИЕ МАЛЫХ ГИДРОЭЛЕКТРОСТАНЦИЙ В СТРАНАХ ЗАПАДНОЙ АЗИИ: ПРИМЕР АЗЕРБАЙДЖАНА

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Abstract

Western Asian countries possess diverse natural resources and pursue various energy policies, resulting in different approaches to the development of renewable energy sources. This article examines the role and development level of Small Hydropower Plants (SHPs) in the region, with a specific focus on Azerbaijan's current status and technical potential. Research indicates that although the total SHP potential of the country reaches approximately 520 MW, only around 10% of this capacity is currently utilized. While improvements in legal regulations and state programs have created a favorable environment for the development of this sector, technical limitations and economic constraints continue to hinder progress. The article also evaluates the impact of climate change on the hydropower sector, regional comparisons, and the future development prospects of Azerbaijan. Ultimately, the development of the SHP sector is of strategic importance for Azerbaijan's energy security and sustainable development strategy.

Xülasə

Qərbi Asiya ölkələri müxtəlif təbii resurslara və enerji siyasətlərinə malik olmaqla, bərpa olunan enerji mənbələrinin inkişafında fərqli yanaşmalar seçmişdir. Bu məqalədə regionda Kiçik Su Elektrik Stansiyalarının (KSES) rolu və inkişaf səviyyəsi araşdırılır, Azərbaycanın mövcud durumu və texniki potensialı təhlil olunur. Tədqiqatlar göstərir ki, ölkənin ümumi KSES potensialı 520 MVt təşkil etsə də, bu imkanların yalnız təxminən 10 faizi faktiki olaraq istifadə olunur. Hüquqi tənzimləmələrin təkmilləşdirilməsi və dövlət proqramları bu sahənin inkişafı üçün əlverişli mühit yaratsa da, texniki məhdudiyyətlər və iqtisadi çətinliklər inkişaf prosesinə əngəl törədir. Məqalədə, həmçinin iqlim dəyişmələrinin hidroenerji sektoruna təsiri, region ölkələri ilə müqayisələr və Azərbaycanın gələcək perspektivləri də dəyərləndirilir. Nəticə olaraq, KSES sektorunun inkişafı Azərbaycanın enerji təhlükəsizliyi və davamlı inkişaf strategiyası baxımından strateji əhəmiyyətə malikdir.

Аннотация

Страны Западной Азии обладают разнообразными природными ресурсами и проводят различные энергетические политики, что приводит к различным подходам в развитии возобновляемых источников энергии. В данной статье рассматривается роль и уровень развития малых гидроэлектростанций (МГЭС) в регионе, с особым акцентом на текущее состояние и технический потенциал Азербайджана. Исследования показывают, что, несмотря на общий потенциал МГЭС в размере примерно 520 МВт, используется лишь около 10% этих мощностей. Хотя совершенствование правового регулирования и государственные программы создают благоприятные условия для развития сектора, технические ограничения и экономические трудности продолжают сдерживать прогресс.

В статье также оценивается влияние изменения климата на гидроэнергетический сектор, проводится региональное сравнение и анализируются перспективы дальнейшего развития Азербайджана. В конечном итоге развитие сектора МГЭС имеет стратегическое значение для энергетической безопасности и устойчивого развития страны.

Keywords: Small Hydropower Plant (SHP), Western Asia, Azerbaijan, renewable energy, hydropower potential, energy security, water resources, energy policy, climate change, investment opportunities.

Açar sözlər: Kiçik Su Elektrik Stansiyası (KSES), Qərbi Asiya, Azərbaycan, bərpa olunan enerji, hidroenerji potensialı, enerji təhlükəsizliyi, su resursları, enerji siyasəti, iqlim dəyişikliyi, investisiya imkanları

Ключевые слова: Малая гидроэлектростанция (МГЭС), Западная Азия, Азербайджан, возобновляемая энергия, гидроэнергетический потенциал, энергетическая безопасность, водные ресурсы, энергетическая политика, изменение климата, инвестиционные возможности

Giriş

Hidroenerji sistemləri axan suyun enerjisindən istifadə edərək ya elektrik, ya da mexaniki enerji istehsal edir. Bu məqsədə çatmaq üçün müxtəlif üsullar mövcuddur, lakin çayın axınına əsaslanan sistemlər (run-of-the-river) mikrohidro və bəzi kiçik sistemlər üçün ən geniş yayılmış üsuldur. Bu tip sistemlər böyük su anbarı tələb etmir. Əsas iş prinsipi belədir:

1. Çayın bir hissəsi kanala və ya təzyiqli boruya (penstok) yönəldilir.

2. Su çarx və ya turbinə çatdırılır.

3. Hərəkət edən su çarxı/turbini döndərir.

4. Bu hərəkət ya mexaniki enerji (məsələn, su nasosu), ya da elektrik istehsalı üçün generatoru hərəkətə gətirir.

Kiçik su elektrik stansiyası qurmaq üçün, bu sahədə ilham ala biləcəyimiz tarixi bir ənənə mövcuddur. İki min il əvvəl yunanlar axan suyun gücündən istifadə edərək, bu enerjini buğda üyüdən dəyirmanların oxlarını döndərən nəhəng çarxları hərəkətə gətirmək üçün istifadə edirdilər. Su elektrik enerjisinin çiçəkləndiyi 18-ci əsrdə isə minlərlə şəhər və qəsəbə kiçik su elektrik mənbələrinin ətrafında yerləşirdi. Bu gün kiçik su elektrik layihələri Nepal, Hindistan, Çin və Peru kimi uzaq bölgələrdə yerləşən icmalar üçün, eləcə də ABŞ kimi yüksək sənayeləşmiş ölkələr üçün tullantısız enerji təmin edir. Bu layihə çərçivəsində aşağıdakı məlumatları müəyyən etmək olar:

- Kiçik su elektrik sisteminin enerji tələbatınıza cavab verib-verməyəcəyini müəyyənləşdirmək;
- Ərazinizin belə texnologiya üçün uyğun olub-olmadığını öyrənmək;
- Sistem komponentlərini başa düşmək;
- İcazə və su hüquqları ilə bağlı məsələlər;
- Artıq istehsal etdiyiniz enerjinin necə satıla biləcəyini öyrənmək (9).

Dünya üzrə kiçik hidroenergetika sahəsində aparıcı ölkələrin təcrübələri göstərir ki, bu texnologiya enerji təminatının şaxələndirilməsi və ekoloji tarazlığın qorunmasında əhəmiyyətlidir. Azərbaycan da bu sahədə böyük potensiala malikdir. Qarabağ regionu isə öz təbii relyefi və su ehtiyatları ilə bu sahədə xüsusi əhəmiyyət kəsb edir. KSES-lərin texniki xüsusiyyətlərinə uyğun stansiya tipləri aşağıdakılardır:

- Run-of-river (çay axını ilə): daimi su axını olan çaylarda tətbiq oluna bilər
- Pelton və Francis turbinləri: dağlıq bölgələrin yüksək hündürlüklərində uyğundur
- Grid və Off-grid yanaşmaları: ucqar kəndlərdə mikro KSES-lər üçün off-grid tətbiqi səmərəlidir

Enerji formulu: $P = Q \times H \times 9.81 \times \eta_t \times \eta_g$

- Q – su axını (m^3/s),
 - H – baş hündürlüyü (m),
 - η_t , η_g – turbin və generatorun səmərəliliyi
- Ekoloji üstünlükləri aşağıdakılar hesab edilir:

- CO₂ emissiyası yoxdur
- Meşələrin qırılmasına alternativ
- Bioçeşidliliyə minimal təsir

Kiçik su elektrik stansiyalarının təsnifatı:

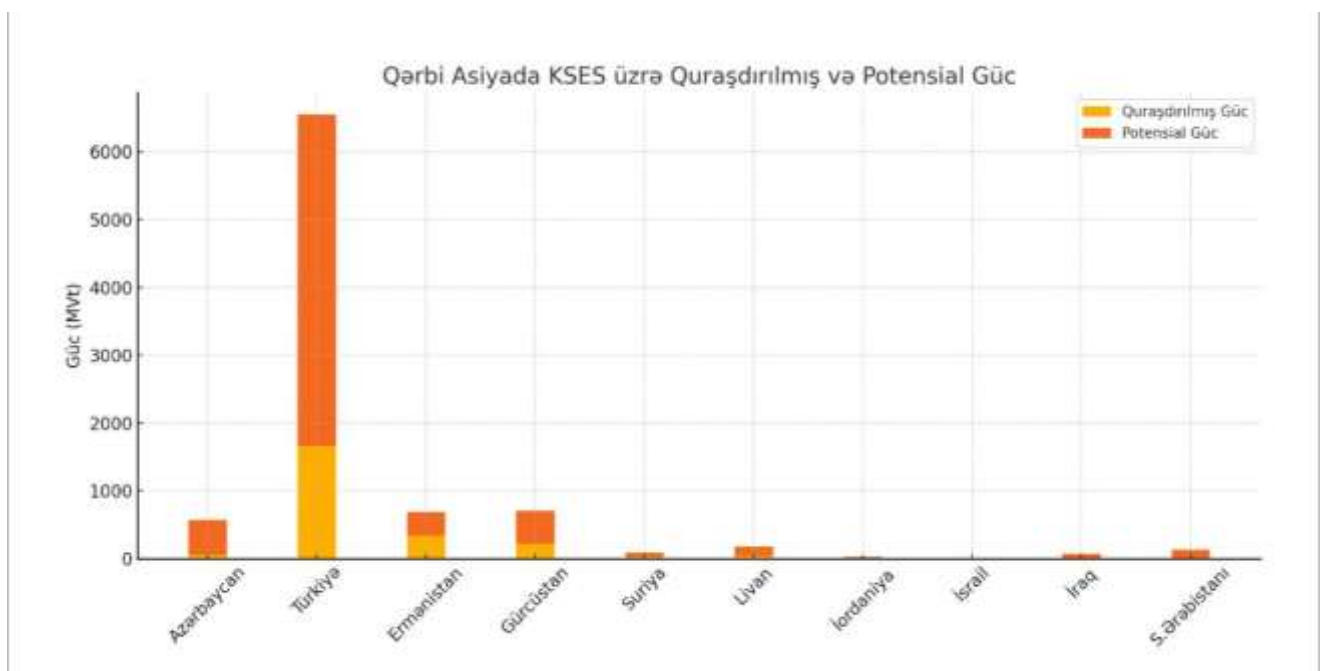
- Gücünə görə: Mikro (≤ 100 kW), Mini ($\leq 1-2$ MW), Kiçik ($\leq 10-50$ MW)
- İstismar növünə görə: Run-of-river (axın əsaslı), saxlama tipləri (rezervuarlar)
- Bağlantı sistemində görə: Şəbəkəyə qoşulu və ya off-grid (izolyasiya olunmuş)

Üstünlükləri:

- Yerli su ehtiyatlarından istifadə
- Aşağı istismar xərcləri
- Karbon emissiyasının sıfıra yaxın olması
- Kənd yerlərinin elektrifikasişdırılması və inkişafına dəstək (7).

Qərbi Asiya regionu təbii resurslar, coğrafi mövqe və iqtisadi inkişaf baxımından fərqli xüsusiyyətlərə malik olan ölkələr toplusudur. Regionun enerji sistemləri bu müxtəlifliyi əks etdirərək, enerji mənbələrinin tərkibində, enerji siyasətində və texnoloji tətbiqlərdə ciddi fərqliliklər nümayiş etdirir. Bu ölkələr arasında enerji ixracatçısı olan Səudiyyə Ərəbistanı və İraq fosil yanacaqlara əsaslanan enerji strategiyası ilə çıxış edirlər. Digər tərəfdən, Türkiyə və İordaniya kimi ölkələr enerji təhlükəsizliyini təmin etmək məqsədilə bərpa olunan enerji mənbələrinin – xüsusilə günəş və külək enerjisinin – inkişafına önəm verirlər.

Qrafik 1. Qərbi Asiya ölkələrində quraşdırılmış KSES-lərin potensial gücü



Mənbə: World Bank. (2022). Report

Qərbi Asiya ölkələrinin enerji təminatında müşahidə olunan əsas tendensiyalardan biri, dövlət tərəfindən idarə olunan enerji şirkətlərinin dominantlığıdır. Bununla yanaşı, bəzi ölkələrdə, o cümlədən İsrail, Ermənistan və Türkiyədə özəl sektorun da enerji istehsalında və paylanmasında aktiv iştirakı qeydə alınır. İqtisadi və siyasi qeyri-sabitlik bir sıra ölkələrdə – xüsusilə İraq, Suriya və Livanda – enerji infrastrukturunun etibarlılığına mənfi təsir göstərməkdədir. Məsələn, Livan iqtisadi böhran səbəbilə şəbəkəyə qoşulan elektrik generasiya gücündə ciddi azalma yaşamışdır. Regionda hidroenergetikanın payı ölkədən ölkəyə dəyişir. Türkiyə, Gürcüstan və Ermənistan kimi su resursları ilə zəngin ölkələrdə hidroenerji quraşdırılmış generasiya gücünün əsas hissəsini təşkil edir. Bununla yanaşı, Azərbaycan, İraq, Suriya və Livanda hidroenergetika daha çox tamamlayıcı enerji mənbəyi kimi çıxış edir. İordaniyada isə bu mənbənin payı son dərəcə məhduddur.

Kiçik su elektrik stansiyalarının (KSES) regiondakı mövqeyi də spesifik xüsusiyyətlərə malikdir. Türkiyə, Ermənistan və Gürcüstan kimi ölkələrdə KSES-in inkişafı üzrə əhəmiyyətli nəticələr əldə olunmuşdur. Digər ölkələrdə isə bu sahə ya ilkin mərhələdədir, ya da iqtisadi, ekoloji və texniki səbəblərlə məhdud inkişaf potensialına malikdir. KSES-lərin inkişafına ən böyük maneələrdən biri, su ehtiyatlarının qeyri-bərabər bölgüsü və transsərhəd çaylar üzərindəki mübahisələrdir ki, bu da regional enerji əməkdaşlığına mənfi təsir göstərir (9).

Enerji təhlükəsizliyi və bərpa olunan enerji mənbələrinin inkişafı son illərdə global səviyyədə prioritetə çevrilmişdir. Su elektrik enerjisi, xüsusilə də kiçik su elektrik stansiyaları (KSES), bu istiqamətdə

effektiv və ekoloji cəhətdən üstün hesab olunur (Quaranta et al., 2021). Qərbi Asiya regionunda isə su ehtiyatlarının bölgələr üzrə qeyri-bərabər paylanması, siyasi sabitsizlik və iqlim dəyişmələri bu resurslardan istifadədə çətinliklər yaradır. Buna baxmayaraq, Türkiyə, Ermənistan və Gürcüstan kimi ölkələrdə KSES-lərin inkişafı sürətlə gedir (8).

Cədvəl 1. Qərbi Asiya regionunda olan KSES-lərin xüsusiyyətləri.

Ölkə	Quraşdırılmış KSES gücü (MVT)	Potensial KSES gücü (MVT)	İstifadə (%)
Türkiyə	1,662.2	4,891.5	34
Ermənistan	382.0 (30 MVT-a qədər)	430.6	89
Gürcüstan	212.2	491.8	43
Azərbaycan	49.5	520.0	9.5
Suriya	23.0	67.6	34
Livan	31.2	144.8	22

Mənbə: World Bank. (2022).Report

Cədvəldən göründüyü kimi, Türkiyə və Ermənistan KSES sahəsində lider mövqedədir. Azərbaycan isə yüksək potensialına baxmayaraq, bu sahədən çox az istifadə edir.

Azərbaycanın KSES potensialı və mövcud vəziyyəti- Azərbaycanın bərpa olunan enerji siyasətində kiçik su elektrik stansiyalarının (Kiçik SES) xüsusi yeri vardır. Xüsusilə işğaldan azad olunmuş Qarabağ iqtisadi zonasında çay şəbəkəsinin zənginliyi və relyefin yüksək dağlıq olması bu stansiyaların geniş tətbiqi üçün əlverişli şərait yaradır. Qarabağ bölgəsi təbii sərvətlər və su ehtiyatları baxımından Azərbaycanın ən strateji əhəmiyyətə malik ərazilərindən biridir. 2020-ci ildəki Vətən müharibəsindən sonra bu ərazilərdə infrastrukturun yenidən qurulması və dayanıqlı enerji təminatı məsələsi prioritet olmuşdur. Bu baxımdan kiçik su elektrik stansiyalarının tətbiqi həm enerji müstəqilliyi, həm də ekoloji baxımdan əhəmiyyətlidir. 2022-ci ilə olan məlumata əsasən, Azərbaycanda istifadə səviyyəsi təqribən 9.5% təşkil edir. Son illərdə bəzi yeni KSES-lər istismara verilmiş və Dağlıq Qarabağ bölgəsindəki bəzi stansiyalar bərpa olunmuşdur (7). Lakin bu sahədə yenilənmiş tədqiqatların olmaması və ucuz yerli qaz ehtiyatlarına əsaslanan enerji siyasəti sektorda inkişafı ləngidir. Azərbaycan Respublikasının enerji sektoru əsasən neft və qaz kimi fosil yanacaq resurslarına əsaslanır. Lakin son illərdə ölkə enerji mənbələrinin şaxələndirilməsi və bərpa olunan enerji potensialından daha səmərəli istifadə istiqamətində yeni hüquqi və institusional çərçivələr formalaşdırmağa başlamışdır. Bu kontekstdə kiçik su elektrik stansiyaları (KSES) Azərbaycanın bərpa olunan enerji strategiyasında nəzərəcarpacaq rol oynamağa başlamışdır.

Ölkənin dağlıq və çay axınları ilə zəngin olan ərazilərində KSES-in inkişafı üçün əlverişli coğrafi şərait mövcuddur. Xüsusilə Qarabağ və Şərqi Zəngəzur iqtisadi zonalarında mövcud olan təmiz su ehtiyatları KSES layihələrinin reallaşdırılması üçün strateji əhəmiyyət daşıyır. Qarabağ bölgəsində əsas çaylardan olan Tərtərçay, Həkəriçay, Bazarçay, Köndələnçay və onların qolları hidroenerji potensialı baxımından önəmlidir. Dağlıq relyef bu çaylarda yüksək enerji potensialı olan axın və baş fərqi (head) yaradır. Əldə olunan ilkin qiymətləndirmələrə əsasən:

- Tərtərçayda 5–20 MW arası kiçik SES-lər üçün əlverişli sahələr mövcuddur.
- Həkəriçayda 10 MW-dan yuxarı layihələr mümkündür.

• Azad edilmiş ərazilərdə artıq Xudafərin və Qız Qalası SES-ləri (böyük SES-lər kateqoriyasında) fəaliyyətə başlayıb, lakin mikro və mini SES-lər üçün hələ tam istifadə olunmamış potensial mövcuddur.

Bununla yanaşı, müasir texnologiyaların tətbiqi və su infrastrukturuna inteqrasiya edilə bilən mikro və mini stansiyalar vasitəsilə mövcud ehtiyatların iqtisadi baxımdan səmərəli istifadəsi mümkündür (1).

2022-ci il məlumatlarına əsasən, ölkədə 10 MVT-a qədər gücə malik olan KSES-lərin quraşdırılmış ümumi gücü 49,5 MVT təşkil edir. Bu göstərici, mövcud 520 MVT-lıq potensialla müqayisədə, istifadə olunmuş resursların cəmi 10 faizini əhatə edir ki, bu da ölkədə KSES sahəsində geniş inkişaf imkanlarının mövcudluğunu göstərir. 2017–2020-ci illər arasında bir neçə yeni stansiya istifadəyə verilmiş, 2021-ci ildə isə əvvəllər Qarabağ bölgəsində de-fakto qüvvələr tərəfindən istismar olunmuş bəzi stansiyalar təmir edilərək yenidən fəaliyyətə başlamışdır (1).

Bundan əlavə, hal-hazırda istifadə olunmayan 23 KSES-in təmir və modernizasiya yolu ilə enerji istehsalına cəlb edilməsi planlaşdırılır. Bu layihələr həm texnoloji baxımdan səmərəliliyin artırılması, həm də regionların enerji təminatında etibarlılığın yüksəldilməsi baxımından əhəmiyyət daşıyır.

Azərbaycan hökumətinin bərpa olunan enerji üzrə yeni strategiyaları və iqtisadi Zonaların İnkişafı Agentliyi çərçivəsində Qarabağda KSES layihələrinin dəstəklənməsi mümkündür. Xüsusilə (dövlət-özəl sektor tərəfdaşlığı) modelləri faydalı ola bilər. Nepalın Andhi Khola layihəsi kimi modellər Qarabağ üçün nümunə ola bilər:

- Kənd təsərrüfatının dəstəklənməsi

- İstehlakçılara uyğun tarif modelləri
- Aşağı gərginlikli lokal şəbəkələrin yaradılması (4)

Qlobal təcrübədə Nepal, Efiopiya və Hindistan kimi dağlıq ölkələrdə kiçik SES-lər kəndlərin elektrifikasişdırılmasında effektiv model kimi tətbiq olunub. Bu modellərdən Qarabağ üçün uyğun yanaşmalar:

- Run-of-river sistemi: çayların təbii axınından istifadə
- Modulyar qurğular: asan quraşdırılan və dağ kəndləri üçün münasib
- Off-grid sistemlər: şəbəkədən uzaq ərazilər üçün müstəqil enerji təminatı

Cədvəl.2. Modelin tətbiqi zamanı qarşıda duran maneələr və tövsiyələr

Maneələr:	Tövsiyələr:
Sedimentləşmə və su keyfiyyəti	Resursların xəritələşdirilməsi
İqlim dəyişiklikləri və su qıtlığı riski	Yerli icmalar üçün maarifləndirici proqramlar
Maliyyə riskləri və məlumat çatışmazlığı	EPC (Engineering, Procurement, Construction) modelinin təşviqi

Mənbə: Tədqiqatçının işi:

Azərbaycan 2021-ci ildə "Elektrik Enerjisi İstehsalında Bərpa Olunan Enerji Mənbələrindən İstifadə haqqında" yeni qanun qəbul etmişdir. Bu qanun çərçivəsində aşağıdakı stimullar mövcuddur:

- Zəmanətli alım tarifləri
- Şəbəkəyə qoşulma imkanı
- Vergi güzəştləri və subsidiyalar

Bununla belə, hələ də ölkədə KSES-lə bağlı müasir potensial qiymətləndirmə tədqiqatlarının azlığı və təbii qazın ucuz başa gəlməsi bu sahədə inkişafın əsas maneələrindən biri olaraq qalır. Azərbaycanın KSES sektoru hələ tam inkişaf etməyib. İnfrastruktur və investisiya imkanları məhduddur, lakin potensial böyükdür. Aşağıdakı tövsiyələr irəli sürülür:

- Regional hidroloji tədqiqatların aparılması
- Ağıllı maliyyə modelləri ilə investor cəlb
- Suvarma və içməli su infrastrukturunda KSES texnologiyalarının tətbiqi
- Sərhəd çaylarda əməkdaşlıq və birgə enerji layihələri

Nəticə

Qərbi Asiyada enerji sektorunun ümumi mənzərəsi göstərir ki, regionun gələcək enerji strategiyası üçün bərpa olunan enerji mənbələrinin inkişafı mühüm prioritet olmalıdır. Hidroenergetika, xüsusilə kiçik su elektrik stansiyaları, bu prosesdə əhəmiyyətli rol oynaya bilər. Lakin bunun üçün dövlət siyasətində dəstəkləyici hüquqi və iqtisadi alətlərin, o cümlədən tarif təşviqlərinin və texnoloji modernizasiyanın gücləndirilməsi vacibdir. Regionda su ehtiyatlarının davamlı idarə olunması, enerji təhlükəsizliyi və ekoloji tarazlığın qorunması baxımından strateji əhəmiyyət kəsb edir.

Qərbi Asiya regionunda KSES sahəsi ölkələr üzrə fərqli inkişaf səviyyəsindədir. Azərbaycan yüksək texniki potensiala malik olsa da, bu sahədən istifadənin səviyyəsi kifayət qədər aşağıdır. Yeni qanunvericilik və texniki islahatlar potensialın reallaşdırılmasına zəmin yarada bilər. İqlim dəyişmələrinin təsirlərini azaltmaq və enerji təhlükəsizliyini təmin etmək üçün KSES sektorunun inkişafı strateji əhəmiyyət daşıyır.

Azərbaycanın KSES potensialı hazırda qismən istifadə olunmuş olsa da, bu sahədə irəliləyiş üçün həm texniki, həm də institusional baxımdan zəmin mövcuddur. Hüquqi və iqtisadi təşviqlərin davamlılığı, regional infrastrukturun bərpası və elmi əsaslı potensial araşdırmaların aparılması, KSES sektorunun inkişafı üçün mühüm şərtlərdir. Uzunmüddətli dövrdə bu sahənin inkişafı ölkənin enerji təhlükəsizliyinin artırılması və yaşıl iqtisadiyyat modelinə keçidi üçün strateji rol oynaya bilər.

Kiçik su elektrik stansiyaları Qarabağ bölgəsinin enerji təminatı və ekoloji davamlı inkişafı üçün mühüm rol oynaya bilər. Onların düzgün planlaşdırılması və tətbiqi ilə bölgənin enerji müstəqilliyinə töhfə verilməklə yanaşı, sosial-iqtisadi dirçəlişi dəstəklənmiş olacaq. Dövlət və özəl sektor arasında əməkdaşlıq bu prosesin uğurlu icrası üçün əsas faktorlardan biridir.

Ədəbiyyat Siyahısı

1. Azərbaycan Respublikası Milli Məclisi. (2021). Bərpa Olunan Enerji Mənbələri haqqında Qanun. <https://meclis.gov.az>
2. Azərbaycan Respublikasının Energetika Nazirliyi. (2021). Enerji Strategiyası və Bərpa Olunan Enerji Mənbələri. <https://minenergy.gov.az>
3. Azərbaycan Respublikasının Prezident Administrasiyası. (2022). Qarabağ və Şərqi Zəngəzur iqtisadi rayonlarının bərpası üzrə dövlət proqramı. Bakı.

4. Gagnon, L. (2008). *Hydropower: The energy payback ratio*. *Hydro Review Worldwide*, 16(2), 36–43. Henrich, S. (2010).
5. Quaranta, E., Revelli, R., & Ridolfi, L. (2021). *Small hydropower: State of the art and barriers to development*. *Renewable and Sustainable Energy Reviews*, 135, 110165.
6. *Small Hydropower in the World: A Comprehensive Overview of the Status, Potential and Development*. Retrieved from <https://www.unido.org>
7. UNIDO & ICSHP. (2022). *World Small Hydropower Development Report 2022 – Western Asia*. United Nations Industrial Development Organization & International Center on Small Hydro Power. www.unido.org/WSHPDR2022
8. UNIDO & ICSHP. (2022). *World Small Hydropower Development Report 2022 – Western Asia*. Vienna, Austria; Hangzhou, China.
9. World Bank. (2022). *Access to electricity (% of population) – Azerbaijan*. <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=AZ>

Historical sciences

THE EVENTS THAT MARKED IN THE BEGINING OF "THE ARAB SPRING": TUNISA'S SOCIAL AND POLITICAL TRANSFORMATION

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Abstract

The main aim of the article is to study the events that marked the beginning of "the Arab Spring": Tunisia's social and political transformation.

Tunisia is one of the strategically important countries in North Africa. Its location on the southern coast of the Mediterranean Sea makes it a crossroads of both trade routes and cultures. Bordered by Algeria to the west and Libya to the southeast, the country's northern and eastern borders open to the Mediterranean Sea. Tunisia has a total area of 164,000 square kilometers, and its coastline stretches approximately 1,300 kilometers. This highlights its significance as a key coastal country in the Mediterranean.

The geographical location of Tunisia has a major impact on the country's economic potential and strategic importance. This unique geographic position allows Tunisia to establish close ties not only with North Africa, but also with Europe and the Middle East.

Conclusion. As a result, the new constitution, finalized and adopted in 2014, marked a significant step forward in Tunisia's democratic development, based on the principles of human rights, the rule of law, and a multi-party system.

Application importance: the material can be used in higher education institutions. Stakeholder who interested in history can also get benefit from this study.

Keywords: Africa, Arab Spring, Tunis, politics, Mediterranean Sea

Introduction. From past to present, Tunisia has developed under the influence of various cultures and has become a country with a rich and deeply rooted cultural heritage. Throughout history, this region has come under the political rule of Arabs, Berbers, Andalusians, and Turks, turning it into an area shaped by a mix of numerous cultural and ethnic influences. Due to these characteristics, Tunisia holds an important place in North Africa, both geographically and culturally [4, pp.20–21].

The main part. Tunisia is one of the strategically significant countries in North Africa. Its location on the southern coast of the Mediterranean Sea makes it a crossroads of trade routes and cultures. Bordered by Algeria to the west and Libya to the southeast, its northern and eastern borders open to the Mediterranean. The total area of the country is 164,000 square kilometers, and its coastline is approximately 1,300 kilometers long. This shows that Tunisia is a key coastal country in the Mediterranean. The geographical location of Tunisia significantly affects its economic opportunities and strategic importance. This unique geographical position allows Tunisia to establish strong ties not only with North Africa but also with Europe and the Middle East [2, p.2].

The predominance of the Arab population plays an important role in shaping the country's cultural and social structures. Nearly 98% of the population adheres to Islam, which is one of the key factors in determining the country's religious and cultural identity. Islam has had a profound impact on Tunisia's social life, traditions, and legal system [9].

In 1574, Tunisia came under the protection of the Ottoman Empire and was administered as a province of the empire by governors officially appointed from Istanbul.

By the mid-19th century, due to problems faced by the Ottoman Empire along its eastern and southern borders, it began to lose its influence in North Africa, particularly in Tunisia. As a result, Tunisia was occupied by the French. With the consent of Great Britain, France expanded its influence over Tunisia and signed the Bardo Treaty with the Bey of Tunisia on May 12, 1881. Through this agreement, Tunisia formally came under French protection. The treaty gave France significant control over the country's foreign relations and internal administration. As a result, Tunisia effectively lost its independence and

became a territory under French control. With the signing of this treaty, Tunisia officially became a French protectorate and part of France's colonial policy. The Bardo Treaty also enabled France to establish political, economic, and military authority over Tunisia and bring local governance under its control. French rule in Tunisia lasted for 75 years [11, pp.5–6].

Later, under the leadership of Habib Bourguiba, the Tunisian people began their struggle for independence and freedom. In 1934, Bourguiba founded the Neo Destour (New Constitutional) Party, launching an independence movement that was considered illegal by the French authorities. During World War II, Tunisia became a battleground for Allied and Axis forces. In 1954, the French government changed its policy toward Tunisia and began engaging with local national leaders. As a result, the Bardo Treaty was annulled in March 1956, and Tunisia gained its independence. The freedom struggle led by Habib Bourguiba faced many challenges. In 1956, the French government was forced to leave Tunisia, marking a significant step toward full independence. Following the abolition of the monarchy on July 25, 1957, the Republic of Tunisia was proclaimed, and Habib Bourguiba became the first president [6, pp.2–3]. Major changes occurred in the country's political life as a result of the reforms carried out during this period.

Habib Bourguiba implemented significant reforms by separating religion from state affairs. He enacted several laws aimed at establishing a secular system, limiting the influence of religion on state policy. The main goal of these reforms was to reduce the impact of religious and cultural conservatism in society and build a more modern and developed state. He also made important strides in the area of women's rights. In 1956, he succeeded in passing laws that strengthened women's rights. Bourguiba's reforms mostly focused on education and social sectors. These reforms led to noticeable changes in the country's economic and social development [1].

Among all Arab countries, Tunisia was the one where women gained the most rights. Additionally, Bourguiba considered Islam a force that hindered the country's development, and in 1981, he banned the headscarf (which he referred to as a "disgusting piece of cloth") in schools and government institutions. He closed religious schools and abolished Sharia courts. Resistance to his revolutionary reforms was especially strong in the city of Kairouan, a place considered sacred by Muslims.

In 1981, Tunisia held its first multi-party parliamentary elections. However, candidates from the main opposition—Islamist-oriented parties—were not allowed to participate. In 1984, the situation worsened when the government eliminated key bread subsidies. This decision increased social and economic tensions in the country and led to widespread protests.

During these demonstrations, participants held loaves of bread instead of posters, trying to highlight the ongoing rise in food prices and the resulting decline in living standards. A group of students formed a human figure shouting the slogan "Tunis hurra" (Free Tunisia), while one young man sewed his mouth shut in protest of limitations on freedom of expression. Such demonstrations continued to grow rapidly [8, p.3].

During these protests, Zine El Abidine Ben Ali, who was then the Minister of National Security and Interior, targeted various political opponents and ordered the arrest of those responsible for numerous human rights violations.

Ben Ali, citing the serious deterioration in the health of 84-year-old Bourguiba and his inability to fulfill his duties, seized political power on November 7, 1987. Despite legal and constitutional limitations, he concentrated the leadership of the state in his own hands. This event led to profound changes in the governance and political structure of the country.

After assuming power, Ben Ali announced his intention to strengthen national unity through dialogue and reconciliation with all political opposition movements, and also promised to carry out reforms in the economic sector. In the early days of his presidency, Ben Ali emphasized the importance of cooperating with opposition groups and labor unions. On November 7, he published the "National Unity Pact", in which he committed to ensuring freedoms in both political and economic spheres.

As a result, between 1988 and 1990, the organization of opposition political parties and social groups within the country was permitted [12, p.37].

Ben Ali served as Tunisia's president for a total of 23 years and 2 months. He participated in the presidential elections held in 1989, 1994, 1999, 2004, and 2009, winning each election by a wide majority. In each of these elections, he maintained his political power, secured his long-term presidency, and clearly demonstrated how one-sided the political system in the country had become [10].

To summarize Zine El Abidine Ben Ali's era, although some level of economic progress was achieved, it did not benefit the broader population; instead, the wealthier groups took advantage of the situation. While there was notable growth in the tourism sector, unemployment rates remained high. Both domestically and internationally, Ben Ali initially began to gain recognition as a democratic leader.

However, over the years, these hopes gradually faded. Ben Ali began taking steps to gradually neutralize the opposition [7, p.53].

During Ben Ali's rule, the restrictions on the internet, the banning of literature on democracy and human rights, and similar measures revealed the repressive nature of the government. The high unemployment rates among the youth were seen as clear indicators of the problems within the country's social and economic system. This situation was dramatically altered by Mohamed Bouazizi's protest, which became a symbol of resistance against the Ben Ali regime.

Born into a peasant family with six siblings, Bouazizi's main source of income was selling vegetables, which he earned about \$10 a day. On December 17, 2010, a group of four men and two women attacked him and confiscated his vegetables. When Bouazizi protested the injustice done to him, one of the female police officers slapped him in the face. Unable to get his fruits back at the police station, Bouazizi calmly parked his car near a government building. He then bought flammable liquid from a nearby shop. He poured it on himself. Then, pointing to the sky, he lit a match. After a few minutes of astonishment, the people around him covered Bouazizi and extinguished the flame. This action expressed his personal pain as well as his frustration with the system. Bouazizi's dramatic protest became a symbol of the popular movements and social injustice that would later take place in Tunisia. [3, p. 74-75].

Bouazizi's self-immolation sparked a wave of democratic protests. After the incident, about 1,000 people gathered in front of the government building in the city of Sidi Bouzid. The next day, police fired tear gas at the young protesters. On December 19-21, the events spread to neighboring cities. A young man named Houcine Neji committed suicide by climbing a high electricity pole in a crowded area and jumping over the power lines. On December 28, Bin Ali visited Bouazizi in the hospital and promised to help his family. He dismissed the governor of Sidi Bouzid and the police chief. However, this step was too late to prevent the uprising. On January 9, Bin Ali ordered army commander Rachid Ammar to stop the uprising, but Ammar sent tanks and troops into action, but did not resort to violence. As a result, Bin Ali decided to leave the Middle East. In January 2011, unable to stop the demonstrations, Zine El Abidine Ben Ali fled to Saudi Arabia with his wife Leila, two daughters, and a son. After the overthrow of the Ben Ali regime, the Tunisian people held free and fair elections for the first time. In these elections held in October, the Ennahda Movement, led by Rachid al-Qannoushi, came first with a large number of votes, winning 89 deputies in the 217-seat Constituent Assembly. The results of these elections changed the political landscape of the country. One of the main objectives of the parliament was to draft a new constitution. At this stage, the issues of women's rights, freedoms, and the protection of democratic principles were brought to the fore. In 2011, the Constitutional Assembly was formed by the interim government and, against the backdrop of extensive public debate, the preparation of a new draft constitution began [5].

Conclusion. As a result, the new constitution, finalized and adopted in 2014, marked a significant step forward in Tunisia's democratic development, based on the principles of human rights, the rule of law, and a multi-party system. This new legislation ensured political stability in the country.

References

1. Aktaş Gözde ve Gök Ali Can, Kuzey Afrika Ülkeleri, Dış Politika Enstitüsü, http://www.dispolitika.org.tr/dosyalar/ogrenci_kosesi/kuzey_afrika_ulkeleri.pdf,
2. Climate Risk Profile: Tunisia .2021 s. 27 (: The World Bank Group.) [In Turkish]
3. Çubukçu, Mete: "Yıkılsın Bu Düzen!" Arap Ayaklanmaları ve Sonrası. İstanbul, İletişim Yayınları, 2012. 216, s. [In Turkish]
4. Hizmetli S. Osmanlı Yönetimi Döneminde Tunus ve Cezayir'in Eğitim ve Kültür Tarihine Genel Bir Bakış. Ankara Üniversitesi İlahiyat Fakültesi Dergisi, Sayı:1, Cilt:32, Ankara, 1992, s.20-21. [In Turkish]
5. <https://tr.euronews.com. /tunus-u-24-yil-demir-yumrukla-yoneten-zeynel-abidin-bin-ali-kimdir-suudi-arabistan-da-oldu>. 2019/09/19/ [In Turkish]
6. Öter, Elif Ebrar. "B "Bağımsızlıktan Günümüze Tunus'un Demokratikleşme Serüveni". İNSAMER Analiz. 18.07.2022. s.7. In Turkish
7. Stewart, Dona J., The Middle East Today: Political, . p.304. Geographical and Cultural Perspectives, Routledge Publishing, London, 2009. [In English]
8. The Arab Spring in Tunisia - A semiotic perspective Nuno Coelho University of Coimbra. s.6, [In English]
9. Tunisia, CIA World Factbook, United States Of America Central Intelligence Agency, 2012. [In English]

<https://www.cia.gov/library/publications/the-world-factbook/geos/ts.html>

10. Tunus'u 24 yıl demir yumrukla yöneten Zeynel Abidin bin Ali kimdir? 19/09/2019

<https://tr.euronews.com/tag/zine-al-abidine-ben-ali> Yayınlanma Tarihi. [In Turkish]

11. Ufuk Ulutaş, Furkan Torlak "Devrimden Demokrasiye Tunus'un Seçimi" Sayı: 46, Kasım 2011. ümumi s. 23, Seta | Siyaset, Ekonomi ve Toplum araştırmaları Vakfı Nenehatun caddesi, N O : 6 6 gop Çankaya 06700. Ankara. [In Turkish]

12. Yasemin Devrimi'nden "Arap Baharı"na Tunus ü s. 61 səh 37 Konur Alp Koçak* YASAMA DERGİSİ 22 [In Turkish]

Medical sciences

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THE MAIN VEGETATIVE MANIFESTATIONS IN THE ACUTE PERIOD TRAUMATIC BRAIN INJURY

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Relevance.

Traumatic brain injury is damage to the skull and/or brain that occurs as a result of mechanical impact. The acute phase of TBI covers the first 24–72 hours after the injury and requires particularly careful monitoring of vital functions. Among them, a special place is occupied by the body's vegetative reactions, which are often the first and most pronounced signs of severe neurological deficit.

Traumatic brain injury (TBI) remains one of the leading causes of mortality and disability among the population, especially among people of working age. In the acute period of TBI, the risk of developing disorders of the autonomic nervous system increases significantly, which can significantly affect the outcome of the disease. Such manifestations include fluctuations in blood pressure, arrhythmia, respiratory disorders, thermoregulation and sweating, which requires timely diagnosis and correction.

Autonomic dysfunction may mask or exacerbate the manifestations of the underlying injury, making clinical assessment of the severity of the patient's condition difficult. It also serves as a prognostic marker of the extent of central nervous system damage and may indicate the need for intensive care or early surgical intervention.

The study of vegetative disorders in the acute period of TBI allows not only to better understand the pathophysiological mechanisms of injury, but also to optimize treatment approaches aimed at reducing complications and improving long-term treatment results. All this emphasizes the high medical and social significance of this topic.

Purpose of the study

To assess the nature and severity of autonomic disorders in patients with traumatic brain injury in the acute period and determine their prognostic significance.

Materials and methods

We examined 76 patients with clinical forms of mild traumatic brain injury (MTBI), including 42 men (55.2 ± 5.70) and 34 women (44.7 ± 5.70) aged 20 to 60 years (the average age was $52.63 \pm 5.73\%$).

When selecting patients, we used the following main criteria:

Monitoring of vital functions (blood pressure, heart rate, temperature, respiratory rate)

Neurological examination (GCS, pupillary reactions)

Cardiac monitoring and temperature control

Results. Among 76 patients with acute MTBI, 100% were conscious upon admission, but 6.5% had mild psychomotor agitation. Based on the Glasgow Coma Scale (GCS), patients were distributed according to severity: 13 points - 48.6%, 14 points - 27.6%, 15 points - 23.6%. 51.4% of patients with moderate severity had persistent headaches, 78% had sleep disorders, 48.6% had anxiety.

Table Digital analysis of the dynamics of vegetative indicators (based on monitoring in the first 72 hours)

Parameters	norm	1 day	2 days	3 days
BP (syst./diast.), mmHg	~120/80	160/95 – 90/60	145/85 – 100/70	130/80 – stable
Heart rate, bpm	60–90	58–125	65–110	75–85
Respiratory rate, breaths/min	12–18	10–24	12–20	14–16
Body temperature, °C	36.6–37.0	37.4–38.1	37.2–37.6	36.8–37.0
Assessment of the autonomic dysfunction scale (CADSS)*	up to 15 points	27 points	22 points	14 points

As can be seen from the table, the indicators are reliable, recorded over three days (the first 72 hours): instability of both systolic and diastolic blood pressure; changes in the respiratory rate and heart rate are also visible. The temperature also increases during the first day. Thus, over three days the level of consciousness improves and a pronounced dysfunction of the autonomic system is noted, i.e. its lability.

Conclusions.

Autonomic disturbances such as blood pressure lability and palpitations were common among patients. Observed symptoms of autonomic disturbances in combination with neurological manifestations indicate the involvement of non-specific brain structures, which requires a specialized approach to treatment.

1. Vegetative disorders are frequent and clinically significant manifestations in the acute period of traumatic brain injury (TBI), especially in moderate clinical forms.

2. The main types of autonomic disorders include: instability of blood pressure, heart rhythm disturbances, respiratory disorders, hyperthermia and sweating, which are associated with dysfunction of the brain stem and hypothalamic structures.

3. Early diagnosis and correction of autonomic disorders in the acute period of TBI allows to improve the prognosis, reduce the risk of complications and increase the effectiveness of the therapy.

4. Comprehensive monitoring of autonomic function parameters (heart rate, blood pressure, body temperature, respiratory parameters) should be included in the standard management of patients with TBI.

5. The severity of autonomic dysregulation correlates with the degree of brain damage and may serve as a prognostic criterion for an unfavorable outcome.

Literature

1. Tsvetkovsky S.B., Stupak V.V. Manifestations of disorders of vegetative regulation in mild traumatic brain injury Clinical aspects of neurosurgery No. 4 (December), 2022. P. 46 - 55

2. Izbasarova A.Sh. With vegetative dystonia syndrome in the consequences of mild traumatic brain injury. Bulletin of KazNMU, No. 2 (1) - 2014. P.84-86.

3. Mustafayeva A.S. Clinical and pathogenetic aspects of the dynamics of restoration of vegetative imbalance in the acute period of severe traumatic brain injury. Neurosurgery and neurology of Kazakhstan, No. 2 (31), 2013 P.3-8.

4. Yrysov K.B., Mashrapov Sh.Zh., Alikeyzy E., Toktobaeva A.A., Faizullaeva G.A., Shamuratov U.A. Kyrgyz State Medical Academy named after. I.K. Akhunbaeva, Bishkek, Kyrgyz Republic Diagnosis of mild traumatic brain injury based on ophthalmological and serological studies. Journal of Neurosurgery and Neurology of Kazakhstan, No. 1 (62), pp. 3-11.

5. Chukhlovina M.L., A.A. Chukhlovin Features of managing patients with traumatic brain injury Journal of Neurology and Psychiatry named after S.S. Korsakov, 2021, v. 121, no. 9. pp. 145-150.

6. Yrysov K.B., Fayzullaeva G.A., Mashrapov Sh.Zh. Evaluation of outcomes of mild traumatic brain injury using neurocognitive testing. Scientific Review, No. 4, 2021. P. 5-9.

7. Mikhailenko A.A., Odinak M.M., Litvintsev S.V., Ilyinsky N.S., Yurin A.A. Mild traumatic brain injury: current and controversial issues. Bulletin of the Russian Military Medical Academy 1(49)- 2015. P.199-203.

8. Alekseenko Yu.V., Protas R.N. Diagnostics and treatment of traumatic brain injury: Textbook. - Vitebsk, 1995.-80 p.

EPILEPSY SURGERY IN CHILDREN WITH GENETIC AETIOLOGY: PROSPECTIVE EVALUATION OF CURRENT PRACTICE AND RESULTS

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ХИРУРГИЯ ЭПИЛЕПСИИ У ДЕТЕЙ С ГЕНЕТИЧЕСКОЙ ЭТИОЛОГИЕЙ: ПРОСПЕКТИВНАЯ ОЦЕНКА СОВРЕМЕННОЙ ПРАКТИКИ И РЕЗУЛЬТАТОВ

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Актуальность. Актуальность хирургии эпилепсии у детей с генетической этиологией обусловлена ростом заболеваемости эпилепсией, связанным с различными генетическими нарушениями. Эпилепсия, особенно резистентная к медикаментозной терапии, значительно ухудшает качество жизни детей и их семей, ограничивая развитие и социальную адаптацию.

Современные исследования показывают, что хирургическое вмешательство может быть эффективным методом лечения, позволяя достичь значительного уменьшения частоты приступов или даже их полного исчезновения. Это особенно актуально для детей с определенными генетическими синдромами, такими как синдром Ландау-Клеффнера или туберозный склероз, где традиционные методы лечения часто оказываются неэффективными.

Проведение проспективных оценок позволяет собрать актуальные данные о результатах хирургического вмешательства, оценить его безопасность и эффективность, а также определить оптимальные критерии для выбора кандидатов на операцию. Учитывая индивидуальные особенности генетической предрасположенности, такие исследования могут способствовать развитию персонализированного подхода в лечении эпилепсии у детей.

Цель исследования. Оценить современные методы и результаты хирургического лечения эпилепсии у детей с генетической этиологией, в которых рассматриваются предоперационное обследование, типы операций и послеоперационные исходы при широком спектре расстройств.

Материалы и методы исследования. Дизайн исследования - проспективное когортное исследование. В нем осуществляется сбор и анализ данных о пациентах до и после хирургического вмешательства, что позволяет оценить эффективность лечения и его влияние на клинические исходы. Методы применяемые в исследовании: будут включены пациенты в возрасте до 18 лет, с известной генетической этиологией, перенесших операцию по лечению эпилепсии из архива неврологического отделения РГП «Больница Медицинского центра Управления делами Президента Республики Казахстан» на ПХВ в период с 1 января 2023 г. по 1 декабря 2023 г. Оценка данных проводилась с использованием нейровизуализации, ЭЭГ, генетической классификации (структурный ген, другой ген, хромосомный) и целей лечения. Результаты оценивались по модифицированной шкале ILAE.

Результаты: По результатам проведенного исследования выявлено, что из 24 детей с генетической эпилепсией у 72 % были ежедневные приступы, когда их направляли на хирургическое обследование, что произошло в среднем через 2,2 года после развития лекарственной устойчивости. После операции у 68 % пациентов наблюдалось уменьшение приступов более чем на 50 %, при этом у 33 % приступы прекратились [медиана наблюдения - 11 месяцев. Отсутствие судорожных припадков было наиболее распространенным в группе с моногенной структурой, но во всех группах наблюдалось значительное облегчение.

Выводы: После хирургического лечения эпилепсии у большинства детей с генетической этиологией наблюдается значительное снижение частоты приступов, даже при отсутствии

единичных структурных изменений и при широком спектре генетических причин. Эти результаты подчеркивают необходимость ускоренного направления на хирургическое лечение эпилепсии и поддержки более широкого представления о том, какую пользу может принести детям хирургическое лечение эпилепсии, даже если оно носит паллиативный характер.

Список литературы

1. Alexandrova N.S. Childhood aphasia and Landau-Kleffner syndrome in the light of brain plasticity. S.S. Korsakov Journal of Neurology and Psychiatry 2004;104(6):54-8. [Aleksandrova N.Sh. Children aphasias and Landau-Kleffner syndrome in the light of brain flexibility. Zhurnal nevrologii i psikiatrii im. S.S. Korsakova = S.S. Korsakov Journal of Neurology and Psychiatry 2004;104(6):54-8. (In Russ.)].
2. Karlov V.A., Gnezditsky V.V. Bifocal atypical rolandic epilepsy with apraxia of the tongue. S.S. Korsakov Journal of Neurology and Psychiatry 2004;104(12):4- 9. [Karlov V.A., Gnezditsky V.V. Bifocal atypical rolandic epilepsy with linguistic apraxia. Zhurnal nevrologii i psikiatrii im. S.S. Korsakova = S.S. Korsakov Journal of Neurology and Psychiatry 2004;104(12):4-9. (In Russ.)].
3. Arzimanoglou A., Guerrini R., Aicardi J. Aicardi's epilepsy in children. 3rd edn. Philadelphia: Lippincott, 2004. Pp. 176-87.
4. Blagosklonova N.K., Velichko M.A. Neurophysiological mechanisms of the Landau- Kleffner syndrome. Epilepsia 1999;40(Suppl 2):164-5.
5. Nikanorova M.Y. Landau-Kleffner syndrome (acquired epileptic aphasia). Bulletin of Practical Neurology 1998; (4):114-6. [Nikanorova M.Yu. Landau-Kleffner syndrome (acquired epileptic aphasia). Vestnik prakticheskoy nevrologii = Bulletin of Practical Neurology 1998;(4): 114-6. (In Russ.)].

Pedagogical sciences

THE IMPACT OF EMOTIONAL INTELLIGENCE ON SECOND LANGUAGE ACQUISITION

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Abstract

The process of acquiring a second language (L2) is a complex interplay of cognitive, social, and affective factors. This article explores the pivotal role of emotional intelligence (EI) in second language acquisition. Emotional intelligence refers to the capacity to recognize, understand, and manage emotions in oneself and others. This article posits that individuals with high emotional intelligence possess advantages in language learning, including improved motivation, better interpersonal communication, and reduced anxiety. By examining the interplay between EI and various components of language acquisition, this discussion highlights the transformative impact of emotional awareness on linguistic success. The article incorporates a blend of theoretical insights and practical applications, reflecting on the implications of emotional intelligence in the context of second language acquisition. It emphasizes the social and cognitive dimensions of language learning that align with broader linguistic inquiries.

Keywords: language learning, motivation, second language, communication, emotions, collaborate, practice

Introduction

The acquisition of a second language is an intricate process influenced by a myriad of cognitive and emotional factors. While traditional models of second language acquisition often emphasize structural and social components, the significance of emotional intelligence in this domain is an evolving field of study. Emotional intelligence, as conceptualized by Goleman (1995), encompasses the ability to perceive, control, and evaluate emotions. In the context of language learning, EI plays a critical role in enhancing motivation, fostering effective communication, and alleviating anxiety.

Emotional Intelligence Defined

Emotional intelligence can be dissected into several key components, including self-awareness, self-regulation, social awareness, and relationship management. Self-awareness allows learners to recognize their emotional states and how these states may affect their learning process. Self-regulation enables individuals to manage their reactions to emotions, which can be particularly beneficial in the face of the challenges associated with language acquisition. [1, 14] Social awareness and relationship management are essential for interaction with peers and instructors in a second language, forming the bedrock for successful language practice and communication.

The Role of Emotional Intelligence in Language Learning Motivation

Motivation is a cornerstone of successful language acquisition. Learners with high emotional intelligence often exhibit intrinsic motivation; they engage with the language not simply as a requirement but as a means of personal expression and social connection. This intrinsic motivation is a powerful driver in language acquisition, as it leads learners to invest more time and effort in mastering the new language. Emotionally intelligent learners are also more capable of setting realistic goals and maintaining resilience in the face of setbacks, further enhancing their commitment and engagement in the learning process.

Enhancing Communication through Emotional Intelligence

Communication is not merely about the exchange of words; it is inherently emotional. The ability to interpret emotional cues, such as tone of voice or facial expression, can significantly influence the effectiveness of communication in a second language. By responding appropriately to a speaker's emotional state, learners can make conversations more engaging and create a sense of trust that fosters better communication. For instance, sarcasm, humor, or empathy often rely heavily on non-verbal signals and emotional context. Learners with high EI are better equipped to navigate intercultural communication, as they understand the nuances and subtleties that accompany language use in different social

contexts. [2, 8] This understanding not only facilitates clearer communication but also fosters stronger relationships and a more supportive learning environment. Learners often experience fear of making mistakes, judgement from peers, and performance pressure, all of which can inhibit their willingness to practice the language. Misunderstanding emotional cues can lead to misinterpretations of intent, potentially causing conflict or awkwardness. For instance, a learner might misread a native speaker's frustration as anger rather than urgency, leading to inappropriate responses. Recognizing these cues can help mitigate such misunderstandings. Here, emotional intelligence plays a protective role. Emotionally intelligent individuals are typically better at managing their anxiety and stress levels. They can engage in self-soothing techniques, reframe their perceptions of failure, and maintain a growth mindset. By addressing anxiety through emotional regulation, learners can create a more conducive environment for language practice, ultimately enhancing their proficiency.

By developing skills to interpret these emotional cues in a second language, learners not only enhance their communication effectiveness but also foster richer, more meaningful relationships in their multilingual interactions.

Social Dynamics and Collaborative Learning

Language learning is inherently social, and the dynamics among peers can significantly affect the acquisition process. High emotional intelligence fosters empathy and understanding, making it easier for learners to collaborate effectively with others. Group activities and language exchanges are richer and more productive environments for those with high EI, as they can forge connections that enhance learning. [3] Such collaborative efforts do not only practice language skills but also contribute to social bonding and emotional support, further promoting a positive attitude towards language learning. Social dynamics play a crucial role in shaping the collaborative learning experience, as they influence how individuals interact, communicate, and build relationships within a group. When learners engage in collaborative activities, the social norms and group cohesion can significantly enhance motivation and participation, leading to deeper understanding and retention of knowledge. Effective collaboration requires not only sharing information but also developing trust and mutual respect among peers, which can be cultivated through structured group interactions and open communication. Moreover, the diverse perspectives that emerge from a socially dynamic environment encourage critical thinking and creative problem-solving, making the learning process richer and more engaging. By fostering an inclusive atmosphere that values each member's contributions, educators can harness the power of social dynamics to promote meaningful learning experiences that go beyond individual achievement.

Conclusion

The impact of emotional intelligence on second language acquisition is profound and multifaceted. From enriching motivation to facilitating communication and managing anxiety, emotional intelligence serves as a critical asset in the language learning process. As educational methodologies evolve, it is essential to consider the integration of emotional intelligence training within language education frameworks. By recognizing the interplay between emotional awareness and linguistic development, educators can create more effective and empathetic learning environments that promote success in second language acquisition.

References

1. Goleman, D. (1995). *Emotional Intelligence: Why It Can Matter More Than IQ*. Bantam Books, New York
2. Thao Le, Thuy Trut Pham (2023) *Impacts of Emotional Intelligence on Second Language Acquisition: English- Major Students' Perspectives*, Chan ho University, Vietnam
3. https://www.routledge.com/The-Psychology-of-the-Language-Learner-Individual-Differences-in-Second-Language-Acquisition/Dornyei/p/book/9780805860184?srsId=AfmBOorb_fABL1qILNdG9BybH02cB3KTRXGSSbYt3sqKRI-l6VjccAHs

THE INFLUENCE OF DIGITAL PLATFORMS ON CRITICAL THINKING DEVELOPMENT: INTEGRATING TELEGRAM INTO LESSONS

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Abstract

The integration of digital platforms into education has transformed traditional teaching methods, offering new ways to engage students and foster critical thinking. This study examines the influence of digital platforms, specifically Telegram, on the development of students' critical thinking skills. Telegram, a widely used messaging platform, offers a range of interactive features that can facilitate active engagement and collaboration among students. By incorporating group discussions, polls, quizzes, and chatbot integration, Telegram creates opportunities for students to interact with one another and reflect on complex issues, promoting independent inquiry and problem-solving. Telegram's features allow for continuous, dynamic interaction beyond the classroom, enabling educators to create learning environments that encourage students to analyze diverse viewpoints, evaluate information critically, and construct well-reasoned arguments. The platform's multimedia capabilities, including the use of images, videos, and audio, enhance its pedagogical effectiveness by supporting varied learning styles and providing different forms of content that challenge students to think critically. Through polls and quizzes, students are prompted to make quick decisions, fostering critical thinking and the ability to justify their choices. Chatbots also provide tailored tasks or feedbacks that encourage deeper reflection on course materials, supporting individualized learning. One of the key advantages of using Telegram in education is its accessibility. As a mobile-friendly platform, it allows students to engage with content at their own pace, facilitating learning outside of formal class hours. This flexibility promotes continuous learning and critical thinking, helping students develop skills necessary for independent learning and inquiry. Moreover, the platform encourages peer collaboration, where students can debate and share ideas, thereby broadening their perspectives. This article highlights the pedagogical implications of using Telegram in education and outlines best practices for integrating the platform into teaching strategies. It suggests that when used effectively, Telegram can significantly enhance students' critical thinking abilities by fostering an environment that promotes reflection, analysis, and dialogue. The findings underscore the potential of digital platforms like Telegram to support the development of essential cognitive skills in contemporary education.

Keywords: Telegram, Critical thinking, digital platforms, blended learning.

INTRODUCTION

Critical thinking is considered one of the most important skills needed by modern world. This ability includes the ability to achieve academic success as well as basic requirements for employment. The reason for this is that hiring a person with well-developed critical thinking will allow the company to move forward, develop and achieve its goals [1]. Considering that the current 21st century is the time when all technologies have reached their peak, the emergence of various digital platforms has created various favorable conditions for people. According to the study, using various platforms as learning tools helps develop critical thinking. This holistic approach, using digital technology and communication as a modern tool in education, promotes comprehensive and self-development of students.

The introduction of various digital educational platforms into the educational process has made a great contribution to the formation of competitive individuals and specialists, especially the younger generation. In the learning process, it is important to use not only educational social platforms, but also various popular social platforms. One of them is the Telegram platform. At first glance, this platform may appear to be a simple communication tool, but it also serves as an educational platform. Telegram is a familiar tool that is often used in daily life when people use it to communicate or communicate with each other. However, it is known that people can open learning channels in Telegram. Telegram currently has a large number of language teaching channels. Since practice is the most important part

of learning a language, many language learners are lazy in mastering it. And the various features of Telegram can play an important role for language learners and improve their knowledge. The main goal of this research is to improve the development of students' critical thinking using Telegram platform in the field of education.

Theoretical framework critical thinking in the digital age

If we look at the history of critical thinking, we see that critical thinking mainly comes from two important disciplines. One of them is psychology and philosophy. It also influenced the formation of critical thinking in education. From these three subjects the foundation of critical thinking was laid [2]. The concept of critical thinking in John Dewey's writings is called reflective thinking. He said that critical thinking is the study of what a person believes and why he believes it. Another remarkable development in history was that in the 1930s, schools participating in the Eight Year Study of the Association for Progressive Education adopted critical thinking as their goal. They attempted to achieve this goal by organizing trials. In 1941, Glazer administered tests of critical thinking to high school students. Similarly, Bloom presented his taxonomy, showing six levels that allow students to develop their bottom-up thinking skills. And Robert H. Ennis dedicated his life to the study of critical thinking and said, "Critical thinking is intelligent, reflective thinking focused on deciding what to believe or what to do"[3]. That is, the ability to think critically is a process that is applied in practice. Ennis identified the skills associated with critical thinking: viewing a problem from a holistic perspective, identifying criteria for evaluating solutions to that problem, proposing alternative solutions, considering the entire situation before making a decision, and monitoring its implementation.

Since different scientists have expressed their opinions about critical thinking, it is difficult to give an exact definition. Bailyn and other scientists have shown that the characteristics of critical thinking vary. According to the research of these scientists, a person believes in the world he wants to believe in and tries to define it, and in the process of thinking, thinks in accordance with certain standards or requirements. There must be a sufficient level of the thinking process. Researchers describe critical thinking in different ways, for example, Dewey believed that a person develops critical thinking based on his observations and experiences. Critical thinking is considered a target program in the learning process. The main goal is to teach students to understand the standards and criteria inherent in critical thinking and be able to apply them in practice [4].

Digital Platforms as Tools for Cognitive Development

The changes and innovations taking place in the world have brought about changes in the field of education. The field of education has changed and the requirements have changed. Society is recognizing the need for new skills in workers, including critical thinking and problem-solving skills. In this regard, a new paradigm of education is being developed that prepares qualified workers who are able to solve the complex problems of the future. Based on this, a new type of blended learning has emerged. The type of learning that combines online and face-to-face learning has gained popularity. In addition, the onset of the pandemic has led to a shift to online learning and has influenced the development of various digital tools. Various tools that have emerged due to the development of technology allow for interesting and innovative lessons. Since traditional learning is a monotonous form of education, it can lead to loss of interest among students, and is also characterized by the ability to quickly assess the material. However, this does not mean that traditional learning is invalid. Because each type of learning has its own characteristics and place. And since digital learning is in demand today, its use in the educational process is effective [5].

Digital platforms have emerged as essential tools in contemporary education, offering dynamic and versatile environments that enhance the teaching and learning experience. These platforms enable educators to communicate with students in real time, distribute educational resources efficiently, assess student performance, and encourage collaboration both inside and outside the classroom. With the growing need for flexible and inclusive education, especially after the shift caused by the COVID-19 pandemic, digital tools have proven to be more than supplementary—they are central to modern pedagogy [6].

One of the key strengths of digital platforms is their capacity to support multiple forms of content delivery. Whether through text, audio, video, or interactive elements, educators can design lessons that cater to various learning styles and needs. Platforms such as Google Classroom, Moodle, Microsoft Teams, and Telegram allow educators to share learning materials, assign tasks, and track student progress, all within a centralized digital space [7]. This not only improves access to information but also promotes learner autonomy, as students can review materials at their own pace.

Moreover, digital platforms serve as powerful tools for fostering communication and collaboration. Features such as group chats, forums, and video conferencing create opportunities for peer interaction, discussion, and cooperative learning. These tools simulate the social elements of traditional classrooms, allowing students to engage in debate, problem-solving, and group projects that build critical thinking and teamwork skills [8]. Educators can also use built-in tools like quizzes, surveys, and polls to assess understanding and encourage reflection. The integration of artificial intelligence (AI) and automation further enhances the potential of digital platforms. Chatbots, analytics dashboards, and automated feedback systems help personalize the learning experience and provide timely support to students. This kind of responsive design can significantly increase learner motivation and achievement [9].

In sum, digital platforms act as transformative tools that extend the boundaries of traditional education. By supporting differentiated instruction, enabling real-time interaction, and providing scalable access to educational content, they empower both teachers and students in the learning process. Their continued evolution will likely shape the future of education in increasingly innovative and inclusive ways.

Telegram as an Educational Environment

In recent years, Telegram has shifted from a simple messaging application into a versatile digital platform that can serve as an effective educational environment. Its structure and features support a wide range of teaching and learning formats, making it especially appealing to educators looking for flexible and modern approaches to communication and content delivery [7]. Unlike many traditional tools, Telegram provides instant access to educational materials, live discussions, and teacher-student interaction, all within a single, user-friendly interface [10].

One of Telegram's key strengths lies in its group chats and channels. Educators can use these features to organize online classes, post assignments, and conduct discussions. Channels are especially useful for delivering lectures and distributing resources to large groups of students, as only administrators can post messages, ensuring content remains organized and distraction-free. Group chats, on the other hand, allow for real-time interaction, enabling students to ask questions, share opinions, and collaborate on tasks [8].

Another unique aspect of Telegram is the integration of bots. These automated assistants can perform a variety of educational functions, such as administering quizzes, sending vocabulary reminders, or helping learners track their progress. Teachers can customize bots to suit specific subjects or skill levels, making the learning experience more personalized and interactive [9].

Telegram also supports a wide variety of multimedia formats, allowing teachers to share PDFs, images, videos, audio recordings, and external links. This multimedia flexibility is ideal for language learning, science demonstrations, flipped classroom models, and more. With the ability to pin messages, educators can highlight important information such as deadlines, links to reading materials, or Zoom meeting invitations [11].

One of the most practical features of Telegram is the scheduling of posts. Teachers can prepare content in advance and schedule it to be sent at specific times, which is particularly useful for managing lessons across different time zones or maintaining consistency in online courses [9]. This also helps students stay on track, as they receive learning materials and reminders regularly, even outside of typical school hours.

Telegram's commitment to privacy and security is another factor that supports its use in education. With options to hide phone numbers, control group membership, and manage who can message or add users, educators can create a safe and respectful learning environment. Additionally, the ability to access Telegram from various devices—phones, tablets, or desktops—ensures learners can stay connected regardless of their location or technology access [11].

Overall, Telegram's diverse features make it a powerful and accessible tool for creating a dynamic educational space. It fosters communication, collaboration, and creativity while supporting a wide range of teaching strategies. As educational needs continue to evolve in the digital age, Telegram offers practical solutions that meet both teacher and student demands for effective, flexible, and engaging learning experiences.

Conclusion

The integration of digital platforms into education has significantly transformed the ways in which students acquire knowledge, interact with information, and develop essential cognitive skills. Among these platforms, Telegram stands out as a flexible and accessible tool that not only facilitates communication and resource sharing but also actively supports the development of critical thinking. Through collaborative discussions, instant feedback, multimedia resources, and the ability to engage with information from multiple perspectives, Telegram enables learners to think analytically, reflectively, and

independently. As education continues to shift toward more interactive and student-centered models, digital platforms like Telegram will remain vital in nurturing thoughtful, curious, and critically engaged learners. Embracing these tools with thoughtful pedagogical strategies ensures that technology enhances—not replaces—the intellectual depth and human connection at the heart of effective education.

References

1. Stupple, E. J. N., Maratos, F. A., Elander, J., Hunt, T. E., Cheung, K. Y. F., & Aubeeluck, A. V. (2016). Development of the Critical Thinking Toolkit (CriTT): A measure of student attitudes and beliefs about critical thinking. *Procedia - Social and Behavioral Sciences*, 217, 1057–1064. <https://doi.org/10.1016/j.sbspro.2016.02.184>
2. Lai, E. R. (2011). Critical Thinking: A Literature Review Research Report. *The Critical Thinking Community*. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=b42cffa5a2ad63a31fcf99869e7cb8ef72b44374>
3. ACER. (n.d.). Critical thinking: Skill development framework (2nd ed.). Retrieved from [https://research.acer.edu.au/cgi/viewcontent.cgi?params=/context/ar_misc/article/1042/&path_info=Critical thinking Skill development framework 2ndEd.pdf](https://research.acer.edu.au/cgi/viewcontent.cgi?params=/context/ar_misc/article/1042/&path_info=Critical%20thinking%20Skill%20development%20framework%202nd%20Ed.pdf)
4. Hurd, P. D. (2020). Critical Thinking. *The Stanford Encyclopedia of Philosophy*. <https://plato.stanford.edu/entries/critical-thinking/?fbclid=IwAR3qb0fbDRba0y17zj7xEfO79o1erD-h9a-VHDebal73R1avtCQCNRFDwK8>
5. Academia.edu. (n.d.). Critical Thinking and Problem Solving. Retrieved from <https://www.academia.edu/download/103875578/679.pdf>
6. Al-Qaysi, N., Mohd, S., Al-Emran, M., & Shaalan, K. (2020). Mobile learning adoption in the Middle East: A systematic review of the past decade. *Education and Information Technologies*, 25(5), 4005–4031. <https://doi.org/10.1007/s10639-020-10100->
7. Sobaih, A. E. E., Hasanein, A. M., & Abu Elnasr, E. A. (2022). Responses to COVID-19 in higher education: Students' learning experience using Microsoft Teams and Zoom. *Sustainability*, 14(2), 735. <https://doi.org/10.3390/su14020735>
8. Manca, S., & Ranieri, M. (2016). Is Facebook still a suitable technology-enhanced learning environment? An updated critical review of the literature from 2012 to 2015. *Journal of Computer Assisted Learning*, 32(6), 503–528. <https://doi.org/10.1111/jcal.12154>
9. Sari, A. R., & Wahyudin, A. Y. (2019). Telegram-based online discussion and students' critical thinking skills in argumentation. *Indonesian Journal of Informatics Education*, 3(2), 115–122. <https://doi.org/10.20961/ijie.v3i2.36245>
10. Rafiq, M., Fatima, R., Siddique, N., & Warraich, N. F. (2021). Impact of Telegram on students' academic performance: A case of higher education institutions in Pakistan. *Library Philosophy and Practice*, 2021, Article 5339. <https://digitalcommons.unl.edu/libphilprac/5339>
11. Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, 15(1), 3–8. <https://doi.org/10.1016/j.iheduc.2011.06.002>

WAYS OF DETERMINING THE EFFECTIVENESS OF ONLINE EDUCATION USING THE METAANALYSIS METHOD

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Abstract

This study aims to determine the implementation of online learning on the quality and effectiveness of distance learning. The method in this study uses meta-analysis which is carried out by examining the relevant research results with research variables from various research articles. This meta-analysis was carried out on 60 research articles that examine online learning. Analysis of the data used in this meta-analysis research uses quantitative methods to determine meta-analysis data in the form of numbers and uses qualitative data to describe the relevant research findings. The results of this meta-analysis research show that the effectiveness of online learning is still lacking when compared to classical or face-to-face learning. The effectiveness of online learning is influenced by several factors, including the quality of teachers in making online learning materials and compiling online learning guidelines, tools used in online learning such as electronic media and internet network support, and student behavior in implementing online learning.

Keywords: online learning, meta-analysis, face-to-face learning, electronic media, distance learning, research results, quantitative methods

Introduction

Online learning is one of the fastest growing trends in educational uses

of technology. Critical thinking in foreign language learning involves the ability to interpret, analyze, and evaluate language in a way that goes beyond rote memorization. Learners are encouraged to consider context, cultural differences, and the various meanings a word or phrase can carry. They are also asked to solve problems, make decisions, and adapt language use to suit different communicative situations. This deeper level of thinking is essential for achieving fluency and accuracy in language use, as well as for understanding the cultural contexts in which the language is spoken.

Research has shown that students who engage in critical thinking during language learning are better at understanding grammar and vocabulary in context, making judgments about language use, and using the language for practical purposes (e.g., communication, negotiation, persuasion). PBL is particularly effective in promoting these higher-order thinking skills, as it challenges students to work through complex issues, gather and evaluate information, and collaborate with others in a language-rich environment.

Materials and methods

Students represent and defend the product and result obtained during the project activity; prove the necessary characteristics of the product obtained, show its advantage, social significance, benefit to themselves and others; represent those who helped in achieving the planned; answer questions from those present at the presentation.

Theme 1: Films

Task 1: Home of Movie History

In the hills above Los Angeles, you can see an image that is familiar to millions: tall, white letters spelling "HOLLYWOOD." It is a famous symbol of the world's movie capital. However, Hollywood wasn't always so well known. In 1853, only a single mud hut stood there. Two decades later, the area just west of Los Angeles was a farming community. It wasn't until the early 1900s that the film industry arrived and changed Hollywood forever.

*In film's early days, most movies were made in New Jersey on the US east coast. However, bad weather and limited sunlight made making movies there difficult. Added to this was the fact that Thomas Edison had patents in the east on most filmmaking technology, and getting permission to use it was expensive. In the west, however, these patents were rarely obeyed. In 1910, director D.W. Griffith arrived in Los Angeles to film the short movie *In Old California*. He loved filming there and quickly spread the*

word of this great location. Cecil B. DeMille, one of the all-time greatest directors, filmed *The Squaw Man* in Hollywood in 1914. It was the west coast's first full-length movie, a huge success, and the reason why the film industry never left California again[1]

1. What is the famous symbol of the world's movie capital?
2. Where were made most movies?
3. When did director D.W. Griffith arrive in Los Angeles?
4. What did Cecil B. DeMille film in Hollywood in 1914?
5. Why the film industry never left California again?

Read the text and answer the questions

Film provides authentic and varied language

Another benefit of using film is that it provides a source of authentic and varied language. Film provides students with examples of English used in 'real' situations outside the classroom, particularly interactive language – the language of real-life conversation. Film exposes students to natural expressions and the natural flow of speech. If they are not living in an English-speaking environment, perhaps only film and television can provide learners with this real-life language input.

The visuality of film makes it an invaluable language teaching tool, enabling learners to understand more by interpreting the language in a full visual context. Film assists the learners' comprehension by enabling them to listen to language exchanges and see such visual supports as facial expressions and gestures simultaneously. These visual clues support the verbal message and provide a focus of attention. Film can bring variety and flexibility to the language classroom by extending the range of teaching techniques and resources, helping students to develop all four communicative skills. For example, a whole film or sequence can be used to summarize listening and reading, and as a model for speaking and writing. Film can also act as a springboard for follow-up tasks such as discussions, debates on social issues, role plays, reconstructing a dialogue or summarizing. It is also possible to bring further variety to the language learning classroom by screening different types of film: feature-length films, short sequences of films, short films, and adverts.

1. What are the benefits of watching film?
2. What does interactive language mean?
3. What do you understand by facial expressions and gestures?
4. What does the word "springboard" mean?
4. Discuss the advantages of watching films.

<https://www.britishcouncil.org/voices-magazine/how-can-film-help-you-teach-or-learn-english>

READING

What is E-Learning?

Did you know that almost everyone who uses a computer has completed some type of e-learning? Perhaps it was called web-based training, or online learning, or computer-based training, but it's all under the same e-learning umbrella. E-learning can encompass a wide variety of online initiatives. So a good, broad way to think about e-learning is as the use of electronic media (computers, tablets, or phones) to educate or train learners.

This article will focus on e-learning in terms of course development and content authoring, and then explore what it is, why we use it, how it's evolved, and much more. So if you're interested in finding out more about e-learning in general, you've come to the right place. Read on!

E-Learning heroes, 2016.

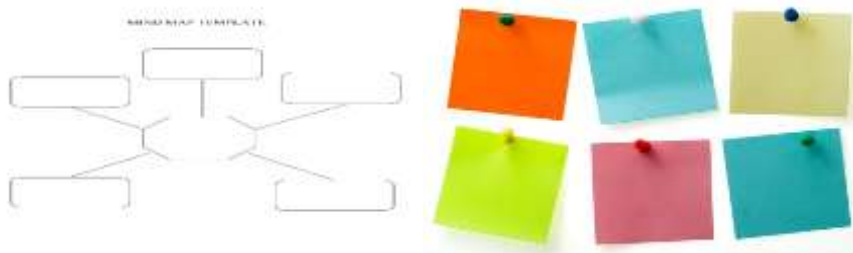
WRITING

Write an essay (in 250 words) on the following topic.

"Teaching in the Internet age means we must teach tomorrow's skills today." - Jennifer Fleming

Give the examples of the skills that might be useful for tomorrow.

Make a mind map on the elements of online learning in groups.



Google, Mind Map, 2024

Dwell on the following questions and comment on them.

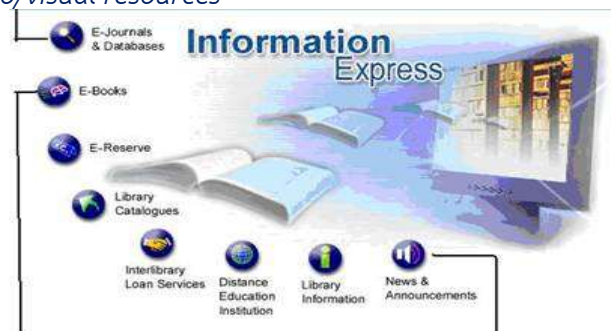
- ✓ *Where is the demand for distance-learning come from?*
- ✓ *What are the reasons of people who choose different forms of online education?*

Study the list of the electronic resources and answer the following questions.

- ✓ *Have ever used any of them? If yes, what were your purposes?*
- ✓ *What type of resources would you like to use in the future and why?*
- ✓ *Which is the appropriate resource for searching language materials?*

Some of the most frequently encountered types are:

- ✓ *E-journals*
- ✓ *E-books*
- ✓ *Full-text (aggregated) databases*
- ✓ *Indexing and abstracting databases*
- ✓ *Reference databases (biographies, dictionaries, directories, encyclopaedias, etc.)*
- ✓ *Numeric and statistical databases*
- ✓ *E-images • E-audio/visual resources*



<http://www.testyourenglish.net/english-online/grammarquiz/ifsquiz.html>

- ✓ *What e-books have you read? (If you have not read what e-books would you like to read?)*
- ✓ *What are the news and announcements do you read online? Why? Why not?*

Reading

Recently, innovative teaching has been viewed as a constructivist, social-constructivist, and student-centered process whereby students should be active learners in a supportive environment, engaging in authentic and relatable problem-solving activities to stimulate learning (Brandon, 2004). Ferrari, Cachia, and Punie (2009) expanded the definition of innovation by suggesting that it involves creative teaching that fosters students' creative potential. Indeed, Zhu et al. (2013) suggested that innovative teaching also requires four competencies: learning, social, educational, and technological. Respectively, these competencies hold within a willingness and readiness to learn, communication with students from different backgrounds, passion and knowledge ability, and a use of technology to further student understanding.

Answer the questions

1. *What involves creative teaching?*
2. *What four competencies does innovative teaching require?*
3. *What does the term "willingness and readiness to learn" mean?*
4. *What does "student-centered process" mean?*

1. Discuss the following topics in pairs.

Write an essay on the statement: "Studying foreign languages should start in the kindergarten".

The Problem of Upbringing

Speaking

1. *Speak on the problems illustrated in the images below*



Google Images

Group work

Brainstorm the problems related with children in groups of 2-3 and then exchange your answers

**Google Brainstorming****Work with vocabulary**

Withdrawal - the act of taking back or away something that has been granted or possessed

Selfishness – the quality or state of being selfish

Violent behavior – marked by the use of usually harmful or destructive physical force

Loneliness- producing a feeling of bleakness or desolation

Disruptive behavior - disrupting or tending to disrupt some proces

Recklessness - marked by lack of proper caution : careless of consequences

Bullying - abuse and mistreatment of someone vulnerable by someone

Learning disorders - to disturb the regular or normal functions of

Unstable- not stable : not firm or fixed : not constant:

Conclusion

The problem situation is a necessary condition for the formation and development of foreign language speech activity and speech thinking, since it is probabilistic in nature and requires flexible, non-standard use of language tools. The very educational activity is filled for the student, personal meaning turns out to be "humanized", humanistically oriented. It should be remembered that the concepts "task" and "problem" are often mixed or used as equivalent.

The model is presented on the basis of a conceptual and methodological platform of foreign language education, taking into account the socio-psychological, communicative-functional and psychological-linguistic features of intercultural and communicative competence.

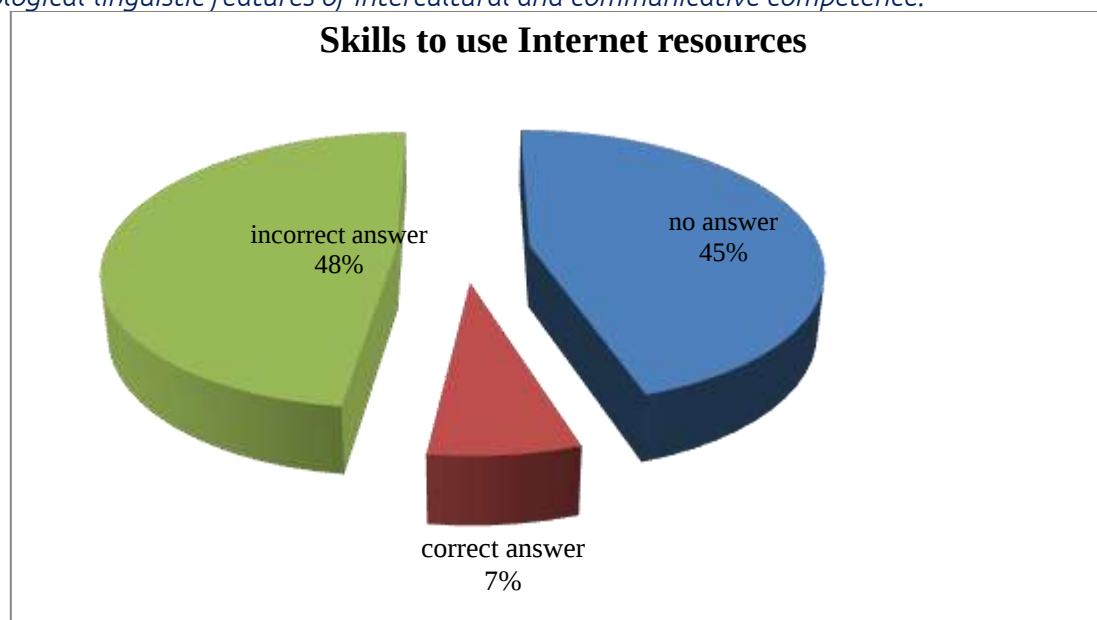
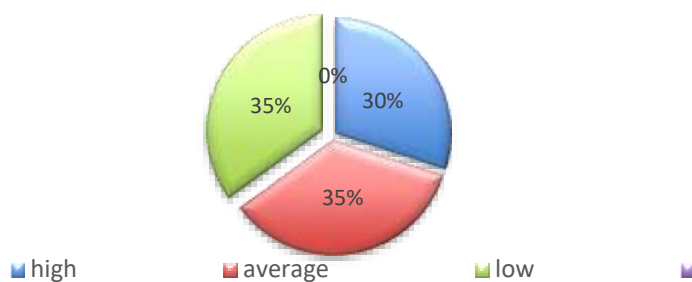


Diagram 1-Results of evaluating the quality of students ' responses to questions that test their ability to work with Internet resources

The data obtained during the experiment showed that, despite the students ' ideas about Internet-resources, most of them do not read, do not show creative activity, and do not have a proper system of knowledge about the possibilities of Internet-resources for the development of language skills and listening skills in a foreign language. The generalized results of the experiment are presented diagram 2. A total of 26 students took part in the study.

Before an experiment



After an experiment

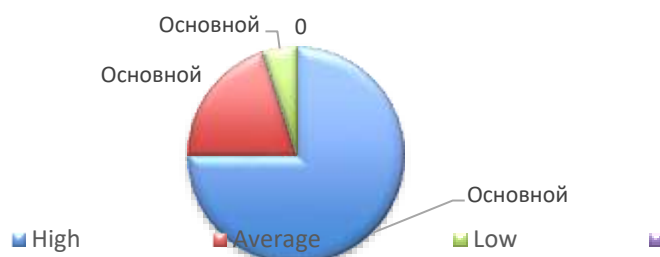


Diagram 2 - The generalized results of the experiment

Conclusion

The diagram shows that the initial level of readiness of students to work with Internet-resources is quite average. The data obtained during the experiment convinced us of the correctness of the initial provisions of the study and led to the need for scientific justification and meaningful development of a model for the formation of modern methods of teaching English based on Internet-resources.

References

1. Anderson, L. W., & Krathwohl, D. R. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman.
2. Beckett, G. H. (2006). *Project-Based Language Learning: An Introduction*. In G. H. Beckett & P. S. Slater (Eds.), *Project-Based Second and Foreign Language Education: Past, Present, and Future* (pp. 7-24). Information Age Publishing.
3. Dooly, M. (2008). *The Role of Online Project-Based Learning in Developing Critical Thinking Skills in EFL Classrooms*. *Language Learning & Technology*, 12(2), 100-118.
4. Krajcik, J. S., & Blumenfeld, P. C. (2006). *Project-Based Learning*. In R. K. M. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 317-334). Cambridge University Press.
5. Lam, A. (2000). *Language Learning through Projects in the ESL Classroom: A Study of Three Projects*. *System*, 28(4), 475-488.
6. Larsen-Freeman, D. (2000). *Techniques and Principles in Language Teaching* (2nd ed.). Oxford University Press
7. Thomas, J. W. (2000). *A Review of Research on Project-Based Learning*.

INTEGRATING PROJECT-BASED LEARNING INTO AGRICULTURAL MACHINERY EDUCATION: NECESSITY, FOUNDATIONS, AND APPLICATIONS IN UZBEK HIGHER EDUCATION

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Abstract

This paper is devoted to the project-based learning (PBL) approach in Agricultural Machinery specifically in theory and practice in the sphere of Uzbek higher education. According to recent global and regional studies, this kind of methodology enhances student engagement, develops practical skills, and aligns educational practice with labor market requirements. Qualitative methodology was used to describe the theoretical background, international case studies, and national reforms in Uzbekistan. In conclusion, the findings favor such an integration since PBL is an effective teaching tool for technical subjects and is a central method to be used in the modernization of agricultural engineering education.

Keywords: *Project-Based Learning, Agricultural Machinery, Technical Pedagogy, Higher Education, Uzbekistan, Vocational Skills*

1. Introduction

Agricultural education is bound to change, because new technologies will develop with increasingly complex machines. Score the integration of digital technologies into systems, with agriculture, however the situation is sometimes very grim in Uzbekistan, like agriculture itself. Relevant modern students are those who have acquired intensive practice along with theory. The common mode of preparation hardly prepares the learner for such eventualities. It has been very effective for active learning and technical competence at vocational and higher levels with regard to Project-Based Learning (PBL) (Tobias et al., 2021; Flores et al., 2023).

Project-Based Learning stems from a constructivist learning approach and focuses on problem-solving, teamwork, and the real application of knowledge to real life. It shows its relevance in all disciplines, especially with STEM and engineering education (Han et al, 2020). This article examines how school teachers can best use PBL in teaching Agricultural Machinery in Uzbekistan from its theoretical foundations to its practical implementation, and even its significance within national education reforms.

2. Methods

This study employs a qualitative-descriptive design, based on analysis of documents and review of the literature. The methods consist of:

- A review of scholarly articles and publications from 2020 to 2024 on project-based learning (PBL) in technical and agricultural education;*
- An analysis of Uzbek national education policies and strategies, including PQ-2909 (2017) and the Strategy for Innovative Development;*
- Review of international case studies of university-based education in European and Asian agricultural universities;*
- Situating the findings in relation to the Uzbek higher educational system and in particular institutions offering agricultural engineering.*

Sources were selected on the basis of their academic relevance, topicality, and concern with constructivist approaches, curricular innovation, and vocational training.

3. Results

The analysis has brought the following salient findings:

3.1 Theoretical Justification for PBL in Agricultural Education

PBL has its roots in constructivist and experiential learning theories (Dewey and Vygotsky), which talk about doing and socially collaborative learning. The literature has demonstrably pointed to the enhancement of problem-solving skills, technical ability, and student autonomy since then (Flores et al., 2023; Rizvi & Rienties, 2023).

3.2 Relevance in the Uzbek Context

Uzbekistan is in the process of reforming its higher education toward competence-based learning, novel ways of teaching, and closely aligning with labor-market needs. PBL has therefore a place straight in these reforms as it promotes independent learning and practice-based pedagogy.

3.3 Examples of Effective PBL Applications

Work packages such as designing machinery, diagnostic simulations, and sustainability checks pose applications in real-world settings. These strengthen learning retention and readiness for the field (Chua et al., 2021; Shin et al., 2022).

3.4 Benefits Observed

Besides international surveys, the pilot implementation reported such outcomes as:

- Increased student motivation and engagement;
- Improved collaboration and communication skills;
- Stronger link between education and real-life agricultural needs;
- Employment and entrepreneurial mindsets.

4. Discussion

From here, the evidence keeps piling up, that PBL is a powerful strategy for technical and vocational education. The typical systematic challenges in Uzbekistan-human theory and practice, innovation, and responsiveness to industry are definitely addressed using PBL. In addition to that, PBL also exists on students' learning which is a priority in current government policies and university curricula.

Integrating PBL into agricultural machinery classes can help: preparing for a job-ready graduate characteristic with some technical skills and soft skills; bringing universities together with the farms; and new interdisciplinary learning that blurs the lines of mechanics, environmental science, and IT. Successful implementation would require: teacher training in facilitation and assessment; institutional support for project materials, laboratories, and partnerships; and a curriculum overhaul to incorporate long-term project work and outcome-based assessments.

5. Conclusion

Project-Based Learning for teaching Agricultural Machinery in higher education was found to be both necessary and theoretically justified by this study. It would enhance student engagement and partaking competence and support the national education reform. PBL: Uzbekistan keeps modernizing its agriculture as well as its education systems. So, learning PBL is an important bridge between learning and industry demands. More research should include empirical case studies and pilot programs in several techno-universities in Uzbekistan as an evaluation of long-term impacts.

References

1. Chua, A. L., Tan, K. W., & Tan, L. H. (2021). Enhancing Mechanical Engineering Education with Project-Based Learning. *International Journal of Engineering Pedagogy*, 11(3), 15–28. <https://doi.org/10.3991/ijep.v11i3.23089>
2. Flores, M., Gómez-Torres, M. J., & Cano, E. (2023). The Impact of Project-Based Learning on Student Engagement in Technical Education. *Education Sciences*, 13(2), 120. <https://doi.org/10.3390/educsci13020120>
3. Han, S., Capraro, R., & Capraro, M. M. (2020). STEM Project-Based Learning in High-Need Education Contexts. *International Journal of STEM Education*, 7(1), 6. <https://doi.org/10.1186/s40594-020-00207-4>
4. Masek, A., Azahari, M. H., & Yamin, S. (2021). Developing Employability Skills through Project-Based Learning. *Journal of Technical Education and Training*, 13(1), 85–94. <https://doi.org/10.30880/jtet.2021.13.01.010>
5. Novak, M., Kobulsky, J., & Brdárská, E. (2022). Teacher Preparation for PBL in Technical Universities. *Journal of Engineering Education*, 111(4), 905–921. <https://doi.org/10.1002/jee.20447>
6. Rizvi, S., & Rienties, B. (2023). Influence of PBL on Technical Knowledge Retention. *Teaching in Higher Education*, 28(1), 34–51. <https://doi.org/10.1080/13562517.2022.2034453>
7. Sánchez-Cabrero, R., Álvarez, F. D., & Martínez, R. (2022). Aligning Vocational Training with Industry 4.0. *Journal of Vocational Education & Training*, 74(2), 291–309. <https://doi.org/10.1080/13636820.2021.1873035>
8. Shin, J., Lee, H., & Kim, D. (2022). Hybrid PBL Strategies in Agricultural Engineering Education. *Journal of Agricultural Education and Extension*, 28(3), 243–260. <https://doi.org/10.1080/1389224X.2022.2046481>
9. Tobias, S., Valencia, J. A., & Hartmann, T. (2021). Bringing Real-World Engineering into the Classroom. *European Journal of Engineering Education*, 46(5), 713–730. <https://doi.org/10.1080/03043797.2021.1889481>

THE ROLE OF MULTIMEDIA TECHNOLOGIES IN DEVELOPING COMMUNICATIVE COMPETENCE: A FOCUS ON ELEMENTARY-LEVEL FOREIGN LANGUAGE LEARNERS

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Abstract

In our rapidly evolving world, where communication skills are vital, the enhancement of English-speaking proficiency among elementary school students has gained paramount importance. This article delves into the implementation of multimedia technologies as a means to enhance communicative competence. It explores the challenges and opportunities presented by multimedia in the context of elementary education, shedding light on its potential to foster effective communication. The article emphasizes the role of multimedia in promoting interactive language learning, reducing language anxiety, and preparing students for real-world language use. It concludes that integrating multimedia technologies is a pivotal strategy to enhance the English-speaking abilities of elementary school students.

Keywords: multimedia technologies, English speaking skills, elementary school students, language proficiency, interactive learning, language anxiety, communication skills.

In today's interconnected world, English language proficiency stands as a gateway to education, career opportunities, and global communication. English, as the global lingua franca, plays a pivotal role in facilitating cross-cultural exchanges, and the ability to speak it fluently is an indispensable asset in our contemporary society. However, elementary school students often grapple with the formidable challenge of developing their English-speaking skills. Conventional teaching methods, characterized by monotony and uninspiring content, have left many students disengaged and unmotivated. Despite the challenges, hope is on the horizon in the form of multimedia technologies, offering a promising solution.

The global significance of English proficiency cannot be overstated. In a world where international collaboration and information exchange are the norm, English serves as the primary medium of communication. It opens doors to higher education, enriches career prospects, and allows individuals to participate actively in the global community. However, elementary school students encounter numerous challenges in developing communicative competence. Traditional teaching methods, typically characterized by mundane textbooks and uninspiring lectures, often fail to ignite students' enthusiasm and motivation. This disengagement results in students viewing the process of learning to speak English with apathy and resistance, making the task even more daunting.

Moreover, conventional classrooms frequently suffer from overcrowding, which can significantly limit opportunities for students to practice speaking. Language acquisition is most effective when students have ample opportunities for real-life conversations. However, overcrowded classrooms can hinder this essential practice. The challenges are further exacerbated by disparities in technology access among students. While some students may have easy access to multimedia resources and the internet, others lack these essential tools. This digital divide not only deepens educational inequalities but also hampers the effectiveness of multimedia resources. To address these challenges, educators and researchers have turned to technology, particularly multimedia technologies, as a beacon of hope. Multimedia technologies encompass a broad spectrum of digital tools and resources, including interactive software, language learning applications, and online platforms that incorporate audio, video, and interactive elements. These innovative technologies offer a new paradigm in language education that is engaging, effective, and adaptable.

Elementary school students encounter a host of specific challenges when striving to enhance their communicative competence. One of the primary obstacles is the dearth of motivation and engagement. Traditional teaching methods, which often emphasize passive listening and rote memorization, can fall short of inspiring students. Consequently, many students disengage from the learning process and may even develop a negative attitude towards acquiring English speaking skills. Furthermore, the

conventional classroom environment, characterized by large student-to-teacher ratios, often restricts opportunities for students to practice speaking. Effective language acquisition requires practical application, and in crowded classrooms, not all students receive adequate speaking practice opportunities, impeding their progress.

Moreover, disparities in technology access among students can exacerbate these challenges. While some students may have access to multimedia resources and the internet at home, others are left without these vital tools. This digital divide threatens to deepen educational inequalities, as students with limited access to technology miss out on the benefits of multimedia resources. To effectively address these challenges and unlock the full potential of multimedia technologies in elementary school language education, a paradigm shift is required. It necessitates a pedagogical perspective that ensures multimedia resources genuinely contribute to language learning without creating distractions.

Beatty (2003) emphasizes the capacity of multimedia technologies to capture students' interests and enhance their motivation [1]. Traditional methods of language instruction often involve lengthy lectures and repetitive exercises that do little to inspire learners. In contrast, multimedia resources harness visual and auditory elements, interactive exercises, and authentic real-world applications to create a dynamic and engaging learning environment.

Research substantiates the significant motivational impact of multimedia technologies [1, p. 56]. This motivation is a natural consequence of the enjoyable aspects of multimedia language resources, which often feature interactive language games, authentic video clips, and culturally rich content. When students find learning enjoyable and engaging, they invest greater time and effort in developing their communicative competence, effectively overcoming the challenges inherent in language acquisition.

Multimedia materials that integrate audio and video elements make substantial contributions to the development of listening comprehension and pronunciation. Listening comprehension is a fundamental component of language learning, as it acquaints students with the sounds, accents, and speech patterns of native speakers. Traditional listening exercises frequently lack access to authentic materials, limiting the comprehensiveness of the listening experience. Multimedia technologies proffer a vast array of authentic listening materials, including interviews, podcasts, news broadcasts, and films. These materials expose students to diverse accents and varying speaking speeds, effectively preparing them for real-world communication. Consistent engagement with multimedia resources equips students with the listening skills necessary to understand spoken English [2].

In addition to listening, multimedia technologies provide opportunities for students to practice and refine their pronunciation. Many multimedia language learning platforms offer pronunciation guides and interactive exercises that allow students to record their speech and receive constructive feedback. This active engagement with pronunciation constitutes a vital step in the journey toward enhancing communicative competence.

One of the distinctive advantages of multimedia technologies lies in their suitability for self-paced learning. Traditional classroom settings often require all students to progress at the same rate, regardless of individual learning strengths or weaknesses. This one-size-fits-all approach inevitably leaves some students struggling to catch up while others are held back. Multimedia resources empower students to independently improve their English-speaking abilities [3]. Students can revisit challenging concepts, replay audio or video materials, and practice speaking at their own pace. This self-guided approach aligns seamlessly with the diverse learning speeds of students, ensuring that no student is left behind and that each can advance at an optimal rate.

In the confines of overcrowded classrooms, where speaking practice opportunities may be scarce, multimedia technologies assume a supplementary role of immense importance. The challenges posed by large student-to-teacher ratios can severely limit opportunities for each student to engage in adequate speaking practice. This limitation poses a considerable obstacle to the development of English-speaking skills, as speaking fluency hinges on regular and consistent practice. Multimedia technologies provide a much-needed remedy to this challenge by furnishing additional opportunities to engage in communicative practice. Interactive language software and platforms frequently encompass speaking exercises designed for individual completion. These exercises simulate real-life conversations, affording students the means to practice speaking and respond to diverse scenarios. In this capacity, multimedia serves as a valuable supplementary resource for educators dedicated to enhancing students' speaking skills [4]. The seamless integration of multimedia resources into elementary school language education, though promising, demands careful consideration of several challenges and critical issues to ensure its utmost efficacy.

The harmonious integration of multimedia resources into language education necessitates a clear alignment with pedagogical goals. Curricula must be thoughtfully designed to effectively incorporate multimedia elements in ways that amplify language learning without causing distractions. Educators must ascertain how multimedia resources can complement and augment existing teaching methods, ensuring they remain in harmony with the curriculum's learning objectives and goals. This essential task requires meticulous planning and coordination to harness the full potential of technology in the realm of language education [5].

Ensuring equal access to multimedia resources constitutes a crucial requirement. Disparities in technology access among students can severely impact the effectiveness of multimedia-enhanced language learning. Without equal access to necessary technology, some students may be left without the advantages that these resources provide. This digital divide has the potential to exacerbate educational inequalities. Therefore, ensuring all students, regardless of their circumstances, can access technology for language learning is of paramount importance. Bridging this divide is essential to uphold the principle of equitable access and to prevent any students from being left behind [6].

To effectively navigate the evolving landscape of language education and capitalize on the benefits of multimedia technologies, educators need to adapt to technology integration. This transition necessitates comprehensive professional development programs that enhance educators' digital literacy and instructional strategies. To fully unlock the potential of multimedia technologies, educators must acquire the skills, knowledge, and confidence to integrate these tools into their teaching methods. Continuous training and professional development programs are essential components of this adaptation process. These programs should offer training in technology integration, pedagogical techniques for multimedia-enhanced learning, and strategies for optimizing the learning experience through multimedia resources. Competent and confident educators play a pivotal role in the successful integration of multimedia technologies into elementary school language education. Therefore, investing in their professional development is crucial for realizing the transformative potential of these technologies in the classroom [6, p. 316].

Overall, the ability to speak English fluently is a crucial skill for elementary school students in our interconnected world. However, conventional teaching methods often leave students disinterested and unmotivated in their pursuit of communicative competence. Overcrowded classrooms and disparities in technology access further compound these challenges. Multimedia technologies offer a promising solution, and research supports their effectiveness in enhancing motivation, engagement, listening and speaking skills, and self-paced learning. These technologies also provide vital supplementary resources in crowded classrooms.

However, successful integration comes with its own set of challenges. Multimedia resources must align with pedagogical goals to ensure they genuinely contribute to language learning. Bridging the digital divide and ensuring equal access to technology is vital to prevent inequalities among students. Finally, the professional development of educators is a critical aspect of maximizing the potential of multimedia technologies. As the role of multimedia technologies in language education continues to evolve, their potential to revolutionize the acquisition of communicative competence is undeniable, shaping a brighter future for elementary school students seeking to thrive in our interconnected world.

References

1. Abenova, A., & Seilkhanova, Z. (2018). *The Use of Multimedia Technologies in English Language Teaching: Challenges and Opportunities*. *International Journal of Instruction*, 11(4), 821-836.
2. Beatty, K. (2003). *Teaching and researching computer-assisted language learning*. Pearson Education.
3. Chapelle, C. A. (2003). *English language learning and technology: Lectures on applied linguistics in the age of information and communication technology*. John Benjamins Publishing.
4. Gerasimenko, E. N. (2019). *Multimedia technologies in teaching foreign languages at secondary school [Published in Russian]*. *Molodoy ucheny [Young Scientist]*, 27(4), 364-366.
5. Nurpeissova, A., & Saparbayeva, G. (2019). *Enhancing English Speaking Skills of Secondary School Students through Multimedia Technology: A Kazakh Educational Context*. *Journal of Educational and Instructional Studies in the World*, 9(4), 154-161.
6. Polyakova, Yu. A. (2016). *Multimedia technologies as a means of teaching English [Published in Russian]*. *Strategii obrazovaniya [Strategies of Education]*, (4), 48-52.

COMPARATIVE ANALYSIS OF EARLY INTERVENTION METHODS FOR SPEECH DEVELOPMENT DELAY: FROM THE EXPERIENCE OF KAZAKH AND CROATIAN SPECIALISTS

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Abstract

This article presents the results of research conducted during an international academic internship in Croatia. The aim of the research during the internship was to study the peculiarities of speech therapy methods used with young children who have speech development delay (SDD), to examine modern technologies and methods, basic approaches to diagnosis and correction of speech development delay, as well as to identify the main principles of organizing speech therapy work in this country. The research methodology was based on analyzing the effectiveness and efficiency assessments of the practical application of various speech therapy methods and their impact on the formation of speech skills. The issue of overcoming speech development delay is examined from organizational-pedagogical and methodological aspects, emphasizing the importance of early intervention and an individualized approach. Data on the early intervention methods used in Croatia were obtained through observation of diagnostic examinations and correctional sessions conducted by special educators and speech therapists at the Educational and Clinical Center at the Educational Rehabilitation Faculty of Zagreb University, the "Silver" Rehabilitation Center, and the Zagreb Day Center for Children and Infants "Mali dom". Interest in the experience of Croatian colleagues is justified by the fact that the periodization of early childhood coincides with that of Kazakhstan, i.e., from 0 to 3 years, whereas in other foreign countries, early childhood encompasses children from 0 to 6-7 years. The research results showed that studying and implementing foreign experience in the Kazakhstani early intervention system contributes to improving the quality and effectiveness of the pedagogical process and creates a dynamic and creative developmental environment.

Keywords: *speech therapy technologies, speech development delay, early intervention, speech correction, sensorimotor development.*

Introduction

The problem of speech development delay remains one of the most significant issues in early childhood development and requires research into various aspects of overcoming the delay or correcting speech disorders. Psychological and pedagogical support for children at an early age is highly effective, as confirmed by numerous studies. When discussing early pedagogical assistance, scientists point to timely diagnosis, the importance of involving the child's parents in the development process, and the application of the most accessible speech therapy methods. However, the question of early correction methods and their application for working with children from 2 to 3 years old is comprehensively discussed among educators and psychologists.

Modern research in neuropsychology and speech therapy confirms that early childhood (up to 3 years) is the most sensitive period for the formation of speech skills (Tomasello, 2003). The neuroplasticity of the brain at this age allows for effective compensation of speech development deficits with timely diagnosis and corrective intervention (Kuhl, 2010). Speech is the most important tool for a child's cognitive and social development. The formation of speech function occurs in stages, beginning from the first months of life, and largely depends on biological, social, and psychological factors. However, in recent years, there has been an increase in the number of children with speech development delay (SDD), which requires improvement of diagnostic and corrective approaches. In British scientists' research in the field of speech disorders, considerable attention is paid to issues such as difficulties in mastering language means in young children. Dorothy Bishop (2001) developed a system of tools for early diagnosis and organization of timely pedagogical intervention. These studies formed reliable

criteria for identifying speech development delay, contributed to the development of unified approaches to early intervention, and practical recommendations for specialists.

The problem of speech development delay in young children in France is viewed as a multifactorial issue requiring an interdisciplinary approach. Special attention is paid to early diagnosis of disorders and development of active speech, as it is precisely at the age of 2-4 years that basic speech and cognitive structures are established. The French model of corrective assistance relies on close interaction between speech therapists (orthophonistes), pediatricians, psychologists, and social workers. One of the leading specialists in speech and communication disorders in children, Laurent Danon-Boileau (2023), conducted research highlighting the importance of early detection of communication disorders. He was the first to systematically substantiate that speech development in children begins long before the appearance of first words—through bodily, emotional, and rhythmic forms of communication with adults. He emphasized the importance of affective communication, trusting relationships, and bodily interaction as the basis for initiating speech, rather than just mechanical memorization of words. The pedagogical process with young children in France is organized based on this idea (functional zones for sensory integration).

Speech development delay (SDD) in children is a pressing issue in both Kazakhstan and Croatia. Early detection and correction of SDD are crucial for successful social and educational integration of children.

In recent years, Kazakhstan has seen an increase in the number of young children with speech delay. According to the Ministry of Health, in 2022, the diagnosis of "Speech development delay" was identified in 200 more cases compared to the previous year. Specialists from the Republican Psychological-Medical-Pedagogical Commission (PMPK) have noted a trend of increasing numbers of young children with speech delay over the past two or three years. Speech therapists and other specialists working with young children attribute the rise in cases of speech development delay to a decrease in live communication within families and an increase in the time children spend with gadgets. There are also frequent cases where parents hope that the child's speech will develop independently and delay seeking specialist help (neurologist, speech therapist). Considering the sensitive period of this age, it is important to emphasize the significance of early diagnosis and timely intervention for effective correction of speech disorders.

In Croatia, the significance of the problem of speech development delay in children is also noted. Statistical data indicate the prevalence of speech development delay in the country, and therefore specialists emphasize the importance of early detection and correction of speech disorders. Croatia is known for developing the verbotonal method, created by academician Petar Guberina in the 1950s-60s in Zagreb. This method is aimed at developing auditory perception and speech correction in individuals with hearing and speech impairments. The "SUVAG" Center in Zagreb is the leading institution applying this method. In recent years, Croatia has seen a trend towards integrating digital technologies into speech therapy practice. The use of multimedia applications, software, and digital devices has become an integral part of corrective work. Specialists actively participate in international conferences and seminars, exchanging experience and implementing advanced speech therapy technologies.

Methodological Foundation of the Research

When researching the issue of speech development delay in young children, it is necessary to rely on fundamental scientific works in the fields of speech therapy, psycholinguistics, and neuropsychology, such as L.S. Vygotsky's theory of speech ontogenesis, which views speech development as a result of the interaction between biological prerequisites and social environment (Vygotsky, 2006). The scientist emphasizes that speech activity is a leading factor in cognitive development. He proved that the development of thinking and speech in a child occurs through interaction with others, and any delays in communication development can lead to deeper cognitive and social problems. Important research by A.R. Luria reveals the connection between speech function and the development of higher mental processes (Luria, 2017).

The development of speech and communication in early childhood is a crucial factor in the formation of a child's cognitive, social, and emotional skills. In this process, modern speech therapy technologies play a critical role, helping to detect and overcome speech disorders at early stages. Their timely application contributes not only to the correction of speech defects but also to the harmonious development of the child's personality.

Analysis of the Problem

Speech development delay is a disruption in the pace of speech formation, characterized by lagging behind age-appropriate norms in such parameters as limited vocabulary, difficulties in forming phrasal

speech, deficiencies in phonetic-phonemic development, and weak activity in speech interaction. According to research by A.K. Zhalmuhamedova, Ph.D., scientific researcher at the "National Scientific Center for the Development of Special and Inclusive Education," several provisions for early correctional assistance were put forward, which indicated correct diagnosis and timely correctional work as fundamental in early intervention; comprehensive support from specialists, as well as the inclusion of parents in the pedagogical process (Zhalmuhamedova, 2008).

Scientists from Abai Kazakh National Pedagogical University, Z.A. Movkebayeva and A.Y. Ermagambet (Movkebayeva, 2024), examine the problem of speech development delay in young children and emphasize the need for targeted preparation of teachers to work with this category. The authors conduct an analytical review of scientific works, identifying the main ideas for overcoming speech delay, and focus on the importance of teachers' readiness for speech therapy support of children in preschool educational organizations. They note that insufficient training of specialists can lead to ineffective corrective work and the emergence of secondary disorders. Thus, the authors conclude that systematic and targeted preparation of teachers is a key factor in the successful correction of speech disorders in young children.

The sensorimotor integration method is actively applied in Kazakhstan and several other countries. It is aimed at activating neurophysiological processes related to speech development through work with tactile and vestibular stimuli. Research shows that the application of this method helps accelerate speech development in children with speech delay and cerebral palsy.

Practicing speech therapist and special educator at the Center for Continuous and Inclusive Education "Dana bala" at the East Kazakhstan University named after S. Amanzholov, R. Baichinov, developed a unique methodology for speech development in Kazakh-speaking children with cochlear implants. As part of a project conducted since 2018, he studied the intonational structures of voice in preschool children with implants and developed 4 stages of rehabilitation: perception of sounds and speech, sound imitation, phrases, and simple sentences. The methodology is designed for children from three to seven years old and has already shown positive results: some children began speaking in sentences after two years of training, while others show interest in sounds after implant installation. This methodology has no analogues in Kazakhstan and is applied in several specialized children's organizations in the country. Thus, this methodology represents a practical guide with clear stages of rehabilitation, adapted for Kazakh-speaking children with cochlear implants. Its uniqueness and successful application in real conditions testify to its high potential. However, additional research involving a larger number of children and long-term tracking of results are necessary for wider implementation of the methodology (Baichinov, 2018).

Research by Kazakhstani scientists emphasizes the importance of early intervention for effective speech development in children with various disorders, reflects progress in the field of early speech development in Kazakhstan, highlighting the need for integration of theoretical training for specialists and the development of practical methodologies adapted to the specific needs of children.

In recent years, the early intervention system in special and inclusive education in Croatia has been actively developing, focusing on the integration of children with special educational needs into the general educational environment. Strategies include a regulatory framework that provides families and children with the opportunity to choose the most suitable form of education: in special resource centers, in special classes at general schools, or in inclusive classes of general educational institutions. Children can study according to general, combined, or individual programs, receiving special psychological and pedagogical support. One example of the successful implementation of technologies in early intervention is the use of tablets to eliminate communication barriers in children with autism spectrum disorders. In 2018, UNICEF provided training and equipment for communication using assistive means in 32 institutions in Croatia, allowing 5,000 children to improve their communication skills. Croatian scientists are actively studying the phonological structure of the language, which is directly related to speech development in children. For example, in the work "A preliminary study of Croatian Language Syllable Networks" (2014), the authors analyze syllable networks of the Croatian language, revealing their properties and structure. Such research helps to better understand the phonological features of the Croatian language, which is important for developing effective methods of teaching and correcting speech in children.

The Zagreb Day Center for Children and Infants "Mali dom" makes a significant contribution. The organizational features of the group for young children and the pedagogical process here reflect the specifics of working with children with special needs, especially those with visual, speech, motor impairments, and complex developmental delays. This institution is focused on early intervention and an

inclusive approach. Groups typically have no more than 4-6 children. Each child has an individual development program based on specialist assessment, as well as a daily routine with a predictable structure in the form of repeating rituals and visual schedules (pictograms or PECS cards). This approach ensures comprehensive impact and stimulation of psycho-speech base development (<http://erisfavia.sed.uth.gr/index.php/project-partners/mali-dom-zagreb>).

Thus, fundamental research by Croatian scientists, such as the development of the verbotonal method and analysis of the phonological structure of the language, plays a key role in understanding and supporting speech development in young children. Scientific research aimed at addressing these issues continues in Croatia, the system of personnel training is being improved, and funding mechanisms are being developed to support inclusive education. Thus, Croatia demonstrates commitment to developing the system of early intervention in special and inclusive education, combining regulatory initiatives with practical measures and scientific research to ensure quality education for all children.

Comparative analysis of modern speech therapy technologies showed the basic principles of early intervention in two countries: an interdisciplinary approach and individualization of the correctional-developmental process. Comparative analysis of speech therapy technologies used for the development of speech and communication in young children in Kazakhstan and Croatia reveals both unique approaches and common trends in this field.

Kazakhstan	Croatia
<i>Adaptation to Language Features</i>	
<i>Kazakhstani methodology is specially developed for Kazakh-speaking children, taking into account the phonetic and intonational features of the Kazakh language.</i>	<i>The verbotonal method, developed in Croatia, is initially applied to various language groups but requires adaptation to the specifics of each language.</i>
<i>Technological Approach</i>	
<i>Kazakhstani methodology is oriented towards children with cochlear implants, reflecting the integration of modern medical technologies into the rehabilitation process.</i>	<i>The Croatian verbotonal method, although it can be applied to children with implants, was initially developed for a wider audience with various types of hearing and speech impairments.</i>
<i>Staged Application</i>	
<i>Kazakhstani methodology is clearly structured into four consecutive stages, providing a systematic approach to speech development.</i>	<i>The verbotonal method also provides for step-by-step learning, but with greater emphasis on the integration of various sensory stimuli at each stage.</i>
<i>Both countries demonstrate commitment to developing effective speech therapy technologies that take into account cultural, linguistic, and technological aspects.</i>	
<i>The Kazakhstani approach emphasizes the importance of national identity and integration of modern technologies in the rehabilitation process, which is especially relevant for multilingual societies.</i>	<i>The Croatian verbotonal method, with its emphasis on the natural development of hearing and speech, offers universal principles that can be adapted to various cultural and linguistic contexts.</i>
<i>Both approaches enrich global speech therapy practice and provide valuable models for further research and practical application.</i>	

Conclusion

Thus, the development and implementation of speech therapy technologies are of strategic importance for early development of speech and communication in children. Modern scientific research confirms that early intervention in speech development not only prevents possible disorders but also contributes to full cognitive and social personality formation. The development of speech therapy technologies requires further research in the fields of neuropsychology, inclusive education, and medical rehabilitation. Government support, an interdisciplinary approach, and the use of innovative methods will significantly increase the effectiveness of corrective work and the quality of life for children with speech disorders.

The research conducted during the scientific internship showed that a multidisciplinary and family-oriented approach is implemented by 47 early intervention programs operating in Croatia. The National Program unites healthcare, social services, and the education system. In comparison, there is insufficient inclusion of young children in Kazakhstan, as well as weak development of psychological, pedagogical, and social support. The key difference is the use of the service model: in Croatia - intersectoral (integrated), in Kazakhstan - institutional-medical. From the above, one can identify a mature, comprehensive system of early corrective assistance demonstrated by Croatia based on a clear legislative framework, and the necessary transition from a medical model to an interdisciplinary one, which Kazakhstan is implementing.

References

1. Tomasello, M. (2003). *Harvard University Press, - Constructing a Language: A Usage-Based Theory of Language Acquisition*
2. Kuhl, P.K. (2010). *Brain Mechanisms in Early Language Acquisition. Neurn, 67 (5), 713-727*
3. Dorothy V.M. Bishop (2001). *Development of the Children's Communication Checklist: A method for assessing qualitative aspects of communicative impairment in children. - The Journal of Child Psychiatry, and Allied Disciplines.*
4. Dorothy Bishop L. *Children Without Language: from Dysphasia to Autism. Oxford University Press, 2023.*
5. L.S. Vygotsky. *Development of Higher Mental Functions. Moscow. 2006. (rus)*
6. A.R. Luria. *Speech and Development of Mental Processes in Children. Moscow, 2017. (rus)*
7. A.K. Zhalmuhamedova. *Providing Early Correctional-Developmental Assistance to Children with Limited Abilities. - Almaty, 2008, 62 p. (rus)*
8. Z.A. Movkebayeva, A.Y. Ermagambet. *Speech Development of Young Children: Features of Special Educators Training. KazNU Bulletin. Pedagogical series 79 (2). 105-114. (rus)*
9. R. Baichinov, R. Agavelyan, *Possibilities of Systematizing Intonational Voice Characteristics of Kazakh-speaking Children with Cochlear Implants. Novosibirsk - Systemic Psychology and Sociology, 2022 №4 (44). 104-111. (rus)*
10. *36th International Convention on Information and Communication Technologies, Electronics and Microelectronics, Croatia. 2014*
11. <http://erisfavia.sed.uth.gr/index.php/project-partners/mali-dom-zagreb-dnevni-centar-za-rehabilitaciju-djece-i-mladezi>

THE EFFECTIVENESS OF TASK-BASED LEARNING IN ENHANCING SPEAKING SKILLS IN FOREIGN LANGUAGE ACQUISITION AT THE HIGH SCHOOL LEVEL

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Abstract

This article explores the significance of Task-Based Language Teaching (TBLT) as a fundamental approach in fostering effective speaking skills among high school students. With a growing emphasis on communicative competence in language education, TBLT emerges as a pedagogical strategy that not only aligns with contemporary language teaching theories but also addresses the unique challenges faced by students in the high school context. The article delves into the theoretical foundations of TBLT, emphasizing its learner-centered and goal-oriented nature. Drawing on empirical studies and classroom experiences, it provides insights into the practical implementation of TBLT for teaching speaking skills, highlighting its adaptability and effectiveness in engaging students in meaningful language use. Additionally, the article discusses potential challenges and offers recommendations for educators seeking to integrate TBLT into their teaching practices. Ultimately, it advocates for the integration of TBLT in high school language curricula as an indispensable method for nurturing linguistic proficiency and communicative confidence among students.

Keywords: *language acquisition, communicative competence, pedagogical approach, effective communication, learner-centered instruction, linguistic competence.*

In the expansive realm of language education, Task-Based Language Teaching (TBLT) emerges as a pivotal pedagogical approach, particularly instrumental in fostering speaking proficiency among high school students. Task-Based Language Teaching is an innovative pedagogical approach that centers around the utilization of communicative tasks as the focal point of language learning and instruction. Rather than emphasizing isolated linguistic components, TBLT places learners in real-world scenarios, prompting them to employ language skills to accomplish meaningful tasks [1]. These tasks can range from problem-solving activities to role-playing exercises, mirroring authentic situations where language is a tool for practical communication.

The overarching goals of TBLT are manifold. Primarily, it seeks to equip language learners with the ability to use the target language effectively in real-life situations. By engaging in purposeful tasks, students are encouraged to apply their linguistic knowledge in context, fostering a deeper understanding of language use beyond mere memorization. TBLT also aims to enhance learners' communicative competence, emphasizing not only linguistic accuracy but also pragmatic appropriateness—the ability to use language appropriately in various social and cultural contexts. In the realm of secondary education, the importance of effective speaking skills cannot be overstated. As students transition from foundational language learning to more advanced stages, the acquisition of speaking proficiency becomes a linchpin in their overall language development. Effective spoken communication is not only integral to academic success but is also a fundamental life skill. It empowers students to articulate their thoughts, engage in collaborative learning, and navigate the complexities of interpersonal communication. Furthermore, the emphasis on speaking skills aligns with the evolving nature of education, which increasingly recognizes the significance of preparing students for real-world challenges. In various professional and social settings, effective verbal expression is a key determinant of success. Hence, integrating TBLT into the classroom becomes not just a pedagogical choice but a strategic imperative, equipping students with the practical language skills essential for their future endeavors. In essence, TBLT serves as a bridge between theoretical language knowledge and its tangible application, preparing high school students for linguistic competence that extends well beyond the confines of the classroom.

Task-Based Language Teaching finds its theoretical underpinnings in both cognitive and socio-cultural perspectives on language acquisition, offering a comprehensive framework that resonates with

contemporary language learning theories. From a cognitive standpoint, TBLT aligns itself with the belief that language acquisition is optimized when learners are actively engaged in problem-solving activities within authentic contexts. By immersing learners in tasks that mirror real-life situations, TBLT facilitates a cognitive process wherein language is not just a set of isolated rules to be memorized but a dynamic tool to be applied and refined through meaningful use.

Within the intricate framework of Task-Based Language Teaching, the task cycle stands as the linchpin, orchestrating a systematic and iterative instructional sequence designed to optimize language learning through a nuanced and scaffolded approach. Its three integral phases—pre-task, during-task, and post-task—contribute cohesively to the overarching objective of fostering language proficiency within authentic communicative contexts [2]. Initiating the pedagogical sequence, the pre-task phase serves as a foundational step where instructors introduce the upcoming task, establish its context, and provide learners with the necessary background information. This phase is instrumental in priming learners for the linguistic challenges ahead, activating their relevant linguistic knowledge, and furnishing them with essential language input. Through careful consideration of the linguistic demands inherent in the impending task, instructors create a preparatory environment that aligns with the principles of task-based language acquisition. The during-task phase, constituting the heart of the instructional cycle, represents the juncture at which learners actively engage in the assigned task. Here, language becomes a dynamic instrument, wielded by learners to navigate and negotiate the intricacies of the task at hand. This active application of language within the context of the task serves not only to reinforce linguistic skills but also to anchor language use in the practical, real-world scenarios that TBLT aims to emulate. Following the culmination of the task, the post-task phase ensues, marking the transition from active engagement to reflective analysis. This critical phase involves discussions that encourage learners to reflect on their task performance, analyze language use, and consider alternative strategies. Through this reflective process, learners gain insights into their linguistic choices and develop metalinguistic awareness—a cornerstone of language proficiency.

In essence, the pedagogical philosophy of Task-Based Language Teaching extends beyond the conventional boundaries of language instruction by prioritizing real-life communication and practical language use. This commitment elevates TBLT beyond the simplistic transmission of linguistic competence, positioning it as a transformative and dynamic approach that actively nurtures the practical skills essential for effective communication in authentic contexts. By immersing learners in tasks that mirror authentic situations, TBLT stimulates critical thinking as individuals grapple with linguistic challenges within meaningful contexts. These tasks prompt learners to analyze information, make decisions, and strategize effective communication—all essential components of critical thinking. For instance, a task requiring learners to negotiate a solution or collaborate on a project necessitates thoughtful consideration, fostering a cognitive environment where language is a vehicle for analytical reasoning.

By adopting a meticulously designed task-centered framework, TBLT becomes a catalyst for a more immersive and holistic language learning experience. The emphasis on tasks that mirror genuine communication needs ensures that learners engage with language in a manner reflective of their future interactions outside the classroom. This deliberate alignment with real-world communicative demands not only enhances language proficiency but also equips learners with the ability to navigate diverse linguistic situations with confidence and competence. Moreover, TBLT serves as a conduit for language acquisition by seamlessly integrating the principles of relevance, engagement, and the dynamic application of language skills [3]. The tasks, carefully crafted to resonate with learners' interests and daily experiences, imbue the learning process with a sense of purpose and applicability. Learners are not merely recipients of language knowledge; they are active participants, employing language as a tool to solve problems, express ideas, and negotiate meaning—skills paramount in authentic communicative exchanges.

In this light, TBLT emerges as an educational paradigm that goes beyond the conventional confines of language teaching, envisioning language acquisition as a multifaceted journey towards proficiency. It not only imparts linguistic knowledge but also fosters a deep-seated understanding of language as a living, dynamic entity [4]. Through its commitment to real-life communication, meticulous task design, and emphasis on relevance and engagement, TBLT paves the way for a transformative language learning experience, providing learners with a comprehensive and immersive pathway to linguistic proficiency.

Implementing Task-Based Language Teaching in the high school context presents a set of challenges that educators must navigate to ensure effective language instruction. One significant challenge revolves around the time constraints within the high school schedule [5]. The structured nature of traditional curricula and the need to cover specific content within a limited timeframe may pose obstacles to the integration of extended task-based activities. To address this challenge, educators can strategically

embed shorter, focused tasks within the existing curriculum. Breaking down larger tasks into manageable components or integrating language tasks into subject-specific content can allow for the incorporation of TBLT without compromising the core academic agenda. By aligning language learning with content objectives, educators can strike a balance between language acquisition and subject matter coverage.

Another challenge lies in the varying proficiency levels of students within a single classroom. TBLT's emphasis on meaningful communication assumes a certain level of language competence, which may be disparate among students. To overcome this, educators can differentiate tasks based on proficiency levels, providing tailored activities that challenge each learner appropriately. Additionally, collaborative tasks that leverage the strengths of diverse proficiency levels can foster a supportive learning environment where more proficient students assist their peers.

Furthermore, the assessment of TBLT poses a challenge in traditional grading systems that often prioritize discrete language skills over integrated communicative abilities. Educators can address this by incorporating a variety of assessment tools, including formative assessments during tasks, peer evaluations, and self-assessment reflections. This multifaceted approach allows for a more comprehensive evaluation of learners' language proficiency, acknowledging the dynamic and multifunctional nature of language use in TBLT.

A potential hurdle also lies in the need for teacher training and professional development to effectively implement TBLT. Educators may be unfamiliar with the methodology or unsure of how to design and implement tasks. To overcome this, schools can invest in professional development programs that provide educators with the necessary training and resources. Workshops, mentorship programs, and collaborative planning sessions can empower teachers to confidently integrate TBLT into their pedagogical repertoire.

In summary, the significance of Task-Based Language Teaching in nurturing speaking skills among high school students cannot be overstated. TBLT emerges not only as an educational method but as an essential guide leading students toward heightened oral proficiency. Its strength lies in the seamless integration of language acquisition with practical, real-world applications, equipping students with not just a linguistic toolbox but also the ability to navigate diverse communicative scenarios. By engaging in purposeful tasks mirroring authentic communication situations, TBLT serves as a crucible for linguistic growth and the development of confidence. Its impact extends beyond the classroom, instilling in students a genuine passion for language that permeates their daily lives. The cultivation of articulate and poised communicators through TBLT represents not only a pedagogical triumph but a transformative journey, endowing students with the verbal skills necessary to confidently navigate the challenges of our interconnected world.

Despite challenges such as time constraints and varying proficiency levels, TBLT's strategic integration into high school curricula proves essential. Breaking down tasks, differentiating activities, and employing diverse assessment tools address these challenges. Moreover, investing in teacher training empowers educators to confidently implement TBLT, bridging the gap between theoretical language knowledge and practical, real-world communication skills. In essence, Task-Based Language Teaching emerges as a transformative paradigm, preparing high school students for linguistic competence that extends well beyond academic confines, enriching their language learning journey with purpose, engagement, and applicability.

References

1. Long, M. (2015). *Second Language Acquisition and Task-Based Language Teaching*. Malden, MA: Wiley Blackwell.
2. Nunan, D. (1989). *Designing Tasks for the Communicative Classroom*. Cambridge: Cambridge University Press.
3. Van den Branden, K. (2006). *Task-Based Language Education: From Theory to Practice*. Cambridge: Cambridge University Press.
4. Skehan, P., & Foster, P. (1997). "Task Type and Task Processing Conditions as Influences on Foreign Language Performance." *Language Teaching Research*, 1(3), 185-211.
5. Willis, J., & Willis, D. (2012). *Task-Based Language Teaching: Teachers' Solutions to Classroom Challenges*. Austin, TX: Pro Lingua Associates.

THE ROLE OF FOOD METAPHOR IN MODERN LINGUISTICS

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РОЛЬ ПИЩЕВОЙ МЕТАФОРЫ В СОВРЕМЕННОЙ ЛИНГВИСТИКЕ

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Abstract

Food metaphor in the context of modern linguistics reveals important aspects of how language and thought are interconnected, and metaphors, especially those based on food concepts, play a crucial role in organising how we perceive and make sense of the world. With roots in basic aspects of human life, such as food consumption, food metaphor serves as a universal tool to simplify and conceptualise complex concepts, creating intuitive images. These metaphors become not only stylistic tools but also cognitive mechanisms that facilitate the structuring of knowledge and the expression of more complex concepts through objects and processes that are simple and familiar to most people.

Аннотация

Пищевая метафоры в контексте современной лингвистики открывает важные аспекты того, как язык и мышление взаимосвязаны, а метафоры, особенно основанные на концептах пищи, играют решающую роль в организации нашего восприятия и осмысления мира. Пищевая метафора, имеющая корни в базовых аспектах человеческой жизни, таких как потребление пищи, служит универсальным инструментом для упрощения и концептуализации сложных понятий, создавая интуитивно понятные образы. Эти метафоры становятся не только стилистическими средствами, но и когнитивными механизмами, которые способствуют структурированию знаний и выражению более сложных концептов через простые и знакомые для большинства людей объекты и процессы.

Keywords: metaphor, cognitive, communication, concept, substance, conceptualisation, linguistics, representation, context.

Ключевые слова: метафора, когнитивность, коммуникация, концепция, субстанция, концептуализация, лингвистика, репрезентация, контекст.

Пищевая метафора, основанная на базовых физиологических потребностях человека, глубоко укоренена в языковом сознании и участвует в процессах номинации, категоризации и оценивания явлений окружающего мира, а также- пищевая метафора обладает высоким миро моделирующим потенциалом, поскольку она позволяет не только структурировать информацию о пище и питании, но и переносить характеристики этих процессов на другие сферы жизни: экономику, политику, искусство, межличностные отношения.

Пищевая метафора, будучи одной из наиболее распространенных и древних форм языкового моделирования реальности, остается значимым объектом изучения в современной лингвистике. Исследования показывают, что пищевая метафора участвует в формировании когнитивных моделей, помогающих человеку ориентироваться в социокультурном пространстве [5].

Вопросы, связанные с пищевыми метафорами, затрагивают не только лингвистику, но и психологию, социологию, культурологию и философию. Так, Вежбицкая А. [6] отмечает, что пищевая метафора тесно связана с базовыми когнитивными механизмами человеческого мышления, что позволяет ей оставаться важным инструментом коммуникации даже в условиях глобализации и культурных трансформаций.

Пищевая метафора активно используется в современных медиа-дискурсах, маркетинге, политической риторике и повседневной коммуникации, а также- пищевая метафора как когнитивный и лингвистический феномен, участвует в процессах концептуализации и категоризации действительности в языке. Пищевая метафора рассматривается в широком контексте — от традиционных выражений, укорененных в языке, до новых образных конструкций, появляющихся в связи с развитием медиaprостранства и глобализацией.

Исследователь Вежицкая А. [6] считает, что метафоры не только отражают мировосприятие носителей языка, но и активно формируют его, влияя на восприятие социальных, политических и культурных явлений. Таким образом, изучение пищевых метафор имеет прикладную значимость в широком круге гуманитарных дисциплин.

Изучение метафоры в лингвистике имеет долгую и насыщенную историю. Однако именно в XX–XXI веках, с развитием когнитивной лингвистики, оно получило новый импульс. В традиционном риторическом понимании метафора рассматривалась прежде всего как стилистическое средство, предназначенное для украшения речи или усиления выразительности. В последние десятилетия исследователи пришли к выводу, что метафора выполняет гораздо более важные функции в языке. Современные исследования показывают, что метафора играет ключевую роль в организации знаний о мире, формировании языковой картины мира и концептуализации различных сфер человеческой деятельности [5]. Метафора оказывается не просто украшением, но фундаментальной составляющей когнитивной структуры, которая помогает нам понимать и организовывать сложные абстрактные концепты через знакомые и простые образы.

Особый интерес вызывает пищевая метафора, поскольку она основывается на одном из самых базовых аспектов человеческого существования — потреблении пищи. Пища является важной частью повседневной жизни и культуры, что делает пищевую метафору интуитивно воспринимаемой и универсальной для носителей разных языков и культур. Это объясняет, почему такие метафоры широко распространены и легко воспринимаются. Пищевая метафора как инструмент языковой репрезентации активно используется для описания самых различных явлений: от социальных и экономических процессов до личных переживаний и политических событий.

Современная лингвистика рассматривает метафору как универсальный механизм концептуализации, который позволяет человеку структурировать и осмысливать окружающую действительность. Метафора функционирует как когнитивный инструмент, позволяющий переносить характеристики одного явления на другое, что помогает понимать абстрактные и сложные концепты через более доступные и знакомые образы. Этот процесс имеет важное значение для человеческого познания и восприятия, позволяя человеку не только объяснять окружающий мир, но и эффективно коммуницировать свои идеи и чувства [4].

Одной из наиболее влиятельных концепций метафоры является теория когнитивной метафоры, разработанная Дж. Лакоффом и М. Джонсоном [1]. Согласно этой теории, метафора представляет собой средство переноса структуры одного концептуального домена на другой. Дж. Лакофф и М. Джонсон утверждают, что метафоры лежат в основе нашего мышления и действуют как ментальные схемы, через которые мы воспринимаем, интерпретируем и осмысливаем реальность. Пищевая метафора, как один из ярких примеров, переносит характеристики процесса приема пищи на более абстрактные и сложные области человеческой деятельности, такие как экономика («залалдарын жұту», «проглотить убытки»), политика («Реформаны қорыту», «переварить реформу») и культура («ойлануға азық», «пища для размышлений»). Такой перенос помогает сделать эти концепты более доступными и понятными, создавая ментальные связи, которые облегчают восприятие и осмысление.

Функции метафоры в языке можно условно разделить на три основные группы. Первая — когнитивная функция, которая заключается в формировании и структурировании знаний о мире. Метафоры помогают упрощать сложные явления и процессы, создавая систему ассоциаций и образов, которые позволяют воспринимать абстрактные идеи через более конкретные и знакомые элементы. Вторая функция — коммуникативная, которая направлена на упрощение и наглядность передачи информации. Метафоры делают речь более яркой, выразительной и доступной для аудитории, помогая эффективно передавать сложные или эмоционально насыщенные концепты. Наконец, третья функция — эмоционально-оценочная, выражающая субъективное отношение говорящего к определенным явлениям и событиям. С

помощью метафор можно передать не только информацию, но и эмоции, отношение к теме, что делает высказывание более живым и насыщенным.

Как отмечает Стернин И.А. [2], пищевая метафора особенно значима в когнитивной сфере, поскольку она связана с первичными сенсорными и физиологическими переживаниями человека. Эти переживания являются универсальными, понятными и доступными для большинства людей, что делает пищевую метафору эффективным инструментом для создания и передачи значений в языке. Кроме того, связь пищи с базовыми инстинктами и повседневным опытом человека позволяет метафорам на основе пищи быть особенно эмоционально насыщенными и яркими, что способствует их широкому использованию в различных сферах общения.

Пищевая метафора, будучи распространенной во многих языках мира, может быть классифицирована по нескольким критериям. Наиболее значимыми являются:

По тематическим группам:

- метафоры, связанные с процессом еды: «сөзді жұтып қоя», «глотать слова», «переварить информацию»
- метафоры, отражающие вкус: «тәтті жеңіс», «сладкая победа», «горькая правда».
- метафоры, связанные с приготовлением пищи: «фактілерді жұтып қоя», «смешивать факты», «поджарить оппонента».

По функциональному назначению:

- оценочные метафоры: «балдай сөздер», «сахарные речи», «кислый человек».
- описательные метафоры: «өз сорпасында қайнау», «вариться в своем соку», «разбавить разговор».

По степени устойчивости:

- фразеологизированные: «бәрі қорыту», «всё переварить», «жевать одно и то же».
- индивидуально-авторские: «жуан өтірік», «жирная ложь», «тонкая корочка правды».

В дополнение к этому, Казкенова А.К. [3] отмечает, что пищевая метафора часто используется для выражения социальных отношений и культурных установок. Например, выражение «өз сорпасында қайнау» может интерпретироваться как отражение замкнутости определенной социальной группы, а «подсластить пиллюлю» — как попытка смягчить неприятные известия.

Также важно учитывать межъязыковые различия. Например, в казахском языке метафоры, связанные с хлебом («Нан – бақытты өмірдің бастауы»), несут положительный смысл, в то время как в английском языке аналогичные выражения могут иметь иной контекст. Это связано с различиями в культурных традициях и восприятии пищи в различных обществах.

Таким образом, пищевая метафора не только структурирует язык, но и отражает особенности национальной культуры и ценностей.

Метафоры, в том числе и пищевая, помогают человеку упорядочивать и осмысливать мир, создавая связи между абстрактными и конкретными концептами. В основе пищевой метафоры лежит принцип метафорического проецирования, при котором свойства одной концептуальной области (например, пищи) переносятся на другую, более абстрактную сферу, такую как эмоции, социальные явления или абстрактные идеи. Это позволяет людям легче воспринимать и интерпретировать сложные или неопределенные явления, делая их более понятными и осязаемыми.

Схема субстанции представляет пищу как объект оценки или свойства, которые могут быть положительными или отрицательными. Метафора «горькая правда» использует представление о вкусе для того, чтобы подчеркнуть неприятность или сложность определенной информации, создавая тем самым сильный эмоциональный эффект. Подобные метафоры активно влияют на восприятие и понимание того, о чем идет речь, и делают информацию более выразительной и насыщенной.

Вежбицкая А. [6] отмечает, что пищевая метафора особенно тесно связана с человеческими эмоциями и восприятием мира. Ассоциации со вкусами — сладкими, горькими, кислыми и т. п. — часто переносятся на эмоциональные состояния, что делает такие метафоры мощным инструментом для выражения субъективных переживаний. Примером таких метафор являются выражения «тәтті табыс», «сладкий успех» или «жанға бататын жеңіліс», «горькое поражение», которые передают не только смысл, но и эмоциональную окраску переживаний, связанных с успешными или неудачными событиями.

Также концепты еды часто используются для характеристики информации или событий, что позволяет моделировать восприятие окружающего мира. Например, выражение «жаңалықтарды қорыту», «переварить новости» метафорически описывает процесс осмысления и усвоения новой, порой сложной и трудной информации. В таких метафорах используется логика взаимодействия с пищей — оценка, усвоение, переваривание — что помогает формировать более понятные образы и упрощает восприятие.

Пищевая метафора является не просто стилистическим приемом, а сложным когнитивным инструментом, который структурирует языковую картину мира и отражает культурные особенности общества. Она способствует упрощению и адаптации абстрактных понятий, делая их более доступными и эмоционально насыщенными. Пищевая метафора не только помогает в коммуникации, но и является важной частью когнитивных процессов, структурируя восприятие мира и наше понимание сложных явлений.

Пищевая метафора в языке отражает сложные когнитивные процессы, связывая гастрономический опыт человека с различными сферами жизни. Современные исследования показывают, что пищевая метафора играет значительную роль в формировании языковой картины мира, поскольку она тесно связана с физиологическими и сенсорными переживаниями, общими для всех людей. Эта универсальность делает пищевые метафоры понятными в различных языках и культурах, хотя их конкретные проявления могут варьироваться в зависимости от национальных традиций и социальных контекстов [5].

Анализ пищевой метафоры требует междисциплинарного подхода, включающего элементы когнитивной лингвистики, психолингвистики, социолингвистики и культурологии. Как отмечает Вежбицкая А. [6], метафорическое осмысление пищи неразрывно связано с представлениями о ценностях, традициях и мировоззренческих установках общества. В этой связи пищевая метафора представляет собой не только лингвистическое явление, но и средство когнитивного моделирования, позволяющее изучить особенности категоризации и структурирования знаний в конкретной культуре.

Список использованной литературы

1. Лакофф Дж., Джонсон М. Перемещение смысла: основы теории концептуальных метафор / Дж. Лакофф, М. Джонсон. — М.: Языки различных культур, 2006. — 320 с.
2. Стернин И. А. Метафора как средство когнитивной обработки / И. А. Стернин. — М.: Наука, 2001. — 274 с.
3. Казкенова А. К. Лексико-семантические особенности метафор в языках / А. К. Казкенова. — Алматы: КазГУ, 2010. — 182 с.
4. Суперанская А. В. Лингвистическая теория метафоры / А. В. Суперанская. — М.: Наука, 1997. — 226 с.
5. Фоконье Т., Тернер, М. Когнитивная поэтика: как метафоры творят смысл / Т. Фоконье, М. Тернер. — М.: Логос, 2005. — 312 с.
6. Вежбицкая А. Языковая картина мира и метафора / А. Вежбицкая — М.: Прогресс, 1996. — 263 с.

Philological sciences

THE MODELING FUNCTION OF METAPHOR IN SCIENCE

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Abstract

The cognitive approach to the study of metaphor dominates modern metaphorology. Recent studies of metaphor within the framework of cognitive linguistics, psycholinguistics, psychology, philosophy, linguocultural studies show that metaphor is really not just a linguistic phenomenon, but a universal cognitive mechanism, one of the ways of perceiving the world. It is able to influence human thinking and behavior, to change the perception of the world. In this article, the author considers metaphor as a method of thinking and investigates the cognitive role of metaphor in obtaining scientific knowledge. Metaphors function as cognitive processes through which we deepen our understanding of the world and create new hypotheses. J. Locke himself noted the fact that understanding a multi-tiered theory, especially a new one, sometimes encounters difficulties related to the lack of adequate means to express new concepts and intuitions. This problem is initially partially solved by the metaphorical use of terms. Therefore, some degree of metaphor persists in scientific terminology due to the infinite nature of knowledge. Metaphor lies at the heart of fundamental scientific constructions. It cannot give real knowledge, but it creates a prism of vision, which brings closer to the cognition of the true nature of the phenomenon or object under study.

Keywords: cognitive function, cognition, thinking by analogy, principle of fictivity, models - metaphors, scientific hypothesis, base metaphor.

By the end of the 20th century, interest in metaphor had significantly increased. Moving beyond philology, where the focus was on poetic metaphor, it entered the realm of disciplines concerned with thought and cognition. This shift was prompted by the formation of the anthropocentric paradigm of the humanities, placing the human being and their role in the world at the center of attention. Metaphor came to be seen as a key to understanding the foundations of thinking, the processes of creating a national specific worldviews, and more. Modern cognitive linguistics research indicates that the production of metaphor is not merely a linguistic phenomenon on the surface level of language, but a universal cognitive mechanism rooted in deep creative cognitive processes. One of modern researchers, Daniel N. Robinson, notes that science is a human endeavor, and regardless of how narrow or specialized it may become, or how dull or cult-like its problems and methods may appear, it rarely escapes the habits of the human mind. One of the most enduring habits is the tendency to impose metaphors and comparisons in trying to understand elusive phenomena. Among such elusive phenomena, none is more ingenious and lively than the mind itself. Hence, philosophy and later psychology have resorted to explanations like "it is like...", or "it is as if...", or "it is nothing more than..." Over the centuries, various metaphors and comparisons have gained and lost popularity [15, p. 331–332].

Before metaphor was recognized as a crucial heuristic tool for understanding nature, it underwent a long journey toward acceptance. Even in the 20th century, fierce debates continued over the legitimacy of metaphor. Many linguists and philosophers dismissed it. In their view, metaphor was the domain of mystics and poets, since intuitive notions and feelings couldn't be expressed with precise terms. When scientists used metaphor, they were accused of employing obscure linguistic expressions. Rationalist philosophers especially rejected metaphor. Thomas Hobbes wrote: "The light of the human mind is the intelligible words, previously cleared of any ambiguity by precise definitions. Reasoning is a step, the growth of knowledge is the way, and the welfare of the human race is the goal. Metaphors and ambiguous words, on the contrary, are something like *ignes fatui* (wandering fires), and to reason with their help is to wander among countless absurdities, the result to which they lead is disagreement and indignation or contempt" [6]. However, expressing his hostility to metaphor, Hobbes immediately made use of it. Positivists,

logical analysts, and empiricists also stubbornly rejected metaphor, equating “committing a metaphor” in science with committing a crime. Even today, some scientists, adhering to classical traditions, insist that scientific definitions and theories are incompatible with metaphor. “To suppose that a scientific explanation is metaphorical is to confuse a scientific theory with a biblical parable”, says M. Bunge, a representative of so-called “scientific materialism” [2, p. 165].

In contrast, philosophical irrationalism took the opposite stance. Friedrich Nietzsche argued that knowledge is inherently metaphorical. “What is truth? A moving crowd of metaphors, metonymies and anthropomorphisms, in short the sum of human relations which have been poetically and rhetorically sublimated, rearranged and embellished by constant use. People regard them as solid, canonical, and inescapable realities. Truth is an illusion, the illusory nature of which everyone has forgotten; they are metaphors that have been much used, have worn out, lost their imprint, and now come out more for mere metal than for coin” [13]. This reflects the views of romantic philosophers and scientists who saw metaphor as a fatal necessity — the only way not just to express thought, but to thinking itself. For them, the entire domain of cognition belonged to metaphor. As K. Zhol notes, in Immanuel Kant’s lectures on logic at Königsberg University, there was nothing original except the very method of Kant’s philosophizing, which is based on the implicit use of thinking by analogy, particularly in discussions of language and the role of metaphor in cognition. Kant’s followers elevated analogy to the principal means of scientific knowledge. According to Kant, people always strive to interpret the abstract in terms of sensory experience, to relate the transcendent to their life experience through analogy, often using the “as if” principle (*als ob*).

In 1876–77, Hans Vaihinger’s work “The Philosophy of “As If”” emerged, significantly influencing philosophers and scientists. A philosophical journal edited by Vaihinger and R. Schmidt (“*Annalen der Philosophie und Philosophische Kritik*”) featured contributions from psychologists, philosophers, linguists, physicists, and mathematicians who adhered to the ideas of fictionalism. As I. Lapshin notes, Neo-Kantian Vaihinger, developing the ideas of Hume, Mill and Spencer, extended the concept of analogy into a universal logical principle, whereby any concept is a metaphor based on sensual analogy (I. I. Lapshin, “*Philosophy of Invention and Invention in Philosophy*”). Vaihinger distinguished hypotheses and fictions in scientific cognition, emphasizing the heuristic role of fictions, especially when hypotheses fall short. Imagination plays a key role in creating fictions, which he defines as vague conjectures born from imaginative force. Like metaphors, fictions must eventually be replaced by precise definitions — but some fictions are irreplaceable because discursive thinking cannot function without them. The rational sense in the “principle of fictivity” is confirmed by contemporary analysis of so-called “false structures of thought”. B. V. Biryukov states that investigating such structures is valuable for psychology, philosophy, cybernetics, information theory, and linguistics. The movement of thought in search of truth is associated with the presence of so-called “false structures” in thinking, which reflect the relativity of human truths and the reality of cognitive errors [3, p. 69]. In some sense, “false structures” are analogous to Vaihinger’s “fictions.”

Since the New Age, empiricist philosophy has been characterized by a gradual transformation of empirical epistemology into an introspective psychological theory of knowledge. For example, Locke’s theory of knowledge reduces all statements about everyday life and science to either reflection or sensation. It was the basis for the views of the sensationalists, who emphasized the metaphorical character of all our speech, since our thinking, according to them, is entirely determined by sensory factors.

In the second half of the 20th century, postmodernism changed the approach to the traditional values of science, which caused a reassessment of the role of metaphor in the scientific sphere. The neopositivist idea of excluding all insufficiently clear statements from the language of science was not successful, because it turned out that achieving unambiguity of concepts leads to the deadening of scientific language and a decrease in its cognitive capabilities, which means that science will not be able to continue its further development. Despite seemingly contradicting science’s requirement for precision and unambiguity, metaphors are pervasive in scientific language: “Metaphors in science are everywhere, and we often don’t even notice them” [12, p. 96].

The study of the role of metaphor in the development of scientific language in the following years revealed the reason for its prevalence in terminology: metaphor is able to express a hypothesis, giving a special direction to the comprehension of the studied object. Modern works on the philosophy of science are full of statements that metaphor can play an extremely important role in the construction of scientific languages. We are talking about theoretical models. “Models - metaphors” serve as heuristic tools for exploring complex phenomena and are developed in two stages. At the first stage we mainly rely on intuition, experience, make bold analogies and create non-trivial metaphors. Analogy is understood as a

kind of heuristic means of cognition. And at the second stage we model and try to make sense of primary intuitions. Metaphorical explanation refers to the period of theory building, not to its final formulation. Scientific theoretical knowledge cannot be only knowledge by analogy. The famous theoretician and historian of physics Pierre Duhem in his work "The Aim and Structure of Physical Theory" wrote: "The history of physics shows that finding analogies between different categories of phenomena was perhaps the most reliable and productive method for constructing physical theories" [quoted from: 7, p. 287]. Duhem aimed to move beyond quasi-psychologism in interpreting analogy's theoretical role, proposing the "mathematical hypothesis method". He noticed that abstracted phenomena often share structural similarities — manifested in physics as identical equations across different theories. This allows the reinterpretation of one theory through the lens of another, leading to discoveries. Thus, in search of a more precise formulation for their intuitive insights, scientists resort to some old concepts and enrich them with new meanings. For example, "Kenneth Johnson introduced the highly speculative metaphor of colored quarks (red, blue, yellow), explaining: "The color of a quark has nothing to do with visible color. The term is used because the combination of colored quarks in quantum mechanics resembles the mixing of visible colors". Trying to explain the properties of theoretical particles physicists have understood the analogy between color and the possible properties of quarks" [10, p. 359].

American philosopher Max Black connected metaphor directly with scientific cognition. He considered metaphor as a phenomenon formed in the movement of thought and developing the conceptual apparatus of language. The modeling role of metaphor, inspiring new analogies and thought paths, has been noted by many (S. S. Gusev, E. A. Lapinya, R. Boyd, etc.). Metaphor is especially valuable in early research stages, when hypotheses are still forming and language to describe phenomena is still developing. R. Boyd, for instance, suggests evaluating metaphor's role by the insights it offers into an object's properties. Though metaphor doesn't provide factual knowledge, it guides us toward understanding. C. Gusev studies metaphor's use in forming scientific hypotheses, and E. Lapinya emphasizes that metaphor, having fulfilled its cognitive function, eventually loses its metaphorical status and becomes a standard term. T. Kuhn believes metaphors' cognitive function lies in prompting new conceptual links during paradigm shifts, usually accompanied by changes in so-called basic metaphors. These "key metaphors" apply familiar conceptual frameworks to new domains, enabling conceptualization through analogy [1, 14]. Scientists and philosophers implicitly or explicitly resort to basic metaphors as the basis of their theoretical constructions. For example, the metaphor "The world is mathematical", can be consciously or unconsciously used by scientists as a hypothetical basis for a theory. They know that the world in reality is not mathematical in the literal sense, but they accept the base metaphor as a diaphora suggesting a special way of perceiving and modeling the world.

In conclusion, metaphor — once seen merely as rhetorical ornament — is now recognized as a vital instrument of thought, cognition, and perception, and as a driver of consciousness. "We need metaphor not only to make our ideas accessible to others through naming, but also to make them accessible to ourselves. Metaphor is not just a means of expression — it is a crucial tool of thought... Metaphor is the instrument of thought to reach the farthest reaches of our conceptual field. Objects that are close to us and easy to grasp give thought access to concepts that are distant and elusive. Metaphor lengthens the "arm" of the intellect; its role in logic can be likened to a fishing rod or a rifle" [14, p. 71–72]. Metaphors function as cognitive processes that deepen our understanding and foster new hypotheses. They underpin scientific constructs at every level — from deep foundational metaphors to surface-level illustrative ones that clarify terminology and concepts.

References

1. Arutyunova N. D. Metaphor and discourse // Theory of metaphor. - M.: Progress, 1990. - p. 5-43.
2. Bunge M. Philosophy of Physics. - M.: Editorial URCC, 2003. - 320 p.
3. Biryukov B.V. About logical modeling of false structures of thinking. // Philosophical Sciences, No. 4, 1972.
4. Black M. Metaphor // Theory of metaphor. - M.: Progress, 1990. - p. 153-172.
5. Chikvaidze A. A. The role of metaphor in the creation of scientific hypothesis. – The latest research in modern science: experience, traditions and innovations: Collected scientific articles of the VII International scientific conference on June 20-21, 2018, North Charleston, SC, USA. - North Charleston, USA: CreateSpace, 2018. p. 85-93.
6. Hobbes T. Leviathan - [Electronic resource]. URL: <http://lib.ru/FILOSOF/GOBBS/leviafan.txt>
7. Jol K. K. Thought. Word. Metaphor: Problems of semantics in philosophical consecration. Kiev: Naukova Dumka, 1984. - p. 304.

8. Kashkin V.B. and Shatalov D.G. "Metaphor as a means of active cognition" *Language, Communication and Social Environment*. Issue 4. Voronezh: Voronezh State University, 2006 [Electronic resource]. URL: <http://lse2010.narod.ru/>
9. Labashchuk M. *Word in science and art: scientific and artistic comprehension of the phenomena of verbal thinking*. - Ternopil: Pidruchniki i posibniki, 1999. - 272 c.
10. McCormack E. *Cognitive theory of metaphor // Theory of metaphor*. - M.: Progress, 1990. - p. 358-386
11. Motko M. L. *Metaphor and scientific cognition*. [Electronic resource]. URL: <http://e-lib.gasu.ru/vmu/arhive/2004/01/37.shtml>
12. Nalimov V. V. *In search of other meanings*. - M.: Progress, 1993. - 280 p.
13. Nietzsche F. *On truth and false hood in the non-moral sense*. [Electronic resource]. URL: <http://nietzsche.ru/works/other/about-istina/>
14. Ortega-y-Gasset H. *Two great metaphors // Theory of metaphor*. - M.: Progress, 1990. - p. 68-81.
15. Robinson Daniel N. *An Intellectual History of Psychology* - M.: St. Thomas Institute of Philosophy, Theology and History, M., 2005. - 568 p.

COGNITIVE AND AFFECTIVE CONSEQUENCES OF INTERNET GAMING: A SYSTEMATIC REVIEW OF RESEARCH**Novikov N.N.***Master's degree student in Psychology, Turan University***Sarsenbayeva L.O.***Professor of the Higher School of Psychology,
Candidate of Psychological Sciences, Turan University***КОГНИТИВНЫЕ И АФФЕКТИВНЫЕ ПОСЛЕДСТВИЯ ИНТЕРНЕТ-ГЕЙМИНГА: СИСТЕМАТИЧЕСКИЙ ОБЗОР ИССЛЕДОВАНИЙ****Новиков Н.Н.***магистрант направления подготовки «Психология», Университет «Туран»***Сарсенбаева Л.О.***профессор Высшей школы психологии, кандидат психологических наук,
Университет «Туран»***Abstract**

The article presents an analytical review of current scientific research on the impact of internet gaming on the cognitive and affective functioning of personality. In the context of global digitalization and the widespread popularity of video games, there is a growing need to understand the dual nature of their effects — ranging from neurocognitive stimulation to the risks of addictive behavior and social maladjustment. The authors systematize empirical findings on the influence of different video game genres on working memory, attention, sensorimotor response speed, cognitive flexibility, and multitasking abilities. Particular attention is given to the neuropsychological correlates of gaming activity: functional changes in the frontal and prefrontal cortex, which are responsible for self-control and emotional regulation, demonstrate the potentially adaptive effects of moderate gaming. However, when a certain time threshold is exceeded or when gaming is driven by escapist or avoidant motives, it may become a source of emotional exhaustion, anxiety, and social isolation. The article also considers age-specific differences in the perception and cognitive impact of gaming, particularly among school-aged children and adolescents. It presents data on emotional engagement in the gaming environment and the effects of gameplay on mechanisms of self-regulation and psycho-emotional recovery. Furthermore, the article analyzes the issue of video game addiction in the context of esports, where competitive environments and high workloads may intensify symptoms of anxiety and depression. The main directions for future research are outlined, highlighting the need for a comprehensive interdisciplinary approach to evaluating the psychological consequences of internet gaming. The review emphasizes the importance of accounting for game genre characteristics, individual differences among players, motivational factors, and the broader social context when interpreting the psychological outcomes of video game engagement.

Аннотация

Статья представляет собой аналитический обзор актуальных научных исследований, посвящённых влиянию интернет-гейминга на когнитивное и аффективное функционирование личности. В условиях глобальной цифровизации и повсеместного распространения видеоигр возрастает потребность в осмыслении двойственной природы их воздействия: от нейрокогнитивной стимуляции до риска формирования зависимого поведения и социальной дезадаптации. Авторы систематизируют эмпирические данные о влиянии различных жанров видеоигр на рабочую память, внимание, скорость сенсомоторной реакции, когнитивную гибкость и многозадачность. Отдельное внимание уделяется нейropsychологическим коррелятам геймерской активности: функциональные изменения в структурах лобной и префронтальной коры, отвечающих за самоконтроль и эмоциональную регуляцию, демонстрируют потенциально адаптивный характер умеренной игровой активности. Однако при превышении определённого временного порога или наличии избегающе-эскапистских мотивов игровая деятельность может трансформироваться в источник эмоционального истощения, тревожности и социальной изоляции. Рассматриваются также возрастные

особенности восприятия и когнитивных эффектов гейминга, в том числе в контексте школьного и подросткового возраста. Приводятся данные об эмоциональной вовлечённости в игровую среду, влиянии геймплея на механизмы саморегуляции и психоэмоционального восстановления. В статье анализируется проблема игровой зависимости в условиях киберспорта, где соревновательная среда и высокая нагрузка могут усугублять симптомы тревожно-депрессивных расстройств. Сформулированы основные направления дальнейших исследований, акцентирующих необходимость комплексного междисциплинарного подхода к оценке последствий интернет-гейминга. Представленный обзор подчёркивает значимость учёта жанровых особенностей игр, индивидуальных различий игроков, их мотивации, а также социального контекста при интерпретации психологических эффектов видеоигровой активности.

Keywords: internet gaming, cognitive functions, emotional regulation, gaming addiction, mental health, motivation, gamer behavior

Ключевые слова: интернет-гейминг, когнитивные функции, эмоциональная регуляция, игровая зависимость, психологическое здоровье, мотивация, геймерское поведение.

Когнитивное воздействие игр

Проблема влияния интернет-гейминга на психологическое состояние человека остаётся предметом активных научных дискуссий, в центре которых находятся два полярных вектора: когнитивное развитие и психоэмоциональные риски. С одной стороны, видеоигры в ряде эмпирических работ представлены как средства стимуляции внимания, тренировки рабочей памяти и формирования устойчивых моделей поведенческого реагирования в условиях повышенной сенсорной нагрузки. С другой — документируются тенденции к эмоциональному истощению, нарушению саморегуляции и социальной дезадаптации, особенно в случаях чрезмерной игровой активности. Эти дихотомические эффекты обусловлены не только количеством времени, проводимого в игровом пространстве, но и жанровыми характеристиками игр, мотивационным профилем игроков, а также возрастными и личностными особенностями. Современные исследования указывают на то, что определённые типы видеоигр — в особенности экшен, шутеры и стратегии реального времени — способны индуцировать улучшение целого ряда когнитивных процессов. Так, выявлено, что игровая активность продолжительностью от 10 до 20 часов в неделю способствует росту показателей избирательного внимания, оперативной памяти и скорости сенсомоторной реакции. При этом наблюдается и количественная зависимость: превышение условного порога в 25 часов в неделю может привести к обратному эффекту — замедлению когнитивной обработки информации и истощению механизмов когнитивного контроля. Таким образом, игра перестаёт выполнять функцию тренажёра и начинает действовать как когнитивный стрессор, нарушающий внутренний гомеостаз внимания и памяти.

Нейропсихологические эффекты

Нейропсихологические данные, полученные с использованием функциональной магнитно-резонансной томографии (фМРТ), подтверждают гипотезу о задействовании фронтальных и префронтальных областей коры головного мозга в процессе активного гейминга. У испытуемых, демонстрирующих высокие показатели игровой вовлечённости, регистрируется повышенная активность в структурах, ответственных за импульсный контроль и рабочую память. Однако парадоксально, что именно в этой группе значительно выше уровень симптомов дефицита внимания, депрессии и тревожных состояний, что указывает на дисбаланс между развивающимися и дезадаптивными функциями игрового взаимодействия. Таким образом, гейминг выступает как феномен с потенциалом двунаправленного влияния, синхронно активизируя как ресурсы психики, так и её уязвимые стороны. Особый интерес вызывает вопрос формирования устойчивых когнитивных паттернов и когнитивной адаптивности у геймеров. Исследования, посвящённые мультизадачности и способности к переключению между задачами, демонстрируют значительное преимущество игроков в видеоигры по сравнению с неиграющей выборкой. Вероятной причиной выступает внутриигровая необходимость одновременно отслеживать несколько источников информации, быстро реагировать на изменяющиеся условия и осуществлять планирование в условиях неопределённости. Однако данная способность может сопровождаться скрытым износом когнитивных ресурсов, что проявляется в снижении глубины переработки информации

при решении комплексных задач вне игровой среды. Это соотносится с теорией когнитивной усталости, согласно которой избыточная нагрузка на префронтальные механизмы приводит к деградации способности к длительной концентрации и устойчивому удержанию целей.

Эмоциональная регуляция и копинг

Наряду с когнитивным аспектом, интернет-гейминг активно обсуждается в контексте эмоциональной регуляции и копинг-поведения. Эмоциональная вовлечённость в игровую деятельность, обусловленная её интерактивной природой, способна как оказывать терапевтический эффект (в частности, снижать уровень стресса и симптомов тревожности), так и провоцировать деструктивные формы поведения, такие как избегающее копинг-поведение, уход от реальности, замещение межличностных контактов виртуальным взаимодействием. Эмпирические данные демонстрируют, что игроки, использующие игры как средство бегства от трудностей, чаще сталкиваются с рисками формирования игровой зависимости, характеризующейся нарушением контроля над поведением, компульсивным игровым участием и снижением общей удовлетворённости жизнью. Также значимым является влияние жанровой принадлежности игры на уровень эмоциональной активации. Так, шутеры и MMORPG оказывают выраженное воздействие на эмоциональную сферу, индуцируя состояние потока и временного эскапизма, тогда как головоломки и казуальные игры действуют как эмоциональные модуляторы, способствующие снижению физиологических маркеров стресса. Отдельный интерес представляют случаи использования видеоигр в качестве замены медикаментозной терапии тревожных расстройств: в частности, результаты сравнительного анализа между игровым воздействием и применением SSRI свидетельствуют о более выраженном снижении тревожности у группы, взаимодействовавшей с игровым контентом.

Социальные и поведенческие последствия

Кроме психофизиологических и эмоциональных эффектов, интернет-гейминг оказывает влияние на формирование просоциального или, напротив, изоляционного поведения. В многопользовательских игровых средах возможно развитие коммуникативных навыков, способности к сотрудничеству и лидерству. Вместе с тем, чрезмерное погружение в онлайн-реальность, особенно в одиночные игры и MMORPG, может провоцировать отчуждение от реального мира, нарушая механизмы социальной адаптации. Стратегии взаимодействия, характерные для игровых сообществ, часто подменяют традиционные формы общения, создавая псевдоэмоциональные связи, не поддерживаемые вне цифрового контекста. Ряд исследований также зафиксировал взаимосвязь между геймерским поведением и снижением уровня креативности у детей, особенно в тех случаях, когда игровая активность превышала оптимальные рамки. Тем не менее, определённые жанры — песочницы и симуляторы — наоборот, способствуют развитию дивергентного мышления. Этот эффект носит селективный характер, проявляясь лишь при определённой установке на креативность в процессе игрового взаимодействия. Наконец, проблема игровой зависимости приобретает особую остроту в контексте киберспорта, где интенсивность тренировок и соревновательная среда создают условия для хронического стресса, эмоционального выгорания и, в отдельных случаях, психической дезадаптации. Признание игрового расстройства официальным диагнозом (код 6C51 по МКБ-11) подчёркивает необходимость комплексного подхода к изучению и регулированию феномена гейминга как психосоциального явления.

Интернет-гейминг представляет собой многоаспектное и неоднозначное психологическое явление, чьё влияние на когнитивные и эмоциональные характеристики личности обусловлено множеством переменных — от жанра и продолжительности игрового взаимодействия до мотивационных установок игрока и уровня социальной поддержки. С одной стороны, видеоигры способны выступать в роли когнитивных тренажёров, активирующих механизмы внимания, памяти и мышления, способствующих формированию устойчивых поведенческих паттернов. С другой стороны, при утрате контроля над игровой активностью возрастает риск развития дезадаптивных состояний: тревожности, эмоциональной лабильности, социальной изоляции и зависимости.

Таким образом, научный дискурс о гейминге требует междисциплинарного подхода, синтезирующего данные нейropsихологии, когнитивной науки, поведенческой экономики и психотерапии. Лишь при условии учёта всех уровней воздействия — от нейронного до социального — возможно адекватное понимание как позитивных, так и негативных последствий интернет-гейминга.

References

1. Martinez L., Gimenes M., Lambert E. (2023). Video games and board games: Effects of playing practice on cognition. *PLoS One*, 18(3), e0283654. <https://doi.org/10.1371/journal.pone.0283654>
2. Bogacheva N.V. (2014). Computer games and psychological specifics of gamers' cognitive sphere. *Vestnik Moskovskogo Universiteta. Series 14. Psychology*, (4), 120–130.
3. NIH. (2022). Video gaming may be associated with better cognitive performance in children. Retrieved from <https://www.nih.gov/news-events/news-releases/video-gaming>
4. Anguera J.A. et al. (2013). Video game training enhances cognitive control in older adults. *Nature*, 501(7465), 97–101. <https://doi.org/10.1038/nature12486>
5. von der Heiden J.M., Braun B., Müller K.W., Egloff B. (2019). The association between video gaming and psychological functioning. *Front. Psychol.*, 10, 1731. <https://doi.org/10.3389/fpsyg.2019.01731>
6. American Psychological Association (APA). (2014). Violent video games and aggression: Causal relationship or scapegoat? <https://www.apa.org/pubs/journals/releases/amp-a0034857.pdf>
7. Bogacheva N.V., Voiskunskiy A.E. (2015). Cognitive styles and impulsivity in gamers with different gaming activity. *Psychology. Journal of HSE*, 1. Retrieved from <https://cyberleninka.ru/article/n/kognitivnye-stili-i-impulsivnost>
8. Desai V. et al. (2021). Stress-reducing effects of playing a casual video game. *Trends in Psychology*, 29(3), 563–579. <https://doi.org/10.1007/s43076-021-00062-6>
9. Sinha S. et al. (2024). Problematic gaming: Escapist strategy to cope with life difficulties. *Indian Psychiatry Journal*, 33(2), 210–218. https://doi.org/10.4103/ipj.ipj_99_23
10. Lapteva N.M. (2023). Review of foreign studies on cognitive effects of video games. *Sovremennaya Zarubezhnaya Psikhologiya*, 12(4), 111–122. <https://doi.org/10.17759/jmfp.2023120410>
11. Kowal M. et al. (2021). Gaming your mental health: A review on mitigating symptoms of depression and anxiety. *JMIR Serious Games*, 9(2), e26575. <https://doi.org/10.2196/26575>
12. Colder Carras M. et al. (2018). Video game play and mental health recovery in veterans. *Social Science & Medicine*, 216, 124–132. <https://doi.org/10.1016/j.socscimed.2018.08.044>
13. Rahimi S., Shute V.J. (2021). The effects of video games on creativity: A systematic review. In: Russ S.W., Hoffmann J.D., Kaufman J.C. (Eds.), *The Cambridge Handbook of Lifespan Development of Creativity*. Cambridge University Press, pp. 368–392.
14. Pchelintsev N.M. (2023). Psychological aspects of online games: How gaming addiction affects youth. *World Research in the Social and Human Sciences*, 226–227.
15. Huang J. et al. (2017). Understanding gaming skill through practice and habit. *Topics in Cognitive Science*, 9(2), 437–466. <https://doi.org/10.1111/tops.12251>
16. Kral T.R.A. et al. (2018). Neural correlates of video game empathy training in adolescents: A randomized trial. *NPJ Science of Learning*, 3, 13. <https://doi.org/10.1038/s41539-018-0029-6>
17. Lobel A. et al. (2017). Video gaming and children's psychosocial wellbeing: A longitudinal study. *Journal of Youth and Adolescence*, 46(4), 884–897. <https://doi.org/10.1007/s10964-017-0646-z>
18. Chung T. et al. (2019). Will esports result in a higher prevalence of problematic gaming? *Journal of Behavioral Addictions*, 8(3), 384–394. <https://doi.org/10.1556/2006.8.2019.46>
19. Sharov K.S. (2015). Online video games as a factor of social deviation. *Tsennosti i Smysly*, 3(37). Retrieved from <https://cyberleninka.ru/article/n/onlayn-videoigry-kak-faktor-sotsialnyh-deviatsiy>

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE DEVELOPMENT OF STUDENTS' PROFESSIONAL AND TRANSVERSAL COMPETENCIES

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1. Introduction

The rapid advancement of artificial intelligence (AI) has significantly transformed the educational landscape. From personalized learning systems to AI-driven assessment tools, modern education is increasingly influenced by intelligent technologies (Luckin et al., 2016). While these tools offer opportunities for improving academic performance, they also play a crucial role in shaping students' professional and transversal competencies. Professional competencies refer to domain-specific skills and knowledge required in a particular field, whereas transversal competencies include critical thinking, communication, teamwork, adaptability, and digital literacy—skills essential across various professions (OECD, 2021) (Selwyn, 2019). This article explores how AI contributes to the development of both types of competencies, discussing its benefits, challenges, and implications for the future of education.

AI and Professional Competencies

Personalized Learning and Skill Acquisition

AI-powered platforms can adapt to individual learning styles and pace, providing personalized pathways for acquiring professional knowledge (Luckin et al., 2016). For instance, platforms like Coursera or Khan Academy use algorithms to recommend courses and content that align with a student's progress and interests (Holmes et al., 2019). In technical fields like computer science or engineering, AI systems can offer simulated environments where students practice coding, data analysis, or design in real time. These environments help students build industry-relevant skills in a practical and interactive way.

Intelligent Tutoring Systems (Chassignol et al., 2018). Intelligent tutoring systems (ITS) such as Carnegie Learning provide instant feedback, guiding students through complex problems in STEM subjects (Chassignol et al., 2018). These systems mimic one-on-one tutoring, identifying areas where students struggle and offering targeted assistance. As a result, learners develop a deeper understanding of subject matter and improve their problem-solving abilities—core components of professional competency.

Industry-Oriented AI Tools. Many industries now rely on AI-based tools. Training students to use these technologies prepares them for future workplaces. For example, in healthcare, AI helps analyze medical data; in finance, it supports risk assessment and algorithmic trading; in journalism, it assists with content generation. Educational institutions that integrate such tools into curricula enable students to acquire hands-on experience with technologies they will encounter in their careers.

2. AI and Transversal Competencies

Critical Thinking and Decision-Making

AI encourages students to develop critical thinking by presenting complex, data-driven problems that require evaluation and strategic decision-making. Platforms that use adaptive testing challenge students with questions based on their responses, encouraging reflection and analysis. Moreover, AI-based simulation games allow learners to experiment with decisions in virtual scenarios, fostering judgment and responsibility.

Communication and Collaboration

Collaborative AI tools such as virtual whiteboards, shared documents with smart suggestions, or AI-powered discussion forums promote teamwork and communication (Baker & Smith, 2019). Students learn how to express ideas clearly, provide feedback, and build arguments in virtual group environments. These tools also allow real-time language translation, enabling collaboration among diverse, international teams and improving intercultural competence (UNESCO, 2021).

Adaptability and Lifelong Learning (OECD, 2021). As AI continuously evolves, it demands that students remain flexible and committed to ongoing learning. Exposure to AI tools in education fosters adaptability—a key transversal skill (OECD, 2021). Students must learn to cope with technological changes, acquire new digital tools, and refine their methods for solving problems. This adaptability is essential in the modern, rapidly changing workforce (OECD, 2021).

Digital Literacy and Ethics (Selwyn, 2019). Interacting with AI requires a solid understanding of digital tools and ethical considerations. Students learn to interpret AI-generated data, evaluate its accuracy, and understand the limitations of machine learning algorithms. In doing so, they also explore ethical questions related to privacy, bias, and the social impact of AI—fostering responsible digital citizenship.

3. Challenges and Considerations

Access and Equity. Not all students have equal access to AI-powered tools, leading to disparities in skill development. Underfunded schools or regions with limited internet connectivity may fall behind in integrating AI into education. Ensuring equitable access is crucial to avoid deepening the digital divide.

Overdependence on Technology. While AI can support learning, overreliance may hinder the development of self-regulation and independent thinking. Students must be encouraged to use AI as a supplement—not a replacement—for their own reasoning and creativity. Educators play a key role in maintaining this balance.

Data Privacy and Security. AI tools collect vast amounts of student data to function effectively. Protecting this data and ensuring ethical use is a growing concern. Schools and developers must establish clear guidelines for data privacy, emphasizing transparency and student rights.

Teacher Roles and Professional Development. Teachers need training to effectively use AI tools in the classroom. AI should not replace educators but empower them to deliver more targeted and engaging instruction. Professional development programs must help teachers understand AI's capabilities and integrate it meaningfully into their teaching strategies.

4. Future Directions and Educational Policy

To maximize the potential of AI in developing competencies, educational systems must adapt their policies and curricula. This includes: Curriculum Integration: Embedding AI literacy and practical experience with intelligent systems into existing courses across all levels of education.

Assessment Innovation: Moving beyond standardized testing to AI-driven formative assessments that capture a wide range of competencies, including creativity and collaboration.

Ethics Education: Promoting awareness of ethical AI use, digital responsibility, and algorithmic bias through specific courses or modules.

Interdisciplinary Learning: Encouraging cross-disciplinary approaches where students solve real-world problems using AI, blending knowledge from science, humanities, and technology.

Artificial intelligence has immense potential to enhance both professional and transversal competencies among students. By offering personalized learning, fostering critical thinking, supporting collaboration, and preparing learners for real-world technologies, AI is reshaping the way education is delivered and experienced (Luckin et al., 2016). However, its integration must be thoughtful, equitable, and guided by ethical principles. When used effectively, AI not only prepares students for the job market but also empowers them to become adaptive, responsible, and innovative members of society.

References

1. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence Unleashed: An Argument for AI in Education*. Pearson Education. <https://www.pearson.com>
2. Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Center for Curriculum Redesign. <https://curriculumredesign.org>
3. UNESCO (2021). *AI and Education: Guidance for Policy-makers*. United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000376709>
4. Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial Intelligence trends in education: a narrative overview. *Procedia Computer Science*, 136, 16–24. <https://doi.org/10.1016/j.procs.2018.08.233>
5. Baker, R. S., & Smith, L. (2019). *Educ-AI-tion Rebooted? Exploring the Future of Artificial Intelligence in Schools and Colleges*. Nesta. <https://www.nesta.org.uk/report/education-rebooted>
6. OECD (2021). *21st-Century Readers: Developing Literacy Skills in a Digital World*. OECD Publishing. <https://doi.org/10.1787/a83d84cb-en>
7. Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.

Philosophical sciences

INFO-COMMUNICATION SPACE AS A FACTOR OF TRANSFORMATION OF LINGUISTIC THINKING

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The intensive spread of computer technologies and their inclusion in all spheres of society has led to such strong transformations in all spheres of social life that in the 1980s a conclusion was made about the emergence of a 'computerized or information society' as a new stage in the development of human civilisation.

At present, a more general conclusion has been made about the formation of a global system of information and communication technologies as a fundamentally new component of modern civilisation. The emergence of this system was a natural and necessary stage in the development of human society. With its emergence, the noosphere as a planetary shell of the Earth acquired a logically completed form. In a certain sense, the emergence of a global-scale system of receiving (production), processing, storage, transmission, distribution, exchange and consumption (use) of information means the emergence of a single for the whole planet 'system of mental reflection'.

Considering the system of information and communication technologies formed within the framework of human civilisation from this angle, we can conclude that a global-scale system of reflection has emerged. In the process of its functioning and development, this formation begins to manifest its inherent regularities more and more clearly. Since this system emerges within the framework of human civilisation, it necessarily contains fundamental regularities of human cognitive activity, but their implementation also has a number of specific features.

One of the most important regularities of this type is, in our opinion, the deep unity of language and thinking, which is traditionally treated as a single phenomenon of 'linguistic thinking'.

The formation of a global system of information exchange was initially perceived as the emergence of a civilizational tool that provides most people with enormous opportunities for direct and rapid access to the spiritual riches of mankind. However, the real processes show a significantly different picture.

First of all, there is an exponential growth in the volume of information irresponsibly channeled into the system of information and communication technologies. As a result, the World Wide Web is overflowing with information that distorts objective reality to a greater extent than it reflects it. The perniciousness of this trend has become so obvious that the task of switching to a new format of the Internet has already been set, when the information sent to the network will be received there only after evaluation by the expert community. However, it is not very clear who will form this expert community and on what grounds, give it appropriate powers, etc. But the very formulation of this problem in such a way indicates the acuteness of this problem.

However, the above-mentioned problem is rather obvious and, accordingly, superficial. In our opinion, the processes that lead to outwardly imperceptible, but from these more profound transformations of consciousness of both an individual and entire social groups are of much greater importance. One of the factors forming this negative trend is, obviously, the constant simplification and distortion of linguistic means used by individuals in the virtual environment.

The change of linguistic thinking in general as a phenomenon of communication in the virtual environment is apparently becoming a mass character. This process turns into a regularity in the sense that it becomes a characteristic feature of communication of the overwhelming majority of participants, i.e., it turns into an empirically fixed norm. Once formed, it then becomes a necessary condition for new participants to 'enter the environment' regardless of their own attitudes.

The result of this process is the formation of contradictions at the basic, fundamental levels of consciousness and linguistic culture of the personality. Personality is formed in a normal cultural and linguistic environment at the earliest (and therefore most important) stages of socialisation. During this

period, on the basis of linguistic thinking, among other things, basic programmes are laid down, which later determine the social behaviour of a person. These programmes, even if they are not fully realised, are always expressed in a concrete linguistic form corresponding to the language of communication. And in the future the personality has to switch to a different form of communication, which, on the one hand, functions within the existing linguistic thinking, but, on the other hand, differs significantly from the accepted and fixed in the consciousness norms. Communication in the virtual environment is perceived by the subject as a very important component of his/her life activity. As a result, there is a deep contradiction between the norms and ideals laid down at the early stages of personality formation, on the one hand, and the rules of current communication, on the other. A certain 'bifurcation' of a person's personality arises, which can unambiguously lead to negative consequences of the functioning of both his individual consciousness and social behaviour. In fact, there is a situation when the mass of people communicating in the virtual environment are not the same people who have already formed in it. This is a very powerful factor causing deep and ever-present stress, which can develop into various hidden mental disorders and abnormal behaviour. Let us specially note that this phenomenon has already become truly mass. Therefore, it is quite difficult to foresee all possible consequences of it. Earlier, for example, it was clear that employees of intelligence services, working 'under a legend', experience enormous psychological difficulties. But there were few of them, they were specially selected and underwent special training. Now tens of millions of people of mostly young age, whose psyche is often not yet fully formed, begin to exist in similar conditions.

The desire for the maximum possible number of contacts, present among users of social networks, obviously pushes to the emergence of their specific language, when the requirements of elementary literacy in writing messages disappear, words are replaced by combinations of individual letters, etc. The appearance of acceleration of communication processes is created. The appearance of acceleration of communication processes is created, but in reality, the opposite happens. Communication loses its depth and becomes more superficial. In fact, there is no communication as such. However, negative transformations of consciousness are present with necessity.

The inseparable connection between language and thinking leads, first of all, to simplification and parameterization of thinking activity. An individual who is constantly involved in such communication gradually loses the ability to solve new problems, and finds himself unable to perceive information above a certain limit of complexity, which ten years ago was considered obvious for his age.

In addition, the integrity of human consciousness developed during the previous development is broken. New verbal constructs are incorporated into the already existing structure of consciousness as initially contradictory components. As a result, they come into conflict with the structures of perception of reality and thinking that have already developed in a person. These foreign components are like computer viruses. Only they affect the basic levels, which were laid during the earliest socialisation of the personality and then are the most important and, at the same time, difficult to understand. As a result, the integrity of human consciousness formed over the years is broken.

The observed parameterization of consciousness as a consequence of the simplification of linguistic means of communication is also expressed in a significant loss of aspiration to master new things. Sufficiently large social groups show in modern conditions a steady apathy to learning, to mastering new knowledge. We can say that there is already a certain 'ideology' justifying the lack of usefulness of knowledge in general.

Thus, we can conclude that modern info-communication technologies can be considered as a global system of human consciousness. The internal regularities of the virtual environment development, orienting to the constant expansion of the number of contacts to the detriment of their quality, lead to an undesirable simplification, parameterization of language means used in the process of communication.

Technical sciences

METHODS FOR ANALYZING STUDENTS' ACADEMIC PERFORMANCE USING NEURAL NETWORKS

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НЕЙРОНДЫҚ ЖЕЛІ АРҚЫЛЫ СТУДЕНТТЕРДІҢ ОҚУ НӘТИЖЕСІН ТАЛДАУ ӘДІСТЕРІ

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Abstract

This paper explores the application of neural networks to analyze students' academic performance in higher education. The study focuses on the use of Radial Basis Function Neural Networks (RBFNN) and perceptron-based algorithms to predict students' success based on various input parameters such as previous academic records, attendance, and test scores. Additionally, clustering algorithms like hierarchical clustering and k-means are examined to categorize students by performance levels. The comparative analysis shows that k-means is more efficient in handling large educational datasets. The research highlights the advantages and limitations of neural networks in educational analytics and suggests effective strategies for implementing machine learning in academic settings.

Аңдатпа

Бұл мақалада жоғары оқу орындарында студенттердің оқу жетістіктерін талдау үшін нейрондық желілерді қолдану мәселесі қарастырылады. Зерттеуде Радиалды базистік нейрондық желі (RBFNN) және персептрон негізіндегі алгоритмдер қолданылып, студенттің үлгерімін болжау үшін алдыңғы бағалары, сабаққа қатысуы мен білім деңгейін бағалау нәтижелері секілді параметрлер есепке алынады. Сонымен қатар, студенттерді оқу үлгерімі бойынша топтастыруда иерархиялық және k-means кластерлеу алгоритмдері салыстырылады. Талдау нәтижесі k-means алгоритмінің үлкен көлемдегі білім беру деректерін өңдеуде тиімдірек екенін көрсетті. Зерттеу нейрондық желілердің артықшылықтары мен шектеулерін сипаттап, оларды білім беру жүйесіне енгізу бойынша ұсыныстар ұсынады.

Keywords: Neural networks, student performance, academic analytics, RBFNN, perceptron, clustering, k-means, hierarchical clustering, educational data mining.

Кілттік сөздер: Нейрондық желілер, студенттің үлгерімі, білім беру аналитикасы, радиалды базистік нейрондық желі, персептрон, кластерлеу, k-means, иерархиялық кластерлеу, білім беру деректерін өңдеу.

Нейрондық желілер - бұл адам миының жұмысын имитациялайтын алгоритмдер. Олар бір-бірімен ақпарат алмасатын өзара байланысты тораптардың массивінен тұрады, дендриттер мен аксондармен байланысты ми нейрондары ақпаратпен алмасады [6].

Нейрондық желілер оқытылатын алгоритмге жатады. Олар уақыт өте отырып, түрлі мысалдарды бақылап, адам бақылауы арқылы оқи алады. Алайда, адамдарға қарағанда нейрондық желілерге жеткілікті болжамдық қабілетке жету үшін көп бақылау қажет.

Нейрондық желілер ішкі ақпараты параллель өңделетіндіктен, жіктеудің басқа алгоритмдерінен ерекшеленеді.

Нейрондық желілер студенттердің үлгерімін болжау үшін белсенді қолданылады.

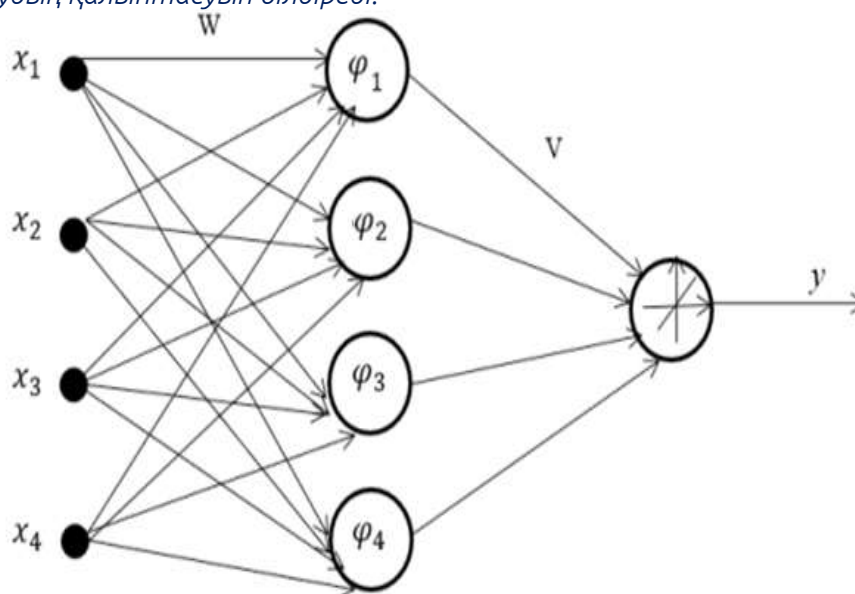
Радиалды базистік нейрондық желі негізінде студенттердің үлгерімін болжаудың математикалық моделінің мысалын қарастырайық. [6]

Радиалды типтегі қарапайым нейрондық желі p әр түрлі кіріс векторларын x_i мұнда $i=1,2,\dots, p$, бейнелеуде тұратын көп өлшемді интерполяция принципі бойынша жұмыс істейді, мұнда $i=1,2,\dots, p$, кіріс N -өлшеуіш кеңістіктен d_i мұнда $i=1,2,\dots, p$, сандарының жиыны.

Осы үдерісті жүзеге асыру үшін P жасырын нейрондарды радиалды типті пайдалану және түр интерполяция шарты орындалатын $F(x)$ бейнелеудің (1 -формула) осындай функциясын көрсету қажет.

$$F(x) = d_i \quad (1)$$

Шығу сызықтық нейрондарымен таразылармен байланысқан жасырын нейрондар P пайдалану шығудың қалыптасуын білдіреді.



1-сурет – Студенттің үлгерімін болжау үшін радиалды базистік нейрондық желінің құрылымдық сұлбасы

1-сурет бейнелейді:

x_1 -алдыңғы аралас пәндер бойынша студенттің орташа бағасы, оларды толық көлемде игеру қажетті шарт болып табылады;

x_2 - еркін бару;

x_3 -Берілген пәнді оқу алдында жүргізілетін қалған білімді тестілеу үшін баға;

x_4 - Басқа пәндер бойынша қарыздардың болуы.

$\varphi_1, \dots, \varphi_4$ - W салмақ коэффициенттерімен бастапқы деректерді беретін радиалды функциялар;

V -берілген салмақ коэффициенттері бар жасырын нейрондардан шығыс сигналдарын жинақтауды орындайтын сызықтық нейрон;

y -желінің шығуында алынатын пән бойынша болжамды баға.

Білім беру деректерін жіктеу мәселелерін шешу үшін көбінесе персептронға негізделген алгоритмдері қолданылады, мысалы WINNOW алгоритмі. Персептрон екі сыныпты жіктеуді қолдайды. Басқаша айтқанда, ол x объектісінің жаңа түрін, егер 3 - формуладағыдай шарт орындалса, 2-сыныпқа немесе 2 – формулада көрметілгендей емес жағдайда 1-сыныпқа жіктейді.):

$$\sum_i x_i w_i > \theta \quad (2)$$

Ол бір түрін қабылдайды және қажет болған жағдайда w_i салмағын жаңартады.

Персептрон w_i және θ өз салмағын инициализациялайды, болжалды y' класын есептеу үшін шек ережесін қолдана отырып, содан кейін (x, y) бір түрін қабылдайды.

Егер, $(y' = y)$ болжау класы дұрыс болса, персептрон әрекет етпейді. Алайда, егер болжанған сынып дұрыс болмаса, персептрон өз салмағын жаңартады.

Оқыту түрінен, оқыту үшін персептрон алгоритмін пайдаланудың ең көп таралған тәсілі - бұл бүкіл оқыту жинағы үшін дұрыс болып табылатын болжамдау векторын тапқанға дейін оқыту жинағы арқылы алгоритмді бірнеше рет орындау. Бұл болжау ережесі, содан кейін тест жиынтығында белгі болжау үшін пайдаланылады. [2]

Нейрондық желілердің артықшылықтары:

- барлық желі бойынша ақпаратты сақтау;
- толық емес біліммен жұмыс істей білу;
- істемеуін болдырмау;
- таратылған жады;
- машиналық оқыту мүмкіндігі;
- параллельді өңдеу мүмкіндігі.

Нейрондық желілердің кемшіліктері:

- аппараттық тәуелділік;
- нәтиженің болжамды болуы;
- шешім қабылдаудың көп кезеңдері;
- ішкі проблемаларды табу қиындығы.

Сондай-ақ, шешім ағаштарының негізіндегі жіктелмелерге қарағанда нейрондық желі өзінің нәтижесіне қалай қол жеткізгені туралы қандай да бір айқын түсініктерді сақтамайтынын атап өткен жөн, бұл оның функционалдық мүмкіндіктерін айтарлықтай төмендетеді.

ЖОО-да студенттің үлгерімін талдау үшін кластерлеу алгоритмдері:

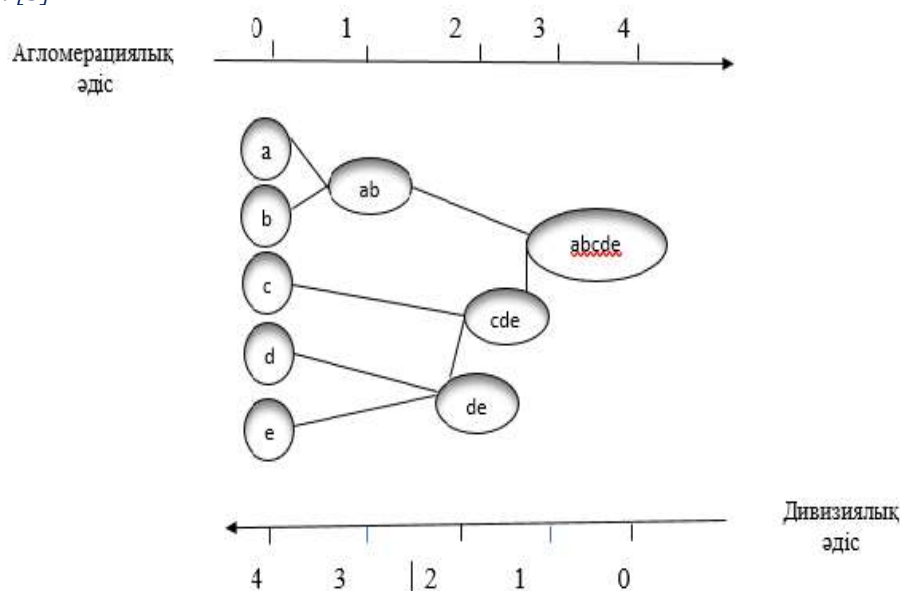
Дереккөздерді талдау, ЖОО-да үлгерімді талдау үшін кластерлеу алгоритмдері қолданылады, олар:

- иерархиялық кластерлеу;
- k-means.

Алгоритмдерді қарастырайық және салыстырайық.

Иерархиялық кластерлеу алгоритмдері

2-суретте иерархиялық кластеризация әдістері жақындық матрицасы негізінде құрылған дендрограмма – ағаштарды құрудың агломерациялық және дивизиялық иерархиялық әдістері болып бөлінеді. [3]



2-сурет – Иерархиялық кластерлеу процесі

Агломерациялық алгоритмдерде жаңа кластерлер өте ұсақ кластерлерді біріктіру жолымен құрылады, яғни кластерлер бір ғана кластер қалғанға дейін біртіндеп біріктіріледі.

Дивизиялық иерархиялық алгоритмдері үлкен кластерді шағын кластерге бөлуге негізделген.

Иерархиялық кластерлеу алгоритмдеріне мыналар жатады:

Жақын көршінің әдісі.

3-формулада екі кластердің арасындағы қашықтық әр түрлі кластерлерден екі элемент арасындағы ең аз қашықтыққа тең болады.

$$\min\{d(a, b): a \in A, b \in B\} \quad (3)$$

мұндағы:

$d(a, b)$ – A және B кластерлеріне тиесілі a және b элементтері арасындағы қашықтық.

Алыс көршінің әдісі.

4-формулада екі кластердің арасындағы қашықтық әр түрлі кластерлерден тұрады.

$$\max\{d(a, b): a \in A, b \in B\} \quad (4)$$

Уорд Әдісі.

Бұл әдісте 5-формулада көрсетілгендей кластерлер арасындағы қашықтықты бағалау үшін дисперсиялық талдау қолданылады.

$$\Delta = \sum_i (x_i - x)^2 - \sum_{x_i \in A} (x_i - a)^2 - \sum_{x_i \in B} (x_i)^2. \quad (5)$$

Әрбір қадамда алгоритмнің екі кластері біріктіріледі, олар дисперсияның ең аз өсуіне әкеледі. Бұл әдіс жақын орналасқан кластерлермен тапсырмалар үшін қолданылады. Иерархиялық кластерлеудің артықшылықтарына түсіну мен іске асырудың қарапайымдылығы жатады.

Иерархиялық кластерлеудің кемшіліктері ол ең жақсы шешімді сирек қамтамасыз етеді, көптеген еркін шешімдерді қамтиды, толық емес деректермен жұмыс істемейді, аралас деректер типтерімен нашар жұмыс істейді және үлкен деректер массивімен нашар жұмыс істейді, бұл әсіресе ББДЗТ үшін маңызды.[1]

K -means алгоритмі:

K -means кластерлеу алгоритмі иерархиялық емес кластерлеу алгоритмдеріне жатады.

Бұл алгоритм қиылыспайтын, жазық (иерархиялық емес) кластерлердің белгілі бір санын генерациялауға негізделген.

Математикалық алгоритм k -means келесі 6-формуламен сипатталады

$$V = \sum_{i=1}^k \sum_{x_j \in S_i} (x_j - \mu_i)^2 \quad (6)$$

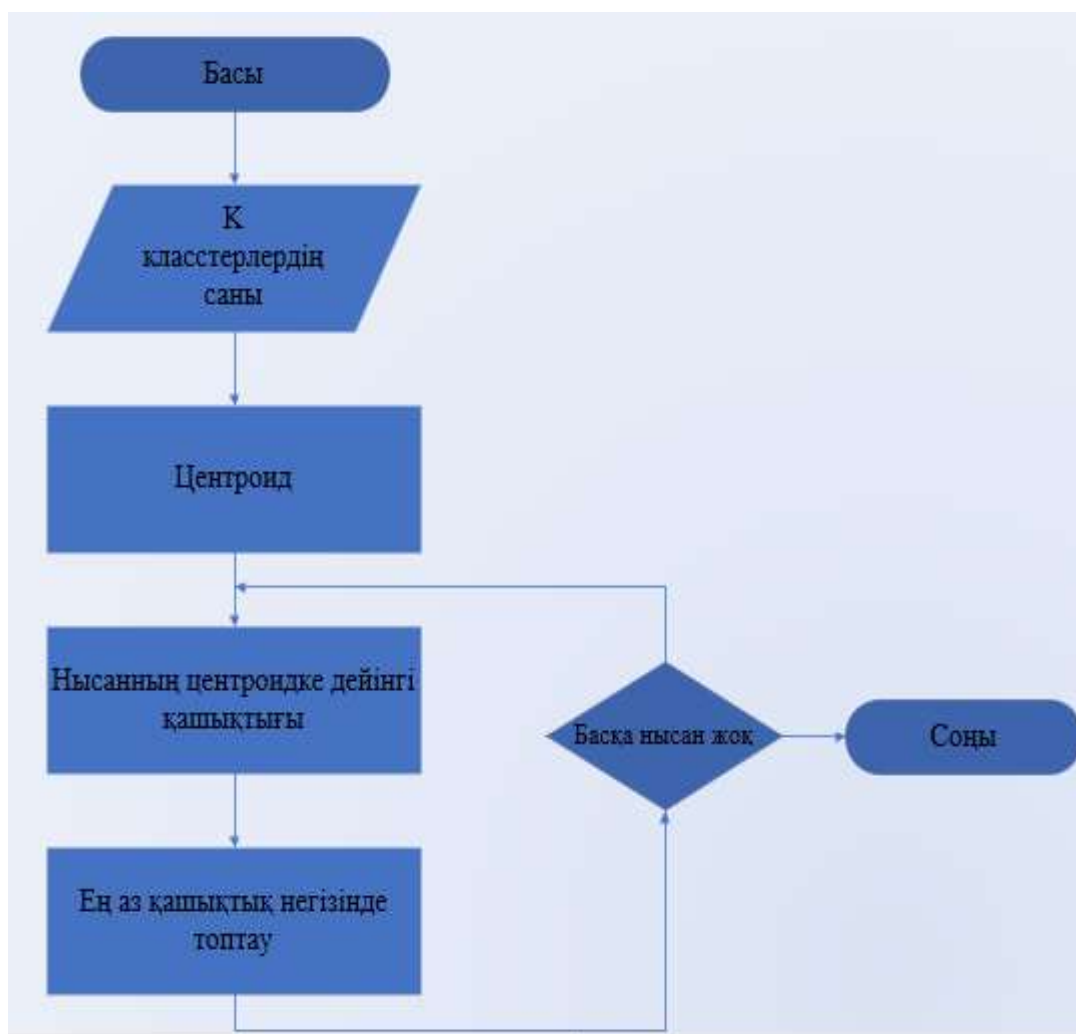
мұндағы:

k - кластерлер саны;

S_i – алынған кластерлер;

μ_i – векторлардың массасы орталықтары (центроидтер) $x_j \in S_i$. ($i = 1, 2, \dots, k$).

k -means алгоритмі 3-суретте көрсетілген.



3-сурет – k-means алгоритмі

Алгоритмнің артықшылықтары:

- үлкен деректер мен кіші деректер k үшін бұл алгоритм көп жағдайда иерархиялық кластеризация қарағанда жылдам жұмыс істейді;
 - k-means иерархиялық кластерлерге қарағанда тығыз кластерлер құрады;
 - центроидтардың қайта есептелетін түрі басқа кластерге ауыса алады.
- Python + OpenCV тілінде k-means алгоритмінің коды 4-суретте көрсетілген.

```

if name == "main":

color_tab = [CV_RGB(255,0,0),CV_RGB(0,255,0),CV_RGB(100,100,255).
CV_RGB(255,0,255),CV_RGB(255,255,0)]
img = cvCvtColor(cvSize(500,500),8,3)
rng = cvRNG(-1)
cvNamedWindow("clusters".1)
while True:
    cluster_count = cvRandInt(rng)%(MAX_CLUSTERS-1)+2
    sample_count = cvRandInt(rng)%999 +1
    points = cvCvtColor(sample_count, 1, CV_32FC2)
    clusters = cvCreateMat(sample_count, 1, CV_32SC1)
    for k in range(cluster_count):
        first = k*sample_count/cluster_count
        last = (k+1)*sample_count/cluster_count if k! = cluster_count else
sample_count
        if first<last:
            cvScalar(cvRandInt(rng)%img.width,cvRandInt(rng)%img.height),
            cvScalar(img.width*0.1,img.height*0.1))
            cvRandShuffle(points,rng)
        # K Means Clustering
        cvKMeans2(points, cluster_count, clusters,
        cvTermCriteria(CV_TERMCRIT_EPS=CV_TERMCRIT_ITER, 10,1/0))
        cvZero(img)|
    for i in range(sample_count):
        pt = points[i,0]
        cvCircle(img, cvPoint(cvRound(pt[0]),cvRound(pt[1])), 2,
        color_tab[clusters[i,0]], CV_FILLED, CV_AA,0)
        cvShowImage("clusters", img)
        if '%c'(cvWaitKey(0)&255) in ['x 1b','q','Q']: #'ESC'
break

```

4-сурет – k-means алгоритмінің коды

K-means алгоритмінің кемшіліктері:

- *k* мәнін болжау қиын;
- жағандық кластерлермен нашар жұмыс істейді;
- әр түрлі бастапқы бөлімдер әртүрлі соңғы кластерлерге әкелуі мүмкін;
- әртүрлі өлшемдегі және әртүрлі тығыздықтағы кластерлермен (бастапқы деректерде) жұмыс істемейді.

K-means алгоритмінің бір түрі бар - "алыс бірінші" (*Farthest first clustering*) алгоритмі. Бұл нүкте деректер аймағында болуы керек.

Мұндай тәсіл көптеген жағдайларда кластерлеуді едәуір жеделдетеді, өйткені қайта тағайындау мен баптауларды аз талап етеді.

Белгілі зерттеулердің нәтижелерін есепке ала отырып ЖОО студенттерінің үлгерімін талдау есептерін шешу үшін кластерлеу алгоритмдеріне салыстырмалы талдау жасалды.[4]

Алгоритмдерді салыстыру келесі тарауда сипатталған *Weka* бағдарламасының көмегімен жасалған.

Кластерлеу алгоритмдерін талдау нәтижелері 1-кестеде келтірілген.

1-Кесте – ЖОО студенттерінің үлгерімін талдау есептерін шешу үшін кластеризация алгоритмдерінің сипаттамаларын салыстыру

Сипаттама / Алгоритм	k-means	Иерархиялық алгоритмдер
1	2	3
Үлкен деректерді өңдеу тиімділігі	+	-
1	2	3
Әр түрлі құрылым кластерлерін бөлу қабілеті	+	-
Есептеу күрделілігі	+	-
Барлығы	3	0

Кестеде көрсетілгендей, k-means алгоритмінде ең жоғары көрсеткіштер, бұл үлкен деректер негізінде жоғары оқу орындарындағы үлгерімді талдау есептерінде кластерлеу үшін оны кеңінен қолдануды негіздейді.[5]

Қорытынды

Зерттеу нәтижелері нейрондық желілердің студенттердің үлгерімін болжау мен талдауда тиімді құрал екенін көрсетті. Радиалды базистік нейрондық желі және перцептрон алгоритмдерін қолдану арқылы студенттердің болашақтағы оқу жетістіктері дәл болжауға болады. Сонымен қатар, кластерлеу әдістерін салыстыру барысында k-means алгоритмі үлкен көлемдегі деректермен тиімді жұмыс істейтіндігі анықталды. Нейрондық желілердің кейбір шектеулеріне қарамастан (мысалы, интерпретация қиындығы мен мәліметтерге тәуелділік), олар білім беру жүйесіндегі аналитикалық процестерді жетілдіруге үлкен мүмкіндік береді.

References

1. Calders, T., & Pechenizkiy, M. (2011). Introduction to the special section on educational data mining. *ACM SIGKDD Explorations*, 13(2), 3–6.
2. Romero, C., & Ventura, S. (2013). Data mining in education. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 3(1), 12–27.
3. Efremova, N.F. (2012). Competencies in education: Formation and assessment. Moscow: National Education. (In Russian)
4. Rudinsky, I.D. (2004). Fundamentals of formal-structural modeling of educational systems and automation of pedagogical knowledge testing. Moscow: Hot Line - Telecom. (In Russian)
5. Naikhanova, L.V., & Dambaeva, S.V. (2004). Methods and algorithms for decision-making in managing the educational process under uncertainty: A monograph. Ulan-Ude: Publishing House of VSGTU. (In Russian)
6. Barsky, A.B. (2016). Introduction to neural networks [Electronic resource]. Moscow: Internet University of Information Technologies (INTUIT). – 358 p. Access mode: <http://www.iprbookshop.ru/52144.html> (accessed 02.04.2019). (In Russian)

IMPLEMENTATION AND EFFICIENCY ANALYSIS OF THE BUBBLE SORT ALGORITHM USING THE MPICH PARALLEL COMPUTING LIBRARY

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Abstract

This article explores the implementation of bubble sorting using the MPICH parallel computing library. It compares the performance of sequential and parallel sorting methods, analyzing time costs and the acceleration achieved. The practical section includes the development of a program that demonstrates the distribution of calculations across multiple nodes, as well as testing on data sets of varying sizes. The results highlight the advantages of parallel approaches when dealing with large data arrays. This article aims to provide an in-depth study of the MPICH library's capabilities, parallel programming techniques, and the development of algorithm optimization skills for distributed systems. In conclusion, it emphasizes the significance of parallel computations in addressing modern data processing challenges.

Keywords: data, parallel, library, project, MPI, MPICH

Introduction

Currently, the rapid development of information technologies has led to an increase in data volumes and the complexity of computational tasks. In this context, traditional sequential computing methods begin to lose their effectiveness. One of the efficient ways to address this issue is the use of parallel computing technologies. Parallel computing is a method of dividing a computational task into several parts and executing them simultaneously on multiple processors. This approach reduces computation time and allows for more efficient use of resources [1].

One of the widely used tools for organizing parallel computing is the MPI (Message Passing Interface) standard. MPI ensures interaction between processes through message passing, enabling the creation of parallel programs. One of the popular libraries that implement the MPI standard is MPICH. It provides high performance and scalability while being compatible with various architectures. The goal of this project is to develop a parallel version of the bubble sort algorithm using the MPICH library and investigate its performance by comparing it with the sequential version [2]. As part of the research, a computing environment is prepared, a method for data distribution among processes is proposed, and experiments are conducted with different data sizes.

The theoretical and practical significance of this project lies in its potential to deepen the understanding of parallel programming principles and develop skills for efficiently working with large datasets. This work can serve as a valuable resource for students and programmers interested in the field of parallel computing [3].

MPICH — MPI Implementation for Message Passing Between Processes. One of the key aspects in ensuring the efficiency of parallel computing is the seamless interaction and data exchange between processes. To address this issue, the MPI (Message Passing Interface) standard has been developed and is widely used in parallel programming. One of the most popular and open-source implementations of the MPI standard is MPICH [4].

MPICH is a library designed for creating parallel programs on multi-processor systems and clusters. It is highly performance-oriented and offers broad platform compatibility. MPICH operates on operating systems such as Linux, Windows, and macOS, allowing programmers to efficiently share data between processes.

A Tool for Organizing Parallel Computations Based on the MPI Interface in Python.

The Python language, with its simplicity and broad capabilities, is widely used in modern scientific research, data analysis, and modeling. However, standard Python tools do not fully support parallel computing. To address this issue, the specially developed mpi4py library serves as a powerful tool that enables the use of the MPI (Message Passing Interface) in the Python environment [5].

mpi4py is a library that implements parallel programming by adapting low-level C/C++ based MPI functions to Python, providing a simple and convenient interface. It supports all the key operations of the MPI standard: point-to-point and collective communication, process synchronization, data distribution, and reduction. Key features of the mpi4py library:

- **Point-to-Point Communication:** Enables direct data exchange between processes. The `Send()` and `Recv()` methods are used for this purpose.
- **Collective Operations:** Performs operations such as broadcasting the same data to multiple processes (`bcast`) or combining the results of several processes (`reduce`).
- **Asynchronous Operations:** Processes can perform other calculations while exchanging data, enhancing performance and efficient use of computational resources.
- **Scalability:** mpi4py works across a wide range of computing systems, from local networks to high-performance supercomputers.

Advantages of Parallel Computations and Organizational Principles

Parallelism is the primary method for accelerating the computation process by processing multiple data elements simultaneously. This approach is achieved by involving several functional units (processors, cores, arithmetic-logic blocks) [6]. When a computational task can be divided into information-independent parts, distributing these parts across different computing devices to be executed concurrently can significantly reduce the overall computation time.

This approach offers considerable time savings compared to sequential computations. The degree of speedup depends primarily on the number of available processors and the number of computation tasks that can be executed in parallel.

Experimental Results

In this section, a parallel version of the bubble sort algorithm is presented using the MPICH library. The main objective of the work is to increase computational efficiency by applying parallel programming principles. Setting Up the MPICH Environment [7].

MPICH is a high-performance library that implements the MPI (Message Passing Interface) standard, which is widely used for parallel and distributed computing. To work with MPICH, the following steps must be taken:

1. Install the MPICH library on the selected operating system;
2. Configure the environment to enable the execution of MPI programs across multiple processors or nodes;
3. Verify the network connection between all nodes.

Parallelizing Bubble Sort

The classical bubble sort algorithm sequentially compares and swaps adjacent array elements if needed. In the parallel version, computation is carried out in the following stages:

1. **Splitting the array:** The original array is divided into multiple subarrays;
2. **Distribution:** The main process (rank 0) distributes these subarrays to the other processes;
3. **Local Sorting:** Each process independently sorts its subarray;
4. **Gathering and Merging:** The sorted subarrays are collected by the main process and merged into a fully sorted array.

Discussion

Data Preparation and Sorting. Data preparation and sorting are crucial steps when working with large volumes of information. These processes help structure the data, make it suitable for analysis, and enhance computational efficiency.

Data Preparation Steps:

- **Collection:** Data is gathered from various sources (sensors, databases, web resources).
- **Cleaning:** Duplicate, erroneous, or incomplete records are processed to improve data quality.
- **Transformation:** Data is converted into a numerical or specific structural format.
- **Partitioning:** Large datasets are divided into smaller parts to make them suitable for parallel processing. Sorting involves organizing data in a specific order, which improves search, analysis, and computational efficiency. Sorting algorithms are chosen based on data size and structure: simple ones like bubble sort, and more complex ones such as quicksort and merge sort [8].

In modern large-scale data applications, parallel and distributed sorting methods are frequently used. These methods divide the computation across multiple processes, enhancing performance. MPI technology is widely used for this purpose.

Generating a Random Array and Distributing it Using MPI Scatter. In parallel computing, efficient data distribution is crucial. The MPI (Message Passing Interface) technology provides several functions to address this issue, one of which is `MPI_Scatter`. Generating a Random Array: This process is carried out by the main process (rank 0). The random array is often used for testing as its contents are not predefined, allowing for an evaluation of the algorithm's flexibility.

Thus, MPI-based parallel data distribution and processing enable the fast and efficient handling of large-scale computations [9].

Local Sorting Using Bubble Sort. Bubble Sort is a simple sorting algorithm that compares adjacent elements and swaps them if necessary. It is frequently used for sorting small datasets and educational purposes. Bubble Sort Algorithm. The principle of bubble sort is that in each iteration, the largest (or smallest) element "bubbles" to the end of the array. The sorting repeats until no more swaps are needed. Local Sorting: This refers to sorting only a portion of a large array. This approach is frequently used in parallel sorting and significantly reduces processing time [10].

Collecting Results and Visualization. In parallel computing, one of the final and crucial stages is collecting and effectively presenting the results. After each process has handled its part of the data, the intermediate results are gathered and combined to form a comprehensive conclusion. This process is widely used in scientific research, engineering calculations, and business analytics.

The Role of Collecting Results: In parallel computation, a large task is distributed across several processes. After each process completes its part, results are gathered to form the final output. This phase addresses:

- Combining distributed data into a single structure.
- Improving execution speed.
- Facilitating easy conclusions and visualizations.

Collection Methods: Special collective operations are used to gather results. For example, in MPI, `Gather` and `Reduce` functions are used to collect results into the main process (usually rank 0).

Sometimes, the collected data needs to be further processed: calculating averages, performing statistical analysis, or identifying correlations. When gathering large volumes of results into a single processor is inefficient, distributed collection methods are used, where data is processed and merged in multiple stages. *Displaying and Storing Results:* Presenting the results in a structured and visual format is essential for better understanding.

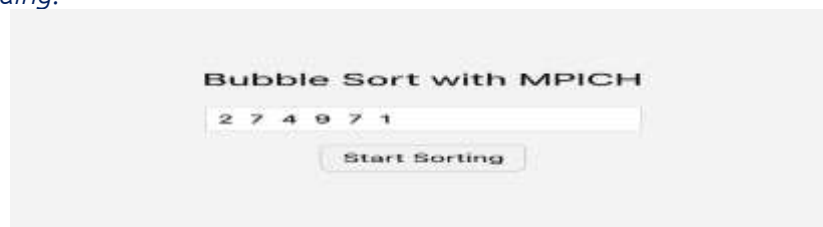


Figure 1. Project Interface

Figure 1 shows the user interface designed for parallel execution of the bubble sort algorithm using MPICH. At the top of the interface, there is a title that describes the purpose of the application. Below it, there is a text field where the user can enter a sequence of numbers separated by spaces, allowing for the input of initial data to be sorted.

Below the text field, there is a "Start Sorting" button. When this button is clicked, the parallel sorting process is initiated. The interface features a simple and minimalist design: the main area includes an empty space where sorting results or feedback (such as errors, time indicators, etc.) can be displayed. The visual simplicity of the interface and the absence of excessive graphical elements make it functionally oriented, especially useful for educational or experimental purposes. The use of MPICH technology indicates that the interface supports distributed or parallel processing capabilities.



Figure 2. Invoking the Bubble Sort Function Using MPICH

Figure 2 shows a terminal interface where a command is executed to perform a parallel computing task. The user selects a directory in the system and runs a Python script using the MPICH environment. This process is executed in a multiprocessor or multi-core environment, which is commonly used for parallel computations.

By utilizing four processors or cores, the computational task is divided among multiple processes, enhancing the efficiency of the operation and maintaining high performance. This demonstrates a practical application of MPI (Message Passing Interface).

The combination of MPICH and Python aims to support scalable solutions and research-oriented development. The environment provides an effective technical infrastructure for testing or implementing high-performance computing methods.

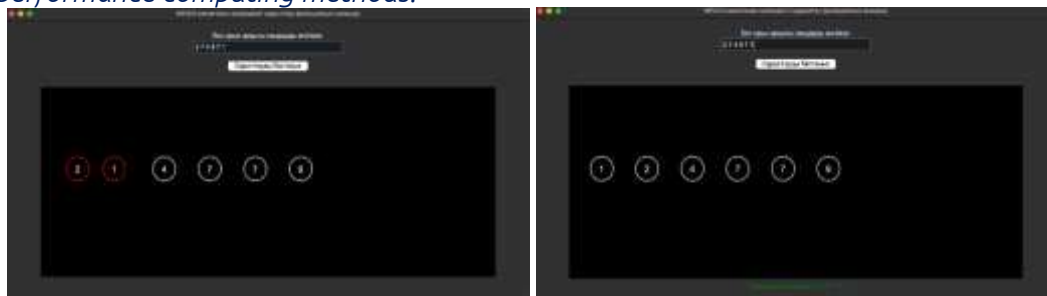


Figure 3. Execution Process of the Project

Figure 3 illustrates an intermediate stage of the bubble sort algorithm's execution. This process involves comparing adjacent elements in the input array and performing necessary swaps to arrange them in ascending order. Process Breakdown:

1. **Comparison:** The algorithm compares the first two numbers (2 and 1). Since $2 > 1$, a swap is needed to place the smaller number (1) before the larger one (2).
2. **Selection:** Red circles visually highlight the elements being evaluated at this stage, allowing the user to easily identify which pair is currently being processed.
3. **Sorting Phase:** After the swap, the algorithm proceeds to the next pair of adjacent elements in the array. If necessary, the comparison and rearrangement process is repeated.

Conclusion

This work has explored the fundamental methods and approaches of parallel computing, examining their efficiency and areas of application in detail. Key stages such as data preparation and sorting, data distribution among processes (Scatter), local sorting techniques, and the collection and output of results have been thoroughly studied. Each step forms the foundation of large-scale data processing and significantly impacts both performance and computational accuracy.

During the data preparation stage, the importance of improving data quality and standardizing its structure was emphasized. This phase enhances the effectiveness of all subsequent parallel computing processes and enables high-performance sorting and analysis. Data cleaning and standardization are essential to ensure the overall efficiency of parallel computations.

The effectiveness of using a local sorting method was demonstrated through the bubble sort algorithm. While this method proves efficient for small datasets, it may be less effective when handling larger volumes of data. Therefore, its use should be limited to specific scenarios. In parallel computing, the bubble sort technique allows data to be divided into segments and sorted independently. The MPI Scatter method plays a crucial role in distributing data across processes. It ensures efficient data allocation, helping accelerate computations. The Scatter function saves time and facilitates parallel execution, making it particularly useful in processing large datasets and in distributed systems.

The process of result collection and visualization represents the final and essential phase of the research. At this stage, effective storage and display of the processed data ensure accessibility, supporting users in understanding the outcomes and making informed decisions based on them.

Overall, this study highlights the essential components of parallel computing and demonstrates how closely interconnected they are. The successful execution of each phase directly impacts computational performance. These approaches offer efficient methods for working with large datasets and are applicable in various fields, from scientific research and engineering calculations to business analytics. Parallel computing is a vital tool for efficiently processing large-scale data to solve modern-day problems, and its future holds significant promise for innovation and advancement in the field.

References

1. Ivanov, E. N., Kozlov, P. V. Using MPI in Distributed Computing Calculations. — Vestnik, 2018. — 252 p.
2. Petrov, A. Yu. Optimization of Sorting Algorithms in Distributed Systems. — Proceedings of the Conference "Parallel Computing", 2019. — 105 p.
3. Zakharov, V. I., Popov, M. N. Principles of Using MPI in Scientific Research. — Vestnik NSU. Series: Mathematics and Mechanics, 2020. — 192 p.
4. Tikhonov, I. P. Efficiency of MPI in Processing Large Data Arrays. — Journal of Computations, 2017. — 118 p.
5. Muratova, G. I., Serikbayeva, S. K. Features of Parallel Computing Systems. — Almaty, 2020. — 240 p.
6. Nikolaev, S. K., Borisov, E. V. MPI and Its Role in Developing High-Performance Applications. — Scientific Journal "Innovations", 2018. — 230 p.
7. Kuznetsov, R. A. MPICH: Development and Optimization of Parallel Algorithms. — Izvestiya of Universities, 2016. — 93 p.
8. Lebedev, O. N. MPI: Performance Analysis of Distributed Systems. — Materials of the International Conference "High-Performance Computing", 2019. — 264 p.
9. Grigoryev, V. S., Orlov, N. D. Modern Libraries for Parallel Computing: Overview and Practice. — Bulletin of Tomsk University, 2021. — 241 p.
10. Kuzmichev, A. V. Distributed Computing: Theory and Practical Use of MPI. — Scientific Research and Development, 2020. — 102 p.

ANALYSIS OF THE POSSIBILITIES OF USING THE DEVELOPED METHOD TO PREDICT THE TIME AND LOCATION OF EARTHQUAKES

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Abstract

Modern approaches to the use of multiple geodetic observations for earthquake prediction are based on the identification of deformation signs of their preparation. The following hypotheses are known that help to obtain information about the approach of a strong seismic event: the "theory" of elastic recoil, the existence of periodic occurrence of earthquakes. The hypothesis that the seismic process is a deformation process is quite convincing. To date, there are no sufficiently reliable models for assessing the threat of an approaching strong earthquake based on the study of deformations of the earth's surface.

Prerequisites for geodetic control of seismic hazard

The mechanism of earthquake preparation has not yet been sufficiently studied. Today, researchers of many natural sciences are studying the nature of earthquakes: from seismology, tectonophysics and geomechanics to fluid dynamics and hydrometeorology. Given the seriousness of the problem, today, along with geodesy, many areas of geophysics are relevant for studying the preparation of seismic events within the framework of their ideas, methods and accumulated experience. Today, the position that an earthquake is a deformation process is considered with full confidence. It is believed that an earthquake occurs as a result of the accumulation and discharge of tectonic stresses in the earth's crust. The degree of stress in solid media is related to their deformation. Therefore, observations of crustal deformations are of particular interest in solving the problems of predicting earthquakes that are a consequence of these deformations according to modern concepts. In this case, both geophysical (millimeters, strainmeters) and geodetic types and measurement methods are used. The main scientific generalizations that contribute to the solution of the problem of geodetic contribution to the problem of earthquake forecasting are the Reid elastic recoil model [1] and the Meshcheryakov model of earthquake deformation precursors. These models relate the behavior of the earth's surface to the seismic cycle. These models do not lose their supporters and continue to develop to this day. These circumstances give reason to hope for some success in the early assessment of seismic hazard based on geodetic observations. In the following sections, elastic recoil models, deformation precursors and seismic cycles are considered in order to develop and propose an approach to assessing the level of seismic hazard from GNSS observations in seismically active areas. This does not imply a forecast of the location, time and strength of the earthquake, but an assessment of the level of danger of a destructive earthquake within a limited area in accordance with the magnitude of the recorded deformations of the earth's surface. It should be noted here that, first of all, the sources of the proposed approach are related to strong earthquakes located in the upper part of the earth's crust and even reaching the surface. This is because monitoring the deformations of the earth's surface during deep-focus earthquakes using geodetic methods is problematic due to their remoteness.

Elastic rebound model G.F. Reid

The theory of elastic rebound (Rebound theory) as one of the possible mechanisms of earthquake source formation was developed by the American seismologist G.F. Reid (H.F. Reid) based on the results of repeated observations at triangulation points in the San Francisco area after the 1906 earthquake.

The results of repeated geodetic observations showed that the total horizontal displacements of the triangulation points (most likely) caused by the earthquake reached six meters, while it turned out that the magnitude of these displacements decreases exponentially (Fig. 1.). This has been confirmed many times (Fig. 2.). The main provisions of Reid's elastic rebound theory [5]:

- The collapse of the rock that caused the tectonic earthquake is the result of elastic deformations exceeding the tensile strength of the rock. The cause of these deformations is the displacement of adjacent plates of the earth's crust.
- Deformations of the earth's crust accumulate gradually over a long period of time.

- The movement of the earth's crust during an earthquake is the elastic withdrawal of the sides of the fault to a state in which elastic deformations are eliminated.
- Seismic vibration occurs on the fracture surface. Initially, the surface on which the fracture line is formed has a small area. The spatial coverage of the vibrations increases at a rate less than the propagation speed of elastic compression waves in the rocks.
- The energy released during an earthquake is the energy of elastic deformation of the rocks.

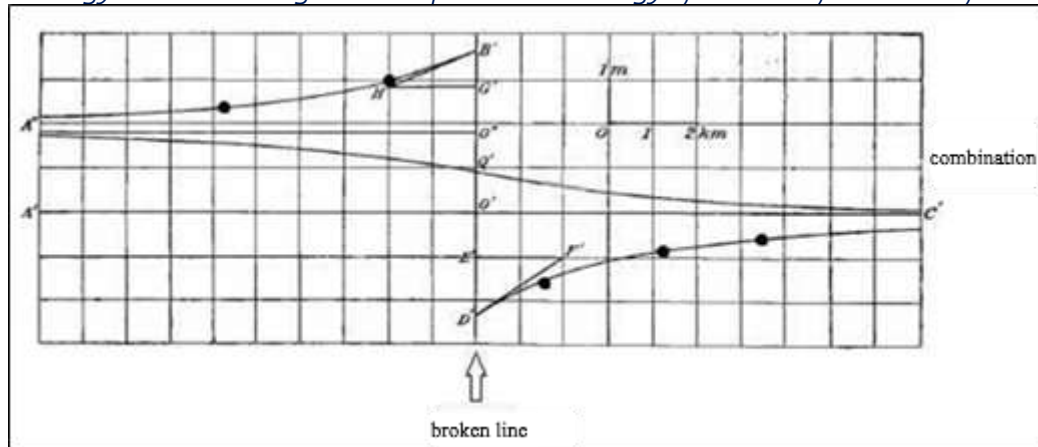


Figure 1. The dependence of the horizontal displacement of the triangulation point on the distance to the fault (black dots are triangulation points).

Reid also shows the elastic deformations of the earth's surface in the area, and the sources of future earthquakes can be seen on the surface of the earth and can be traced through repeated geodetic observations. The Reid model suggests that the value of the elastic deformations accumulated between two large earthquakes, largely due to their constant accumulation rate, is of great importance both for estimating the time of earthquake occurrence and for understanding the physical mechanism of the earthquake. One of the most important provisions of the Reid model is the conclusion that the earthquake recurrence interval can be determined if the values of the total seismic shear stress and the average rate of its accumulation are known. However, the rate of accumulation of deformation in the period between strong events in the San Andreas fault system is inherently nonlinear, and this does not give grounds for accurately predicting the onset of a new seismic event.

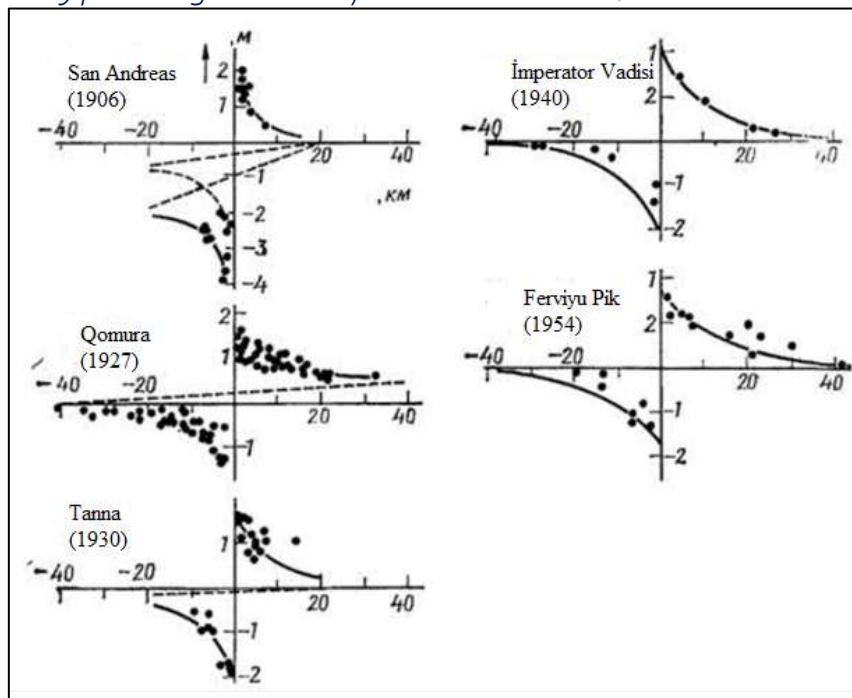


Figure 2. Experimental confirmation of the dependence of the displacement of the triangulation point on the distance to the rupture [3].

There are quite a few results in the world literature on determining the movements and deformations of the earth's surface associated with strong earthquakes. Here, one can pay attention to the monographs of Richter Ch.F. [6]. The elastic recoil model is supported and developed by Russian

researchers [4]. Supporting the theory of elastic recoil, A.K. Pevnev claims that seismogenic deformation is not displacement, but "elastic bending" of rocks in the focus of an approaching earthquake. This "elastic bending" of the earth's surface can be recorded by geodetic methods. In the works of A.K. Pevnev, the option of seismogenic rupture with displacement along the strike is considered. Let us consider other options. Another important generalization of A.K. Pevnev is the hypothesis about the stress-strain state of the future focus of a strong seismic event. The author claims that: "During the preparation stage for an earthquake, the size of its preparatory focus decreases due to the process of accumulation of elastic seismogenic deformations (stresses). Then, due to the achievement of limiting elastic stresses, there is a significant increase in size during its destruction. These changes in the volume of the source are very significant and can be sufficiently measured by geodetic level methods, which opens the way to real earthquake forecasting". Pevnev proposes to organize observations aimed at determining the regularities of the destruction of earthquake sources. Another important feature of the author emphasizes the complexity of the approach (geodesy, geophysics, seismology), which his desire is added to the algorithm of the tectonic conditions of the region in this dissertation, in the development of methods and software. A variant of the elastic recoil model for the reverse rupture mechanism of movement in the earthquake source, which is characteristic of subduction zones, is proposed. The model is confirmed by the results of re-smoothing in the area of the Nankaidō earthquake in Japan (1946, $M=8.2$).

To test the model, the authors used geodetic measurements before and after the Fairview Peak, Nevada (1954, $M=7.1$) and Hebgen Lake, Montana (1959, $M=7.1$) earthquakes in the United States.

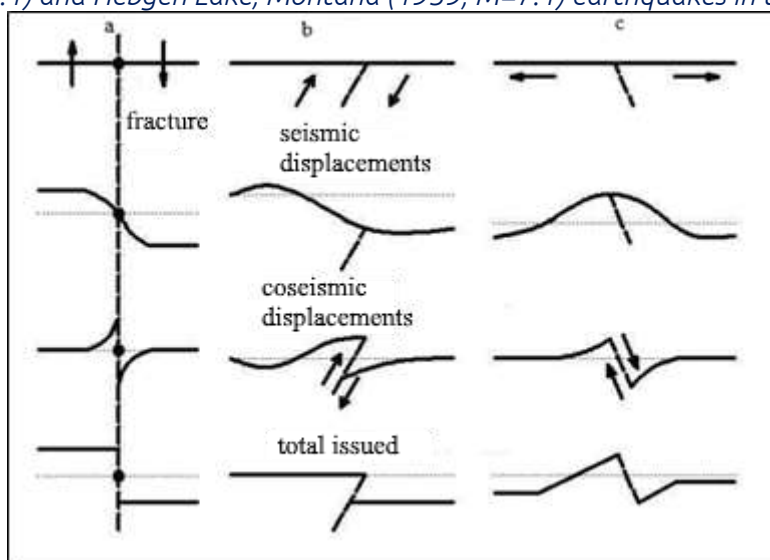


Figure 3. Elastic recoil models for various types of continuous displacements according to [15]. a) Displacement along the strike of the fault. b) Throw. c) Reset.

It is shown that during movements such as uplift and subsidence, the predictive features are the rise and fall of the earth's surface.

Uplifts that preceded strong earthquakes in the Lesser and Greater Caucasus were recorded based on re-leveling data.

In addition to the elastic recoil theory, there are a number of other models of the seismic process, the authors of which criticize the conclusions drawn by Reid. A detailed review of the models is given. He argues that some destructive earthquakes do not demonstrate compliance with the elastic recoil model, and puts forward the hypothesis of gas injection to the surface from the lower layers of the earth's crust. The author does not publish evidence of methane emissions during earthquakes from field observations. At the same time, elastic curvatures of the earth's surface, especially in fault zones with displacement along the fault, have been repeatedly recorded by geodetic methods and published in scientific journals, as indicated above.

Most of the proposed models of a seismic event do not describe the patterns of surface deformations before the event as clearly as the Reid model. The vast majority of alternative models do not deny the fundamental role of elastic deformations of the earth's crust in the process of preparing a seismic event. This gives grounds to try to use the provisions of the elastic recoil model in the development of approaches to assessing the level of seismic hazard in seismically active regions based on geodetic observations.

Literature

1. Антонович К.М, Использование спутниковых радионавигационных систем в геодезии [Текст]. В 2 т. Т. 2. Монография / К.М. Антонович; ГОУ ВПО «Сибирская государственная геодезическая академия». – М.: ФГУП «Картгеоцентр», 2006. – 360 с.: ил.
2. Савиных В.П., Певнев А.К., Ямбаев Х.К., Теория упругой отдачи, дилатансия, геодезия - прогноз // Геодезия и Аэрофотосъемка, 2013, №5, с. 29-34
3. Bisnath S., Gao Y., Current State of Precise Points Positioning and Future Prospects and Limitation, Observing our Changing Earth: Proceedings of the 2007 IAG General Assembly, Perugia, Italy, July 2 - 13, 2007, pp. 615-623
4. Cai C., Gao Y., Modeling and assessment of combined GPS/GLONASS precise point positioning, GPS Solutions, 2013, 17(2), pp. 223-236, DOI 10.1007/s10291-012- 0273-9
5. 82. Doglioni C., Barba S., Carminati E., Riguzzi F. Fault on-off versus strain rate and earthquakes energy, Geoscience Frontiers.- 2015.- No 6.- pp.265-276
6. Shi C., Lou Y., Zhang H., Zhao Q., Geng J., Wang R., Fang R., Liu J., Seismic deformation of the Mw 8.0 Wenchuan earthquake from high-rate GPS observations, Advances in Space Research, 2010, Vol. 46, Iss. 2, pp. 228-235, doi.org/10.1016/j.asr.2010.03.006
7. Wang G., GPS Landslide Monitoring: Single Base vs. Network Solutions, A case study based on the Puerto Rico and Virgin Islands Permanent GPS Network, Journal of Geodetic Science, 2011, 1(3), pp. 191-203, DOI: 10.2478/v10156-010-0022-3
8. Wu J.C., Tang H.W., Chen Y.Q., Li Y.X., The current strain distribution in the North China Basin of eastern China by least-squares collocation, Journal of Geodynamics, vol. 41, 2006, pp. 462–470, <https://doi.org/10.1016/j.jog.2006.01.003>

PHYSICAL AND PHYSICOCHEMICAL ASPECTS OF OIL AND GAS WELL COMPLETION AND DEVELOPMENT

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NEFT VƏ QAZ QUYULARININ TAMAMLANMASI VƏ MƏNİMSƏNİLMƏSİNİN FİZİKİ VƏ FİZİKİ-KİMYƏVİ ASPEKTLƏRİ

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Xülasə

Məlumdur ki, quyuların tamamlanması neft və qaz quyularının istismarının mənimlənməsi fazasına keçir. Bununla yanaşı quyuların mənimlənməsi xüsusi bir texnoloji tsikl olmaqla onların tikintisini başa çatdırır. Mənimlənmənin keyfiyyəti və quyuların sonrakı istismarının nəticələri layın ilkin və ikinci açılması, axının yaradılması, laydan axının intensivləşdirilməsinin tətbiqi mərhələlərində məhsuldar kollektorlarının süzülmə xüsusiyyətlərinin necə bərpa olunmasından asılıdır. Təsadüfi deyil ki, mənimlənmənin keyfiyyəti mahiyyətə yatağın işlənməsinin xarakteri və tempini müəyyən edir.

Quyu, quyudibi və ya quyüətrafi zona və layın quyulararası hissəsi vahid bir sistemin qarşılıqlı əlaqəli və qarşılıqlı təsirdə olan elementləridir. Quyuların tikintisi prosesində layın süzülmə xassələrinin (LSX) ən çox dəyişdiyi zona məhz quyu ətrafi zonada baş vermiş olur. Hətta məlumdur ki, quyunun tam istismara düşdüyü zaman belə quyudibi zonasında süzülmə xassələrinin dəyişməsi onun məhsuldarlığına təsir edir. Odur ki, LSX-nin quyuların istismarının başlanğıc mərhələsində pisləşməsi təkcə onların məhsuldarlığına təsir etmir. Bu həm də yatağın işlənmə tempi və son neft neftqaz veriminə təsir göstərmiş olur. LSX pisləşməsi layın ilkin açılması, kəmərin sementlənməsi, perforasiya ilə ikinci açılması və quyuların müxtəlif təmiri zamanı cürbəcür maddələrlə layın çirkənlənməsi hesabına baş verir. Laya süzülən maddələrin lay məhsulu və süxurla qarşılıqlı fiziki-kimyəvi təsiri, yüksək temperaturun güclü təsiri gillərin hidrotasiyasına, duzlar, asfaltın və qatranların çökməsinə, durğun zonaların yaranmasına səbəb olur, lay flüidi ilə olan təmas zonasında isə yüksək təzyiq qradientli səthlərin əmələ gəlməsi lay enerjisi hesabına aradan qaldırılması heç də həmişə mümkün olmur. Keçiriciliyin pisləşdiyi zonalarda lay enerjisinin bir hissəsi itir. Belə ki, quyüətrafi zonada keçiriciliyin 5 dəfə pisləşməsi (azalması) quyunun məhsuldarlığının 2 dəfə azalmasına səbəb olur. Keçiriciliyin 10 dəfə dəyişməsi quyu məhsuldarlığını 3.5 dəfə, keçiriciliyin 50 dəfə azalması isə quyu məhsuldarlığının 15 dəfə azalması deməkdir. Çox mühüm amillərdən biri ondan ibarətdir ki, quyudibi zonanın keçiriciliyinin pisləşən zonasının ölçüləri o qədər də böyük olmayıb, onlarla santimetr təşkil edir. Quyüətrafi zonada süzülmə xarakteristikasının faktiki dəyişməsinin təhlili göstərir ki, bu zona geniş diapazonda dəyişir. Belə ki, qazma başa çatdıqdan sonra və quyunun mənimlənməsindən sonra layların 50%-dən çoxu potensial mümkün olan məhsuldarlığa qarşı 2 dəfə az, 25%-i 4 dəfə, 20%-i isə 10 dəfə az məhsuldarlığa malik olur. Məhz qeyd olunan statistika hal-hazırda quyüətrafi zonada LSX-nin tənzimlənməsinə əsas strategiyasını, yəni layların açılmasının, quyuların mənimlənməsi və istismarının müasir texnologiyalarının seçilməsi yolu ilə keçiriciliyin pisləşməsinə minimuma endirilməsini müəyyən edir. Əgər qazıma zamanı təbii LSX-nin saxlanması təmin edilməsi mümkün deyilsə, onda onların quyuların mənimlənməsi zamanı quyudibinə məqsədyönlü təsirlər edilməklə bərpa olunması vacibdir.

Nəticə

Nəticə etibarlı ilə aşağıdakıları qeyd etmək olar. Məhsuldar layların qazılması və qoruyucu kəmərlərin sementlənməsi proseslərində qeyd olunan fiziki və fiziki-kimyəvi hadisələr quyudibi zonasının süzülmə xarakteristikasını xeyli pisləşdirir və quyunun mənimlənməsini çətinləşdirir bilər. Mədən praktikasında hətta elə hallar mövcuddur ki, quyunun tikintisi başa çatdıqdan sonra onun mənimlənməsi quyu ilə məhsuldar lay arasında hidrodinamik əlaqənin yaradılması mümkün olmamışdır.

References

1. Lian, Z., Wang, Y., Zhang, J., & Liu, H. (2023). Evaluation method for reservoir damage of cementing slurry. *Frontiers in Energy Research*, 11, 1227981. <https://doi.org/10.3389/fenrg.2023.1227981>
2. Iscan, A. G., Kok, M. V., & Bagci, A. S. (2006). Permeability reduction due to formation damage by drilling fluids. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 28(9), 837–846. <https://doi.org/10.1080/00908310600713958>
3. Ahad, M. A., & Al-Majed, A. A. (2021). Novel water-based drilling and completion fluid technology to minimize formation damage. *Petroleum*, 7(4), 381–389. <https://doi.org/10.1016/j.petlm.2020.12.002>
4. Isgandarli, Turgay. (2024). OPTIMIZATION OF HYDRODYNAMIC PARAMETERS OF DRILLING FLUIDS FOR IMPROVED CUTTINGS TRANSPORT IN HORIZONTAL WELLS. *PAHTEI-Proceedings of Azerbaijan High Technical Educational Institutions*. 46. 103-112. 10.36962/PAHTEI46112024-12.
5. Talib, I. T. (2024). Optimizing Prevention Methods and Drilling Fluid Parameters to Minimize Lost Circulation in Drilling Operations. *International Journal of Oil, Gas and Coal Engineering*, 12(4), 101-105. <https://doi.org/10.11648/j.ogce.20241204.12>
6. Ismayilov, G. G., Valiyev, R. H., & Isgandarli, T. T. (2025). Impact of drilling and cementing on reservoir filtration properties in oil and gas wells. *Processes of Petrochemistry and Oil Refining*, 26(2), 489–498. <https://doi.org/10.62972/1726-4685.2025.2.489>
7. Olayiwola, O., Nguyen, V., Andres, R., & Liu, N. (2023). The application of nano-silica gel in sealing well micro-annuli and cement channeling. *arXiv preprint arXiv:2301.08288*. <https://arxiv.org/abs/2301.08288>

CALCULATIVE ASSESSMENT OF THE APPLICATION OF THE EXPANDER -GENERATOR UNIT AT THE TASHKENT COMBINED HEAT AND POWER PLANT

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РАСЧЕТНАЯ ОЦЕНКА ПРИМЕНЕНИЯ ДЕТАНДЕР-ГЕНЕРАТОРНОЙ УСТАНОВКИ НА ТАШКЕНТСКОЙ ТЕПЛОЭЛЕКТРОЦЕНТРАЛИ

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Abstract

Modern energy-saving technologies allow for the efficient use of pressure drop in natural gas during throttling before combustion. Modern energy-saving technologies allow for the efficient use of pressure drop in natural gas during throttling before combustion. One of the most promising solutions in this field is the use of expander-generator units (EGUs), which are widely applied in global energy practice. The main objective of this study was a comprehensive analysis of the efficiency of EGU implementation at the Tashkent Thermal Power Plant. The research was based on calculation methods presented in scientific sources and averaged operational data from similar installations at thermal power plants. The work included an assessment of the excess gas pressure potential, selection of an industrially manufactured EGU type, development of a new connection scheme to gas distribution points (GDP) and power plant equipment, as well as calculation of heat exchangers included in this scheme. The study proved the technical feasibility and economic viability of implementing an expander-generator unit at the Tashkent Thermal Power Plant, which allows converting previously unused throttling energy, increasing the overall energy efficiency of the plant and obtaining additional electrical power.

Аннотация

Современные энергосберегающие технологии позволяют эффективно использовать перепад давления природного газа при его дросселировании перед сжиганием. Одним из наиболее перспективных решений в этой области являются детандер-генераторные агрегаты (ДГА), широко применяемые в мировой энергетической практике. Основной целью проведенного исследования стал комплексный анализ эффективности внедрения ДГА на Ташкентской теплоэлектроцентрали (ТЭЦ). Исследования основывались на методиках расчета, представленных в научных источниках, а также на усредненных данных эксплуатации аналогичных установок, на ТЭЦ. В ходе работы была проведена оценка потенциала избыточного давления газа, выбран тип ДГА, выпускаемый промышленностью, предложена новая схема его подключения к газораспределительным пунктам (ГРП) и оборудованию ТЭЦ, а также выполнен расчет теплообменников, входящих в состав данной схемы. Проведенное исследование доказало техническую возможность и экономическую целесообразность внедрения детандер-генераторного агрегата на Ташкентской ТЭЦ, позволяющее преобразовывать ранее неиспользуемую энергию дросселирования, увеличить общую энергоэффективность станции и получить дополнительную электрическую мощность.

Keywords: natural gas, main gas pipeline, gas distribution point, throttling, gas turbine unit, expander-generator unit, gas heating, electricity generation.

Ключевые слова: природный газ, магистральный газопровод, газораспределительный пункт, дросселирование, газотурбинная установка, детандер-генераторный агрегат, подогрев газа, выработка электроэнергии.

Введение. Природный газ, подаваемый в топки энергетических котельных агрегатов и других теплогенерирующих установок Ташкентской ТЭЦ для обеспечения процесса горения, как правило, имеет среднее давление. Снижение давления с высокого до среднего осуществляется с использованием регуляторов давления, установленных на станционном газораспределительном пункте (ГРП).

Снижение давления газа в регуляторе осуществляется посредством дросселирования, представляющее собой необратимый процесс прохождения газа через местное гидравлическое сопротивление, в результате которого давление уменьшается без совершения полезной работы. Степень понижения давления зависит от состава газа, его скорости, параметров состояния, а также от конструкции трубопровода. После прохождения через дросселирующее устройство удельный объём и скорость газа увеличиваются. Температура газа при этом может остаться неизменной, повыситься или понизиться — в зависимости от его состава и начальных параметров перед дросселированием [1-3].

Основная часть. С целью утилизации потенциальной энергии сжатого газа при снижении его давления предлагается внедрение детандер-генераторной установки (ДГУ). Детальный анализ существующих схем детандер-генераторных установок для ТЭС приведен в [4-6]. На рис. 1 представлена схема предлагаемой детандер-генераторной установки применительно к Ташкентской ТЭЦ.

Принцип действия установки следующий. Природный газ из магистрального газопровода подаётся на газораспределительный пункт, а также в нагревательный контур промежуточного маслоохладителя трубчатого типа (ПМТ). В охлаждающий контур ПМТ поступает масло из системы смазки газотурбинной установки (ГТУ), циркулирующее по замкнутому циклу. При этом дросселирование природного газа на участке до подачи в ПМТ не производится. В результате теплообмена между теплоносителями в ПМТ происходит нагрев газа, поступающего в подводящий трубопровод детандер-генераторного агрегата (ДГА), и одновременное охлаждение масла.

Охлаждённое в промежуточном маслоохладителе (ПМТ) масло возвращается в систему смазки газотурбинной установки (ГТУ). Нагретый в ПМТ природный газ по подводящему газопроводу поступает в детандер-генераторный агрегат (ДГА), где в процессе расширения совершается полезная работа, используемая для привода электрогенератора. После расширения газ направляется через выпускной газопровод в нагревательный контур промежуточного воздухоохладителя трубчатого типа. В его охлаждающий контур поступает воздух из системы воздушного охлаждения ГТУ, подаваемый с помощью дутьевого вентилятора.

В результате теплообмена между газом и воздухом в воздухоохладителе происходит подогрев газа и одновременное охлаждение воздуха. Подогретый газ далее направляется к энергетическим котлам, а охлаждённый воздух отводится в атмосферу [7,8].

Для проведения энергетических и термодинамических расчётов были проанализированы ключевые точки схемы, представленной на рисунке 1, с учётом потерь давления и температуры, зафиксированных в ходе эксплуатации оборудования Ташкентской ТЭЦ.

Точка 1. Природный газ с параметрами $P_1 = 1,25$ МПа, $T_1 = T_{oc} + 5$ после фильтрации подается в трубопровод, ведущий к промежуточному маслоохладителю.

Точка 2. Природный газ с параметрами $P_2 = P_1 \cdot (1 - 0,025) = 1,21875$ МПа, $T_2 = T_{oc} + 5$, поступает в нагревательный контур трубчатого промежуточного газоохладителя. Потери давления на участке 1-2 составляют около 2,5%, изменение температуры незначительно, принимается $T_2 = const$.

Точка 3. Параметры природного газа в этой точке схемы определяются расчётом. При температуре $T_3 < 80^\circ\text{C}$ работа ДГА невозможна согласно техническим требованиям завода изготовителя.

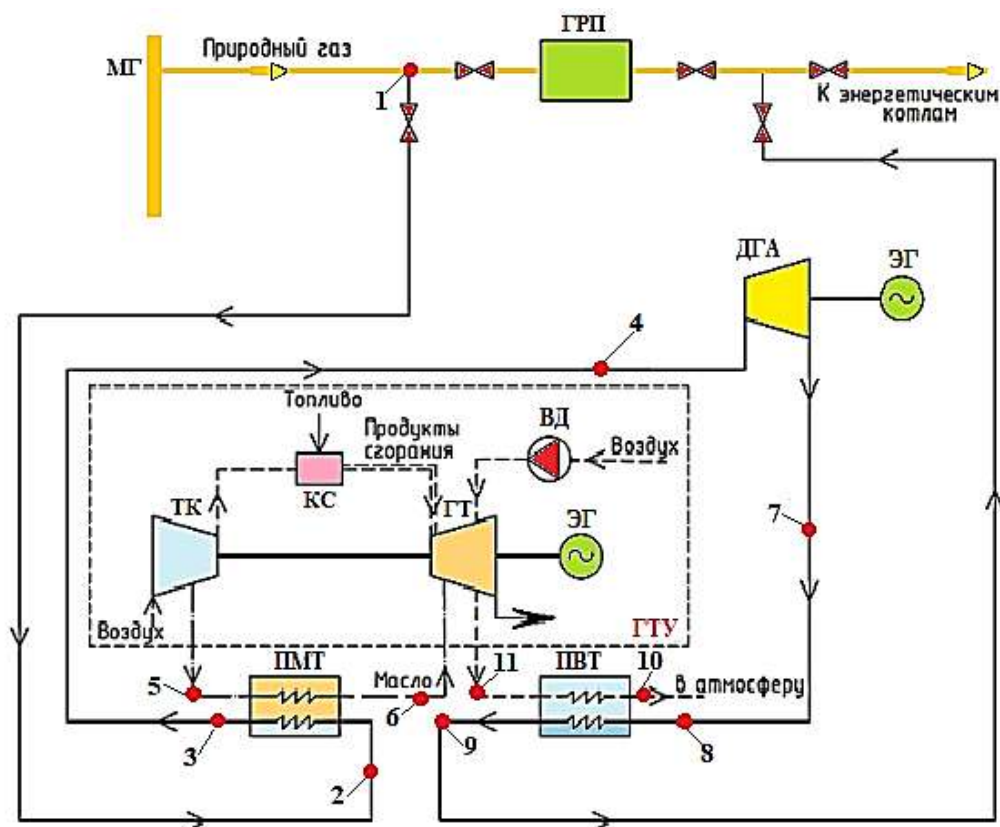


Рис. 1. Детандер-генераторная установка: МГ - магистральный газопровод, ГРП - газораспределительный пункт, ДГА - детандер-генераторный агрегат, ВД - вентилятор дутьевой, ЭГ - электрогенератор, ГТУ - газотурбинная установка, ТК - турбокомпрессор, КС - камера сгорания, ГТ - газовая турбина, ПВТ - промежуточный воздухоохладитель трубчатый, ПМТ - промежуточный маслоохладитель трубчатый.

Точка 4. Природный газ с параметрами $P_4 = P_3, T_4 = T_3$ (потерями давления и температуры на участке 3-4 можно пренебречь), поступает во всасывающий патрубок ДГА.

Точка 5. Турбинное масло Shell Turbo Oil GT 32 с температурой $T_5 = 80^\circ\text{C}$ соответствующей номинальному режиму работы турбокомпрессора ГТУ, поступает в охлаждающий контур трубчатого промежуточного маслоохладителя.

Точка 6. Турбинное масло Shell Turbo Oil GT 32 с температурой $T_6 \leq 40^\circ\text{C}$ поступает в систему охлаждения и смазки ГТУ. Эти строгие требования к температуре масла установлены заводом-изготовителем газовой турбины.

Точка 7. Природный газ с параметрами $P_6 = 0,2$ МПа, $T_6 \geq 5$ °С, поступает в выходной патрубок ДГА. При температуре $T_6 < 5$ °С работа ДГА не возможна согласно данным завода изготовителя.

Точка 8. Природный газ с параметрами $P_7 = P_6 \cdot (1-0,05) = 0,19$ МПа, $T_6 > 5^\circ\text{C}$, поступает в воздухоохладитель, трубчатого типа.

Точка 9. Параметры природного газа в данной точке схемы определяются расчётом.

Точка 10. Охлажденный воздух отводится в атмосферу. Параметры воздуха для данного расчета не учитываются.

Точка 11. Атмосферный воздух, нагретый в системе охлаждения заднего подшипника ГТУ до температуры $T_{10} = 55^\circ\text{C}$, поступает в охладительный контур промежуточного воздухоохладителя.

Таблица 1.

Расчётные параметры природного газа

Месяц	апрель	май	июнь	июль	август	сентябрь	октябрь
Температура газа на выходе воздухоохладителя (точка 9), °C.	16,70	24,63	30,43	31,23	33,03	24,13	16,16
Дополнительная теплота, вносимая в топку с топливом, кДж/кг.	32,30	51,11	58,15	63,53	59,39	45,29	30,29
Изменение расхода топлива на котел, кг/с.	0,00354	0,00535	0,00634	0,00668	0,00625	0,00506	0,00346
Ежемесячная экономия топлива, м³/мес.	12312,64	18533,3	22131,38	22485,82	21012,59	17135,38	11672,84
Ежемесячная экономия топлива, сум./мес.	5124245	7762855	10012010	10245905	9872190	7910195	4871160

Другие параметры необходимые для расчета:

- теплоемкость воздуха в системе охлаждения заднего подшипника ГТУ, $C_{10} = 1,005$ кДж/(кг·°C);
- массовый расход газа через ДГА (максимальный), $G_2 = 13$ кг/с;
- массовый расход воздуха (номинальный) в системе охлаждения заднего подшипника ГТУ, $G_{10} = 3,7$ кг/с;
- массовый расход масла в системе охлаждения и смазки ГТУ, $G_5 = 11,6$ кг/с;
- теплоемкость природного газа определяется по теплоемкостям его отдельных компонентов и массовым долям этих компонентов в газе по формуле:

$$c_1 = \sum_{i=1}^n c_i \cdot b_i.$$

Для Ташкентской ТЭЦ $c_1 = 1,882$ кДж/(кг·°C);

- теплоемкость масла в системе охлаждения и смазки ГТУ $c_5 = 2,982$ кДж/(кг·°C).

Тепловой расчет проводился для нагрузки ДГА 75% от номинальной.

Уравнение теплового баланса для промежуточного маслоохладителя трубчатого типа:

$$0,75 \cdot G_2 \cdot c_2 \cdot (T_3 - T_2) = G_5 \cdot c_5 \cdot (T_5 - T_6). \quad (1)$$

Найдем температуру газов в точке 3:

$$T_3 = \frac{G_5 \cdot c_5 \cdot (T_5 - T_6)}{0,75 \cdot G_2 \cdot c_2} + T_2. \quad (2)$$

Учитывая сохранение теплоемкостей $c_2 = c_1$:

Зная температуру газов в точке 4 (на входе в ДГА) $T_4 - T_3$, по приведенной в заводской документации на ДГА таблице соответствия найдем температуру газов в точке 7 на выходе из ДГА.

Уравнение теплового баланса для промежуточного воздухоохладителя трубчатого типа:

$$0,75 \cdot G_8 \cdot c_8 \cdot (T_9 - T_8) = G_{10} \cdot c_{10} \cdot (T_{11} - T_{10}). \quad (4)$$

Найдем температуру газов на выходе из промежуточного маслоохладителя трубчатого типа, в точке 9:

$$T_9 = \frac{G_{10} \cdot c_{10} \cdot (T_{11} - T_{10})}{0,75 \cdot G_8 \cdot c_8} + T_8. \quad (5)$$

Учитывая сохранение теплоемкостей и расходов $G_8 = G_2$, $c_8 = k \cdot c_{10}$, где k – поправочный коэффициент, получаем:

$$T_9 = \frac{G_{10} \cdot c_{10} \cdot (T_{11} - T_{10})}{0,75 \cdot G_2 \cdot c_1 \cdot k} + T_8. \quad (6)$$

Результаты. Помещённые в таблице 1 данные отражают результаты расчётов по месяцам. Анализ результатов расчетов, выполненных по формулам (1) - (6), показывает, что технически (по условию $T_6 \geq 5$ °C) работа ДГА на Ташкентской ТЭЦ возможна на протяжении большей части календарного года (апрель-октябрь). Максимальное число часов работы ДГА в год составит 5136 ч ($n=5136$ ч).

Литература

1. Куличихин В.В. Использование избыточного давления природного газа на промышленных предприятиях / В.В. Куличихин, О.О. Лазарева // Надежность и безопасность энергетики. – 2010. – № 9. – С. 48–54.
2. Мукольянц А.А. Анализ эффективности схем бестопливных установок генерации электроэнергии на базе детандер-генераторных агрегатов. // Журнал «Проблемы энерго- и ресурсосбережения». - Ташкент, № 3-4, 2019. – С. 320-324.
3. Гаррис, Н.А. Основные направления ресурсо-энергосбережения при транспорте газа / Н.А. Гаррис, Н.А. Колоколова // Нефтегазовое дело. Электронный научный журнал. Выпуск 1, 2009 – с.81 – 85.
4. Агабабов В.С. О применении детандер-генераторных агрегатов в газовой промышленности. Энергосбережение и энергосберегающие технологии в энергетике газовой промышленности. – 2001. – Т. 2. – С. 50–53.
5. Гатауллина, А.Р. Необходимость подогрева газа в детандер-генераторных установках при использовании потенциала избыточного давления транспортируемого природного газа // Энергетика: Эффективность, надежность, безопасность: материалы двадцатой Всерос. науч.-техн. конф. / Томский политехнический университет. – Томск: Изд-во Томского политехнического университета, 2014. Т. I. – С. 199 – 201.
6. Степанец А.А. Об эффективности детандер-генераторных агрегатов в тепловой схеме ТЭЦ // Энергетик. – 1999. - №4. – С. 24-32.
7. Mukolyants A.A., Sotnikova I.V., Karimova N.E., Taubaldiev A.A. Analysis of the power of the expander-generator unit depending on the temperature of the low-potential heat source. Deutsche internationale Zeitschrift für zeitgenössische Wissenschaft. №11. 2021. VOL. 1. p. 46-49.
8. Агабабов А.С. Оценка эффективности использования детандер-генераторных агрегатов для получения электроэнергии // Энергосбережение и водоподготовка. 2001. №2. С. 13-18.



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