InterConf
Scientific Publishing Center

THE ISSUE CONTAINS:

Proceedings of the 10th International Scientific and Practical Conference

EXPERIMENTAL AND THEORETICAL RESEARCH IN MODERN SCIENCE

Toronto, Canada
16-18.07.2026

Scientific Collection
InterConf

№ 301
July, 2026

OPEN ACCESS

Scientific Collection «InterConf»

№ 301

July 2026

THE ISSUE CONTAINS:

Proceedings of the 10th International Scientific and Practical Conference

EXPERIMENTAL AND THEORETICAL RESEARCH IN MODERN SCIENCE

TORONTO, CANADA

July 16-18, 2026

TORONTO
2026

UDC 001.1

S 40 *Scientific Collection «InterConf»*, (301): with the Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science» (July 16-18, 2026; Toronto, Canada) / comp. by LLC SPC «InterConf». Toronto: Aeropanzer, 2026. 148 p.

ISBN 978-0-9869427-2-3 (series)
DOI 10.51582/interconf.2026.301

Please, cite as shown below:

1. Surname, N. & Surname, N. (2026). Title of an article. *Scientific Collection «InterConf»*, (301), 21-27. Retrieved from https://archive.interconf.center/index.php/conference-proceeding...

This issue of Scientific Collection «InterConf» contains the materials of the International Scientific and Practical Conference. The conference provides an interdisciplinary forum for researchers, practitioners and scholars to present and discuss the most recent innovations and developments in modern science. The aim of conference is to enable academics, researchers, practitioners and college students to publish their research findings, ideas, developments, and innovations.

Scientific Collection «InterConf» and its content are indexed in Google Scholar

No 301

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

TABLE OF CONTENTS

LAW AND INTERNATIONAL LAW

HISTORY AND ARCHEOLOGY, ARCHIVAL STUDIES

BIOLOGY AND BIOTECHNOLOGY

MEDICINE AND PHARMACY

CHEMISTRY AND MATERIALS SCIENCE

INFORMATION AND WEB TECHNOLOGIES

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

BUSINESS ECONOMICS

The Role and Challenges of Agricultural Insurance in Georgia

Aniashvili Levan[1], Tchiotashvili David[2]

[1] The Faculty, of Social sciences, business and law,
4th year student of Bachelor of Business Administration;
Gori State University; Republic of Georgia

[2] Scientific supervisor, Doctor of Economics, Professor;
Gori State University; Republic of Georgia

Abstract. Agricultural insurance, as an economic and financial mechanism, protects farmers and agricultural producers from financial losses caused by natural events. Agricultural insurance plays a significant economic and social role for Georgia, as agriculture is one of the country's most important sectors and is often damaged by natural disasters. The importance of the state agricultural insurance program is manifested in the following: financial protection for farmers, income stability, agricultural development, strengthening food security, and state support. Consequently, insurance mitigates the impact of economic losses caused by natural disasters and helps maintain employment and population income. This serves to mitigate these very risks, which in turn creates social stability for farm households and rural populations.
Keywords: *Agricultural insurance; Farming, Insurance risk; Financial mechanism.*

Introduction

Agriculture is a critical and highly vulnerable sector of the economy, especially in agrarian societies where the sector's share of the economy is high. This is due to the existence of natural disasters and various other unpredictable risks. It was for this reason that the concept of agricultural, or agro-insurance, first emerged in the 18th century. Over time, the system was refined, developed, and spread throughout the world. In Georgia, agro-insurance, as a risk management tool for the agricultural sector, is a relatively new mechanism. Since 2014, a government program has been in effect that supports and subsidizes agro-insurance. This process, along with crop insurance, has made guarantees of stability more accessible to farmers. In farming, crop insurance is of paramount importance. Therefore, implementing the agro-insurance program is vitally important for current producers. A well-managed Reforming the agricultural sector and developing agribusiness will contribute to the socioeconomic growth of farmers, the development of the country, and the well-being of the population. The development of agricultural insurance products gives farmers access to more financial resources, which contributes to the stable development of the sector. The great importance of agro-insurance is evidenced by the fact that every year, farmers lose their entire year's livelihood due to damages caused by various natural disasters. These natural disasters not only severely hinder farmers' income but also impede their economic progress over time. Agricultural insurance is a growing business product, driven by the commercialization of agriculture, international trade, and new insurance products. The creation and marketing of new insurance products has a positive impact on the farming sector. To increase productivity and income, farmers also need to invest in the professionalization of their farms and modern digital technologies. It is also particularly important for the government to work on improving their education. The main objectives of agro-insurance can be considered as follows:

Reducing financial risks for farmers;
Protecting crops and income;
Promoting sustainable agricultural development;
Encouraging investment in the agricultural sector;
Reducing economic losses caused by natural disasters.

Discussion

The importance of the state agricultural insurance program is reflected in the following main areas:

Farmers’ financial protection - In the event of losses caused by natural disasters, farmers receive insurance compensation, which helps them continue their activities.

Income stability - Insurance reduces the financial risk caused by crop loss and helps farmers maintain their income.

Agricultural development - When risks are lower, farmers are more willing to invest in modern technologies and high-quality production.

Strengthening food security - Crop protection mechanisms help preserve local agricultural production and ensure the country's food supply.

State support - The government finances a significant portion of the insurance premium, making agricultural insurance more affordable for farmers.

BUSINESS ECONOMICS

The agricultural insurance sector is characterized by its unique dynamics. Its economic production processes are closely linked to natural production processes. Agriculture is highly dependent on:

a) natural environmental conditions, soil, water resources, climate conditions, and the ecosystem;

b) the frequency and severity of natural disasters;

c) the spread of pests and fungal diseases.

Under stable climatic conditions and with the implementation of proper farming technologies, it is possible to maintain soil fertility, preserve ecosystem sustainability, and manage and control pests and diseases. However, it is not always possible to prevent insurance risks and the losses they cause. It is precisely in such situations that agricultural insurance becomes particularly important for maintaining the economic stability of agriculture. Agricultural production is seasonal, and agricultural risks are mainly divided into two categories:

a) crop production and its related risks;

b) livestock farming and its related risks.

For each of these subsectors and production conditions, it is essential to consider the specific risks associated with them. In addition to the specific risks directly related to agriculture, agricultural insurance products should also take into account risks associated with accidents or criminal acts committed by third parties. Agricultural insurance ensures that fluctuations in global market prices do not cause devastating damage to the national economy and the agricultural sector. Agricultural insurance products may cover one or several risks, the entire farm, or only a specific part of it. To maintain the financial sustainability of the sector, it is most important to insure risks associated with systemic natural disasters (hail, drought, mudflows, floods) and epidemic diseases. Risk is a characteristic of uncertainty about the future of an object. Without risk, there is no insurance. How can risks in agricultural production be reduced? It is necessary to understand the nature, level, and characteristics of the risks faced by agricultural producers. The following agricultural risks exist:

- Production risks;
- Price and marketing risks;
- Institutional risks;
- Financial risks;
- Professional risks;

- Personal risks;
- Systemic risks.

Production: For example, grain prices typically fluctuate significantly during the harvest period and decline after the harvest, when the first information about the total harvest becomes available. Over the years, price fluctuations are primarily linked to production volumes in individual years, as well as supply and demand in both domestic and foreign markets. Under unfavorable weather conditions and low yields, product prices may increase or decrease significantly.

Prices: Price volatility is a serious source of risk in agriculture. Price changes from year to year may display a relatively similar pattern, which is explained by the seasonal nature of agricultural production.

Institutional: These risks may arise due to changes in economic policy, agricultural legislation, or state agricultural policy. Managing institutional risk requires a stable legislative framework regulating land relations, which has significantly influenced the investment attractiveness of agricultural production over the past decade.

Financial: These risks are related to enterprise formation, capital accumulation, and financing methods. In this case, the risk is caused by changes in borrowing interest rates, the size of equity capital, and insufficient liquidity.

Professional: This type of risk is particularly common in crop production and is assessed by the degree of variability in the yields of individual crops. The level of production risk is often measured using the statistical indicator known as the coefficient of variation.

Personal: This is especially important in peasant and family farms. It refers to situations such as illness or disability, which may seriously affect the economic activities of the farm.

Systemic: These risks have a major impact on the economy and cause significant losses for both farmers and the state. Examples include periods of drought or epidemics among livestock and poultry. This systemic component may result in substantial losses within agricultural insurers' portfolios.

Among European countries, crop insurance is the most widely demanded insurance product. Similarly, in Georgia, agricultural insurance products mainly consist of crop insurance. Compared with European countries, the share of insurance subsidies in Georgia is relatively high. Under the State Agricultural Insurance Program, the government subsidizes 70% of the insurance premium, which exceeds the subsidy level in many European countries, while the insured farmer pays the remaining 30% of the premium. At different stages of the program's development, the subsidy rate varied between 50% and 90%; however, the current mechanism provides a 70% state co-financing rate.

The introduction and development of agricultural insurance in Georgia cover a relatively short period. On the initiative of the Government of Georgia, the State Agricultural Insurance Program was launched through the creation of a pilot agricultural insurance program, which came into effect in September 2014 and involved government financing of a significant portion of the insurance premium. Georgia's efforts to introduce international practices have spanned only ten years. For such a complex type of insurance as agricultural insurance, this is a relatively short period. Developed countries around the world possess extensive experience in this field. Numerous mechanisms have been tested to ensure the effective functioning of agricultural insurance systems. Research has shown, based on international experience, that government support is critically important for agricultural insurance. In leading countries where agricultural insurance systems operate successfully, co-financing programs are in place and the government actively participates in the process. As a result of implementing the agricultural insurance program, the sector has clearly become more popular among the population. The introduction of the State Agricultural Insurance Program in Georgia has undoubtedly moved the country's agricultural sector to a new stage of development. However, many stages of development still lie ahead to establish a fully functioning system. Compared to other countries, agricultural insurance is a relatively new product for Georgia, and it will take time for the population to understand, analyze, and fully recognize its advantages, importance, and necessity. The development of the insurance market for the agricultural sector is extremely important, as it will promote agricultural production, increase competitiveness, reduce production risks, and help preserve farmer’s income. Based on statistical data, we can assess the pace and results of agricultural insurance development. As of 2025, the situation is as follows:

In 2014, the agricultural insurance program was still in its initial stages of development. By 2025:

- The state budget increased by 50% (from 10 million to 15

BUSINESS ECONOMICS

million GEL);

- The maximum insurable area was doubled (from 10 to 20 ha, and from 50 to 100 ha for grains);
- Co-financing for villages along the dividing line was increased to 75%;

Procedures for damage assessment and compensation were simplified.

Chart N1

Information on agricultural insurance implemented in 2025

Insurance company	Insurance policies issued since the beginning of the reporting year	Insurance premium collected since the beginning of the reporting year
Insurance company "Aldagi"	29075	18,012,558
TBC insurance	2253	3,475,149
Insurance company "Alpha"	166	292,957
New vision insurance	90	86,744
International insurance company "Irao"	3	240
Total	31,587	21,867,648

Chart N2

Difference between 2014 and 2025 agricultural-insurance statistics

Year	Quantity of insurance policies	Total insurance premium (Lari)	Insured area
2014	21,056	12,586,739	18,723 ha
2025	31,587	21,867,648	24 000 ha

In addition, the program's cumulative results indicate its growth: Since 2014, more than 194,000 insurance policies have been issued, 72,703 beneficiaries have used the program, and the amount of damages compensated has exceeded 92 million GEL. If we look at the premiums collected from agri-insurance policies issued in 2025, we can see that the total number of policies has been increasing over the years and continues to

BUSINESS ECONOMICS

grow. According to these statistics, we can calculate that the total premiums collected in 2025 exceed those of 2014 by approximately 9 million, which equates to a growth of about 73%. Statistics show that the interest of farmers and people working in agribusiness in agro-insurance is gradually increasing, However, compared to other developed countries, agricultural insurance in Georgia is far from perfect. We can compare the agricultural insurance model in Georgia with those in developed countries to clearly highlight the differences between them:

Chart N3

Agricultural Insurance Model in Georgia

Characteristics	Georgia (emerging market)	Developed countries (USA, EU)
Market maturity and history	New platform (the state program has been in effect since 2014).	Centuries of experience and an established insurance culture.
Government subsidies	High share, the state covers 50% to 70% of the premium (2026 budget: 17 million Ge Lari).	High and stable, subsidies are often over 60% and are linked to protecting farmers' income.
Scope of insured risks	Limited: It mainly covers hail, floods, storms, and spring frost.	Comprehensive (MPCI): Covers drought, diseases, pests, and yield/price declines (Revenue Insurance).
Technological level	It is mainly based on an on-site physical assessment of damages by experts.	High-tech: Satellite monitoring, AI, drones, and parametric (index-based) models.
Farmer involvement	Low: Only a small percentage of farmers insure their crops (due to low trust and awareness).	High: The majority of farmers (often over 80%) are enrolled in insurance schemes.

Based on the information, which is given in the table, we can say that the agro-insurance model in Georgia lags behind that of developed countries. The main reasons for this are challenges such as: Limited choice of risks: The program managed by the Georgian Ministry of Environment and Agriculture does not cover critical risks such as drought or plant diseases. According to the local farmers' association, the current program does not fully meet the farmers' needs and requires an expansion of its list of covered risks. Loss Assessment System: Unlike the automated satellite systems used in developed markets, the loss assessment process in Georgia is often a point of dispute between insurance companies and farmers, leading to a lack of transparency. Despite the challenges, the sector is growing, with both the number of insured beneficiaries and the area of insured land increasing in recent years. Market-leading companies are actively working to provide farmers with stability guarantees and increase access to insurance. Therefore, with the right interventions and the help of innovative technologies, it is possible to capture a much larger share of Georgia's agricultural market and offer a better product to the agricultural population, so that this sector can develop for the benefit of both insurance companies and individual Georgian farmers and Georgian agribusiness.

Conclusion

Agriculture plays one of the most significant roles in Georgia's economy. Its development will lead to economic sustainability and an improved quality of life for the population. In order to promote the country's agrarian development, the state must use all available levers, one of which will certainly be agrarian insurance, through which it will be possible to relatively easily solve all of these problems, which farming faces in agricultural activities.

References:

[1] Ministry of Environment and Agriculture of Georgia. https://www.rda.gov.ge/
[2] Rural Development Agency. https://www.rda.gov.ge/
[3] State Insurance Supervision Service of Georgia. https://insurance.gov.ge/ka/Statistics
[4] „Aldagi" Company. https://aldagi.ge/
[5] Business Media. https://bm.ge

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

BUSINESS ECONOMICS

Remote Work and Knowledge Management: Lessons From Post-Pandemic Europe

Stamatev Stanimir Penev[1]

[1] PhD in Economics, Chief Assistant Professor at the Department of Management; *University of National and World Economy*; Republic of Bulgaria

Abstract. The widespread adoption of remote work during the COVID-19 pandemic fundamentally changed how organizations create, share, and retain knowledge. Although fully remote work has declined since the pandemic, remote and hybrid arrangements remain significant features of the European labour market. This article examines the implications of this shift for knowledge management in post pandemic Europe. Using secondary quantitative data from Eurostat and other European institutional sources, the study analyses remote-work patterns between 2019 and 2025, cross-country differences, and their relationship with enterprise digitalization. The findings are interpreted through the distinction between explicit and tacit knowledge and the SECI (Socialization, Externalization, Combination, and Internalization) model. The article argues that digital technologies can strengthen the codification, storage, and distribution of explicit knowledge, while prolonged physical separation may constrain informal learning and tacit knowledge transfer. The European experience suggests that effective remote work depends not only on technological capacity but also on the deliberate design of knowledge processes and meaningful opportunities for interaction.
Keywords: *remote work, knowledge management, hybrid work, tacit knowledge.*

1. Introduction

The COVID-19 pandemic transformed remote work from a limited practice into a significant feature of European working life. In 2021, 41.7 million employees teleworked in the European Union, approximately twice the number recorded in 2019 (Eurofound, 2022). Although remote work has since declined, remote and hybrid arrangements remain established across many suitable for remote work occupations (Eurofound, 2024). This shift has important implications for knowledge management. Digital technologies facilitate the documentation, storage, and distribution of knowledge, while physical separation may limit informal learning, mentoring, and tacit knowledge transfer. The central challenge is therefore whether organizations can continue to create, share, and retain knowledge effectively in distributed work environments.

This article examines how persistent remote and hybrid work has affected the conditions for effective knowledge management in post pandemic Europe. Using Eurostat data, it analyses cross-country differences in remote work and their relationship with enterprise digitalization. The article argues that effective remote work depends on balancing digital knowledge infrastructure with opportunities for social interaction and that well-designed hybrid arrangements may provide the most sustainable model for knowledge-intensive organizations.

2. Literature Review and Theoretical Framework

The expansion of remote work during the COVID-19 pandemic accelerated digital collaboration and changed how organizations coordinate work and exchange knowledge. Although home working has declined from its pandemic peak, hybrid arrangements remain established across many suitable for remote work occupations, with considerable differences between European countries (Eurofound, 2024). For knowledge-intensive organizations, this shift creates both opportunities and risks: digital platforms improve access to information, while reduced informal interaction may constrain workplace learning and the transfer of expertise (Derrick, 2022).

A central distinction in knowledge-management theory is between explicit and tacit knowledge. Explicit knowledge can be documented, stored, and distributed through procedures, reports, and digital repositories. Tacit knowledge, by contrast, is rooted in experience, judgment, and practical understanding and is therefore more difficult to formalize and transfer (Nonaka & Takeuchi, 1995). Remote work may strengthen the management of explicit knowledge by increasing reliance on documentation and digital systems, while making tacit knowledge transfer through observation, informal discussion, and shared experience more difficult.

The study adopts the SECI model as its theoretical framework. The model describes organizational knowledge creation through four interconnected processes: socialization, externalization, combination, and internalization (Nonaka, 1994; Nonaka & Takeuchi, 1995). Remote work may weaken socialization by reducing direct interaction, while strengthening externalization and combination through greater documentation and digital knowledge exchange. The SECI model therefore highlights the central tension examined in this study: digitalization can improve access to explicit knowledge, but effective knowledge creation also depends on social processes that may be more difficult to sustain at a distance.

3. Methodology

This study applies a quantitative research design based on secondary data from Eurostat. Long-term remote-work trends are examined using the Labour Force Survey dataset Employed persons working from home by professional status (lfsa_ehomp), while the cross-sectional statistical analysis uses 2025 data for all 27 EU Member States (Eurostat, n.d.-a). The analysis combines descriptive and inferential statistics. Cross-country variation in the share of employed people usually working from home is assessed through the mean, median, range, and standard deviation. Pearson's correlation coefficient (r) is then used to examine the relationship between the prevalence of usual home working and enterprise digitalization. Digitalization is measured as the percentage of small and medium-sized enterprises reaching at least a basic level of digital intensity, based on Eurostat's Digital Intensity Index (isoc_e_dii) (Eurostat, n.d.-b). The correlation analysis matches both variables for the same reference year, 2025, across all 27 EU Member States. Statistical significance is assessed using a two tailed test. As correlation does not establish causation, the results are interpreted as evidence of association and considered in relation to the knowledge-management framework developed in the preceding section.

4. Statistical Analysis and Results

The Eurostat data reveal a clear structural break in patterns of home working across the European Union. Before the COVID-19 pandemic, the share of employed people who usually worked from home had remained broadly stable at approximately 5%. The pandemic produced a sharp increase, with the EU-27 rate reaching 13.5% in 2021. Although the prevalence of home working subsequently declined, it did not return to its pre-pandemic level. By 2025, 8.9% of employed people in the EU usually worked from home, indicating that the pandemic produced both a temporary disruption and a lasting change in the organization of work (Eurostat, *n.d.-a*).

The persistence of remote work is also evident in the cross-country data. In 2025, the mean share of employed people usually working from home across the 27 EU Member States was

8.84%, while the median was 8.20%. The standard deviation reached 4.98 percentage points, indicating considerable dispersion between countries.

Table 1

Descriptive Statistics for Usual Home Working Across EU Member States, 2025[1]

Statistic	Value
Number of countries (*N*)	27
Mean	8.84%
Median	8.20%
Minimum	1.30%
Maximum	21.10%
Range	19.80 percentage points
Standard deviation	4.98 percentage points

The scale of cross country variation becomes particularly clear when the highest and lowest values are compared. Finland recorded the highest rate of usual home working, at 21.1%, followed by Ireland at 19.3%. At the opposite end of the distribution, Bulgaria and Romania recorded rates of only 1.6% and 1.3%, respectively. The resulting range of 19.8 percentage points shows that remote work has not developed uniformly across Europe. An employed person in Finland was approximately sixteen times more likely to report usually working from home than an employed person in Romania.

The country-level distribution also reveals a broader geographical pattern. Several northern and western European countries recorded comparatively high levels of usual home working, whereas rates remained considerably lower in parts of southern and eastern Europe. This divergence suggests that the persistence of remote work cannot be explained by the pandemic alone. Instead, the continuing differences point towards structural factors, including occupational composition, economic specialization, organizational practices, and digital capacity.

To examine the relationship between remote work and enterprise digitalization more systematically, Pearson's correlation coefficient was calculated for all 27 EU Member States. The analysis matched the 2025 share of employed people usually working from home with the percentage of SMEs reaching at least a basic level of digital intensity in the same year.

[1] Calculations are based on the share of employed persons who usually worked from home in the 27 EU Member States. Source: Author's calculations based on Eurostat dataset *lfsa_ehomp*.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026). Toronto, Canada
No 301

BUSINESS ECONOMICS

The results showed a statistically significant positive correlation between the two variables, $r(25) = .686$, $p < .001$. The strength of the relationship can be described as moderately strong, indicating that countries with higher levels of enterprise digitalization tend to have higher rates of usual home working.

Table 2

Correlation Between Remote Work and SME Digital Intensity, EU Member States, 2025[2]

Variables	*N*	Pearson's *r*	*p*
Usual home working and basic SME digital intensity	27	.686	< .001

The relationship is also visible in the country level distribution. Finland combined the highest level of SME digital intensity, at 94%, with the highest prevalence of usual home working. The Netherlands, Sweden, Belgium, and Ireland also combined comparatively high levels of digitalization with substantial remote work adoption. At the opposite end of the distribution, Bulgaria and Romania recorded both low levels of usual home working and some of the lowest levels of SME digital intensity. These patterns are consistent with the positive correlation identified in the statistical analysis.

The result is theoretically plausible. Remote employees depend on digital systems to access information, communicate with colleagues, collaborate on shared outputs, and retrieve organizational knowledge independently of physical location. In knowledge-management terms, digital maturity provides the infrastructure required for the codification, storage, retrieval, and distribution of explicit knowledge. The correlation therefore supports the argument that remote work is more likely to persist in environments where organizations possess stronger digital capabilities.

Nevertheless, the relationship should not be interpreted as causal. Digitalization may facilitate remote work, but the expansion of remote work may itself encourage organizations to invest in digital technologies. Both variables may also be influenced by occupational structure, income levels,

[2] Pearson's two-tailed correlation. Remote work is measured as the percentage of employed persons usually working from home. Digital intensity is measured as the percentage of SMEs reaching at least a basic level of digital intensity. Source: Author's calculations based on Eurostat datasets *lfsa_ehomp* and *isoc_e_dii*.

managerial practices, broadband infrastructure, and the relative size of knowledge intensive sectors. The coefficient should therefore be interpreted as evidence of a significant association rather than proof that digitalization directly causes higher levels of remote work.

From a knowledge management perspective, the findings reveal a further distinction. Digital capacity may create the technological conditions required for remote work, but it does not demonstrate that the social processes underlying tacit knowledge transfer are equally effective at a distance. An organization may be highly capable of exchanging digital information while still experiencing difficulties in mentoring, informal learning, observation, and spontaneous knowledge creation. The empirical results therefore support the theoretical proposition developed in the preceding section: technological capacity and social interaction should be treated as complementary, rather than interchangeable, conditions for effective knowledge management.

4. Conclusion

The findings indicate that remote work has become a lasting, although unevenly distributed, feature of post-pandemic Europe. The substantial differences between EU Member States show that its persistence is shaped by broader structural conditions rather than by the pandemic alone. Most notably, the analysis identified a statistically significant positive relationship between SME digital intensity and the prevalence of usual home working (r = .686, p < .001), suggesting that stronger digital capacity is associated with a greater ability to sustain remote work.

From a knowledge management perspective, however, technological capacity is only part of the explanation. Digital systems can support the codification, storage, and distribution of explicit knowledge, but they cannot fully replace the social interaction through which tacit knowledge is shared. The principal lesson from post pandemic Europe is therefore that effective remote work requires a balance between digital infrastructure and opportunities for direct interaction. Well-designed hybrid models may offer the most sustainable approach by combining flexibility and digital knowledge access with the social processes needed for learning, mentoring, and collaborative knowledge creation.

References:

[1] Derrick, J., Willems, T., & Wang, P. K. (2022). Researching informal workplace learning in the context of remote working in the post-COVID-19 world. *Hungarian Educational Research Journal, 12*(4), 445-457.
[2] Eurofound. (2022). *The rise in telework: Impact on working conditions and regulations*. Publications Office of the European Union.
[3] Eurofound. (2024). *Living and working in the EU e-survey 2024*. https://www.eurofound.europa.eu/en/surveys-and-data/surveys/living-and-working-in-the-eu-e-survey/e-survey-2024
[4] Eurostat. (n.d.-a). *Employed persons working from home by professional status* [Data set]. European Commission. https://doi.org/10.2908/lfsa_ehomp
[5] Eurostat. (n.d.-b). *Digital intensity by size class of enterprise* [Data set]. European Commission. https://ec.europa.eu/eurostat/databrowser/view/isoc_e_dii/default/table
[6] Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, 5*(1), 14-37.
[7] Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

MANAGEMENT

Modern Talent Management Models in the Hotel Industry: Challenges and Prospects in the Georgian Context

Sosanidze M.O.[1], Kokashvili N.B.[2], Orjonikidze N.M.

[1] Ph. D (Econ.), Associate Professor;
Gori State University; Republic of Georgia

[2] Ph. D (Econ.), Associate Professor;
Gori State University; Republic of Georgia

[3] Professor;
Gori State University; Republic of Georgia

Abstract. In the current global hospitality industry environment, human capital is considered one of the most important factors in ensuring high service quality, sustainable competitive advantage, and long-term organizational development. Therefore, effective talent management is becoming an integral element of strategic human resource management aimed at attracting, developing, motivating, and retaining highly qualified employees. The purpose of this study is to analyze modern talent management approaches and assess their application in the Georgian hotel industry. A qualitative approach was used as the methodological basis for the study. Empirical data was obtained through twelve semi-structured in-depth interviews with executives and HR managers of hotel companies operating in Tbilisi and various regions of the country. The study's findings indicate that the main factors hindering effective talent management include high staff turnover, a shortage of qualified specialists, seasonal employment, poor integration of the education system with labor market needs, and the limited use of modern HR tools. Based on these findings, practical recommendations have been developed to improve talent management systems, increase employee engagement, and strengthen the competitiveness of the Georgian hotel sector.
Keywords: *talent management; hotel industry; human resources; staff retention; hotel business; Georgia.*

Introduction

The tourism and hospitality industry is one of the most dynamically developing sectors of the global economy and plays a vital role in the socioeconomic development of many countries, including Georgia. Growing international tourist flows, intensifying competition among hoteliers, and rising consumer expectations for service quality necessitate the search for new sources of sustainable competitive advantage.

MANAGEMENT

While previously, a hotelier's competitiveness was determined primarily by material resources, location, and infrastructure, today human capital has become a key strategic resource. The professionalism and competence of employees, their ability to effectively interact with clients, adapt to change, and provide a high level of service largely determine the success of hotel organizations.

In recent years, the concept of talent management has gained particular importance as a priority area of strategic human resource management. Modern organizations view talent management as a continuous process of identifying, attracting, developing, motivating, and retaining high-potential employees who can ensure the long-term development of the organization. This problem is particularly pressing in the hotel industry, where the quality of services provided directly depends on the level of professional training of staff. High staff turnover, seasonal employment, labor migration of skilled professionals, and the mismatch of educational qualifications with employer requirements pose serious obstacles to the sustainable development of the hotel industry in Georgia.

Despite growing research interest in talent management, the implementation of modern talent management models in the Georgian hotel sector remains understudied. Most existing studies focus on general human resource management issues and do not consider the specifics of the national labor market, the institutional environment, and the operational characteristics of hotel companies.

The scientific novelty of this study lies in its comprehensive analysis of modern talent management approaches, taking into account the specifics of the Georgian hotel industry, and in identifying the factors influencing the processes of attracting, developing, and retaining qualified employees.

The aim of the study is to evaluate existing talent management practices in the Georgian hotel industry, identify key challenges, and develop practical recommendations aimed at improving the effectiveness of human resource management and strengthening the competitiveness of hotel companies. To achieve this goal, the following research objectives were defined:

-analysis of modern theoretical approaches to talent management;

-study of international experience in applying talent management systems in the hospitality industry;

-assessment of existing talent management practices in the Georgian hotel sector;

-identification of key challenges in attracting, developing, and retaining personnel;

-development of practical recommendations for improving the talent management system.

Literature Review

Over the past two decades, talent management has become one of the most dynamically developing areas of research in strategic human resource management. Modern organizations view talent not only as a source of professional knowledge and competencies, but also as a strategic resource that ensures a sustainable competitive advantage in the face of increasing global competition.

One of the first comprehensive studies in this area was the work of Lewis and Heckman (2006), who defined talent management as a system of interrelated processes that includes identifying, attracting, developing, assessing, and retaining high-potential employees. The authors emphasize that the effectiveness of a talent management system is determined by the degree of its integration with the organization's strategic goals.

Further development of this concept is presented in research by Armstrong (2023), who argues that talent management should be viewed as a continuous process encompassing the entire employee lifecycle within an organization. The author notes that only the comprehensive integration of recruitment, training, performance appraisal, career development, and incentive systems can ensure the sustainable development of human capital and the long-term competitiveness of an organization. Research by Davidson, McPhail, and Barry (2011) shows that high employee turnover remains one of the most serious problems in the hotel industry. Constant staff turnover leads to increased recruitment and training costs, reduced service quality, a deteriorating organizational climate, and decreased customer satisfaction.

In recent years, the digital transformation of business has significantly influenced the development of talent management. The use of HR analytics, artificial intelligence technologies, big data, and digital platforms allows organizations to significantly improve the objectivity of recruitment, assessment, and development processes, as well as predict turnover risks and the effectiveness of personnel decisions. Contemporary research considers digital HR technologies as one of the most promising areas for the further development of human resource management.

A systematic literature review by Kravariti, Voutsina, Tasoulis, Dibia, and Johnston (2022) is of particular importance for the development of modern theory. After analyzing dozens of international studies, the authors concluded that talent management in the hotel industry is in a period of intensive development. Despite a significant increase in publications, many issues remain understudied, particularly in emerging economies. Researchers emphasize the need for empirical research that takes into account national characteristics of the labor market, education system, and institutional environment.

Despite the growing number of international publications, studies on talent management practices in the Georgian hotel industry remain limited. Most existing studies focus on general human resource management issues and offer little analysis of modern mechanisms for attracting, developing, and retaining talented employees in the Georgian labor market. It is this research gap that necessitates this study.

In modern academic literature, the term "talent" is used to describe an employee who, through professional knowledge, high competence, innovative thinking, and development potential, has a significant impact on the success of an organization and the achievement of long-term goals. Accordingly, talent management is a strategic and continuous process that includes identifying, developing, motivating, and retaining such employees.

When identifying talent, organizations rely on several key criteria. One of the most important is the employee's performance and the results they achieve. Equally important is their development potential, which includes the ability to quickly absorb new knowledge, adapt to change, and assume leadership responsibilities in the future.

Modern organizations also place special emphasis on emotional intelligence. The success of a hospitality employee depends on more than just professional knowledge. Effective communication, teamwork skills, empathy, and conflict management are often just as important as technical competence. Today, organizations consider not only an employee's professional skills but also their fit with the organizational culture. Sharing common values and goals connects employees with the organization and fosters effective collaboration.

Talent management goes beyond recruitment. It's far more important for organizations to create an environment that provides employees with opportunities for professional development and strengthens their motivation to stay with the company. This is why international practices place special emphasis on career development planning, succession planning, continuous learning, and skills development. Mentoring and coaching programs promote employee professional growth, while a fair evaluation and incentive system enhances employee engagement and a sense of responsibility.

In modern organizations, the quality of the work environment is also considered a key factor in employee retention. Compensation that matches labor market conditions, health insurance, recognition and rewards for employee achievements, flexible work schedules, and work-life balance create conditions that significantly increase employee satisfaction and loyalty.

In the service industry, where the risk of burnout is relatively high, measures aimed at supporting and improving employee well-being are considered an important aspect of human resources management. Several different models are used in talent management practices. One of the most common is the inclusive model, which states that every employee in the organization should be provided equal opportunities for development. This approach increases employee engagement and helps reduce turnover.

In contrast to the inclusive model, the exclusive model focuses on the development of high-potential employees. In this case, the organization directs its resources to the professional development of employees considered the most likely candidates for future leadership positions. Modern organizations widely utilize competency-based models, which base employee assessment on a comprehensive analysis of professional (hard skills) and behavioral (soft skills) qualities. This approach is particularly important for the hospitality sector, as service quality is determined by more than just professional knowledge. Effective communication, empathy, and customer focus are equally crucial.

In recent years, digital talent management models based on HR analytics, artificial intelligence, and data-driven solutions have gained particular importance. Such systems allow organizations to more objectively assess employee potential, improve the hiring process, and elevate human resources management to a strategic level.

A comparison of models shows that none is universal or equally effective for all organizations. The choice of a specific approach depends on the organization's size, the specific nature of its operations, organizational culture, and labor market conditions. Therefore, it is crucial for the Georgian hotel industry to implement a talent management system that adapts international practices to local realities.

Research Methodology

Our study is based on a qualitative research approach, which allows for a deeper understanding of talent management in the hotel industry, identifying existing challenges, and determining factors influencing the processes of attracting, developing, and retaining personnel. The study is descriptive and analytical in nature and aims to examine current talent management practices in the Georgian hotel industry. The theoretical basis for the study is based on modern concepts of strategic human resource management and talent management, presented in the works of leading international researchers, as well as international analytical reports on the development of the global hospitality industry.

The empirical portion of the study was conducted through semi-structured in-depth interviews, allowing for detailed information on the respondents' practical experiences and identifying key challenges in the hotel sector. The study involved twelve HR managers and executives representing hotel companies of various categories and ownership types.

To ensure comparative analysis, the sample was divided into two groups. The first group included representatives of international hotel chains operating primarily in Tbilisi and Batumi.

The second group included executives and HR managers of small and medium-sized hotels located in the Kakheti and Shida Kartli regions.

This approach allowed us to identify differences in talent management practices between international hotel brands and independent regional hotels operating in diverse socio-economic conditions.

All interviews were conducted with the voluntary consent of study participants and were conducted in accordance with the principles of confidentiality and anonymity.

This method allowed us to identify the most frequently recurring themes, identify key talent management challenges, identify similarities and differences between international and local hotel companies, and identify key trends in the development of human resources management systems in the Georgian hotel industry. The aim of the study was to identify key trends, existing challenges, and current talent management practices in the Georgian hotel industry. Research Results

Georgia's hotel industry has demonstrated steady positive growth in recent years, driven by the growth of international tourism, increased investment in the hospitality sector, and the expansion of hotel infrastructure. However, this accelerated growth is accompanied by growing demand for skilled labor, significantly increasing competition among employers.

According to GeoStat, UN Tourism, and the World Travel & Tourism Council (WTTC), the tourism sector remains one of the most important drivers of the country's economic development. However, the industry's sustainable development depends significantly not only on the quantitative growth of tourist flows but also on the ability of hotel companies to develop professional human capital and provide high-quality service.

- **Skilled Personnel Shortage**

The interview results showed that almost all study participants view the shortage of skilled professionals as the most serious problem facing the modern hotel industry.

Representatives of international hotel chains note that, despite the use of modern digital recruitment platforms, finding employees who meet professional requirements is becoming increasingly difficult. A similar situation is observed in regional hotels, where the problem is exacerbated by a limited supply of skilled labor.

These results are consistent with research by Baum (2020), who emphasizes that the shortage of professionally trained personnel is one of the most serious global challenges facing the hospitality industry.

- **High Employee Turnover**

Almost all respondents noted that employee turnover has a negative impact on the performance of hotel companies. The most common reason for dismissal is more attractive working conditions offered by competitors or foreign employers.

As one study participant noted:

"Even after extensive training, employees often leave the organization for a minor salary increase."

A particularly noticeable and problematic trend is the migration of experienced employees abroad. Respondents believe that higher salaries, better social benefits, and greater opportunities for professional development in European countries and the United States create a challenging competitive environment for the local Georgian hotel industry. Consequently, talent retention can no longer be achieved through monetary compensation alone and requires the immediate implementation of holistic, employee-focused management systems. These results confirm the findings of Davidson, McPhail, and Barry (2011) that high turnover leads to increased recruitment and training costs, reduced service quality, and decreased organizational effectiveness.

▪ **The Impact of Seasonality**

The study shows that seasonality is particularly problematic for hotels operating in Georgia's regions. Respondents emphasize that seasonal employment significantly reduces employee motivation, as temporary staff have fewer prospects for long-term career advancement.

At the same time, employers often refrain from investing additionally in staff development because they are unsure whether these employees will stay with the organization after the peak season ends. This creates a vicious cycle: organizations invest less in their staff, and as a result, employees feel less motivated to stay with the organization long-term.

At the same time, employers are also unwilling to invest significant financial resources in training employees who work only a few months a year.

Misalignment of the Education System with Labor Market Requirements

Almost all study participants noted a gap between the vocational education system and the actual needs of the hotel industry.

Despite graduates having sufficient theoretical training, employers note a lack of practical skills necessary for effective work in the modern hotel industry. Particularly frequently cited were insufficient proficiency in modern digital technologies, hotel management software, foreign languages, and professional communication skills.

▪ **Employer Branding and Talent Retention**

Most respondents noted that young professionals consider career advancement opportunities, corporate culture, professional development programs, work-life balance, and the quality of internal communication when choosing a job.

Interviews revealed that while salary remains an important structural factor, it is no longer the sole criterion influencing career decisions. In particular, younger workers increasingly value the quality of the work environment, professional development opportunities, fair treatment, and clear career prospects. Consequently, developing a strong employer brand and institutional policies focused on employee well-being are becoming vital sources of competitive advantage for modern hotels.

This finding is fully consistent with current research by the CIPD (2024) and Armstrong (2023), which consider employer branding to be one of the most effective tools for strategic human resource management.

Discussion of Results

The findings demonstrate that the key talent management challenges in the Georgian hotel industry largely coincide with trends observed in the global hospitality industry.

However, the study found that the impact of these factors in Georgia is exacerbated by the characteristics of the national labor market, the scale of labor migration, the limited capacity of regional hotels, and the insufficient integration of the educational system with employer needs.

Unlike most international studies, which focus on the digitalization of HR management and the implementation of HR analytics, the results of this study indicate that the creation of an effective system for training and retaining qualified employees remains a priority for the Georgian hotel sector.

The findings confirm the need for a comprehensive talent management model that integrates human capital development, modern motivation methods, digital HR technologies, and active collaboration between businesses and educational institutions.

Recommendations and Future Prospects

The results of the study demonstrate that current talent management challenges in the Georgian hotel sector are closely interconnected and cannot be effectively addressed by a single organization. Creating a sustainable human capital development system requires coordinated, strategic collaboration between businesses, educational institutions, and government agencies.

Based on empirical data, the following priority areas and recommendations were developed:

Integrating Education and Practice: To bridge the gap between theoretical knowledge and practical skills, it is advisable to widely implement an integrated model of education and practice (e.g., dual education). This structure will allow students to gain practical professional experience in a real hotel environment in parallel with their studies, significantly accelerating their adaptation after graduation.

• Strengthening Internal Training and Joint Programs: For small and medium-sized regional hotels, creating internal internship systems or establishing a joint training center shared by several local properties can be highly cost-effective. This approach promotes the development of professional skills tailored to the specific operational needs of local markets, while simultaneously enhancing employee loyalty.

• Employer Branding: Research findings confirm that employee retention cannot be achieved solely through competitive salaries. Today's workers increasingly prioritize professional development opportunities, fair performance appraisals, flexible working conditions, work-life balance, and visible organizational support. Consequently, hotels need to invest in employer branding and cultivate a positive organizational culture to attract and retain top talent.

• Implementation of digital HR management tools: In the context of rapid technological advancement, the implementation of HR analytics, data-driven solutions, and modern digital assessment systems is becoming increasingly important. These tools allow organizations to objectively assess employee potential, improve career tracking, and elevate HR management to a strategic level.

• Leadership development programs: Organizations should prioritize the timely identification of high-potential employees (HPEs) and their preparation for future internal leadership positions. Building a robust internal talent pool significantly reduces the financial costs associated with external recruitment and contributes to long-term organizational stability.

Systematic implementation of these recommendations will not only improve the quality of internal HR management but also enhance the overall competitiveness of the Georgian hotel industry in both domestic and international markets.

Conclusion

Today, talent management is no longer simply an operational function of HR management in the hotel industry;

it is a critical factor in the long-term strategic development of an organization. This study revealed that talent management in the Georgian hotel industry faces numerous structural challenges, ranging from high turnover and regional seasonality to educational mismatches and fierce international competition. At the same time, the research findings indicate that employee expectations have shifted significantly: alongside financial compensation, opportunities for continuous professional development, fair treatment by employers, organizational support, and a supportive work environment are increasingly important.

A review of international experience, combined with the findings of this study, confirms that there is no single, universal talent management model. Each hotel must choose and implement an approach that is tailored to its specific size, operational goals, corporate culture, and the socioeconomic environment in which it operates. For the Georgian hotel industry, success lies in the use of a flexible framework that successfully adapts global best practices to local market realities.

Ultimately, investing in human capital development is not the sole determining factor in the success of an individual hotel. In the long term, this creates the necessary basic infrastructure to enhance the competitiveness of the entire sector and further strengthen Georgia's macroeconomic tourism potential. For these reasons, a strategic focus on talent management will remain highly relevant, and future research in this area will contribute both to practical management decisions and to the development of scientific literature in this area.

References:

[1] Armstrong, M. (2020). *Armstrong's handbook of human resource management practice* (15th ed.). Kogan Page. https://www.scribd.com/document/975328987/Armstrong-s-Handbook-of-Human-Resource-Management-Practice-15th-Edition
[2] Collings, D. G., & Mellahi, K. (2009). Strategic talent management: A review and research agenda. *Human Resource Management Review, 19*(4), 304-313.https://doi.org/10.1016/j.hrmr.2009.04.001
[3] Cappelli, P. (2008). Talent management for the twenty-first century. *Harvard Business Review.* https://hbr.org/2008/03/talent-management-for-the-twenty-first-century
[4] Kravariti, F., Voutsina, K., Tasoulis, K., Dibia, C., & Johnston, K. (2022). Talent management in hospitality and tourism: A systematic literature review and research agenda. *International Journal of*

Contemporary Hospitality Management, 34(1), 321-360. https://doi.org/10.1108/IJCHM-03-2021-0365

[5] Sheehan, M., Grant, K., & Garavan, T. (2017). Strategic talent management: A macro and micro analysis of current issues in hospitality and tourism. *Napier University Repository.* https://napier-repository.worktribe.com/output/996850

[6] Sheehan, M., Grant, K., & Garavan, T. (2018). Talent management practices in hospitality and tourism: A macro and micro analysis of current issues. *Worldwide Hospitality and Tourism Themes, 10*(1), 101-116. https://doi.org/10.1108/WHATT-10-2017-0065

[7] Thunnissen, M., Boselie, P., & Fruytier, B. (2013). Talent management and the relevance of context: Towards a pluralistic approach. *Human Resource Management Review, 23*(4), 326-336. https://doi.org/10.1016/j.hrmr.2013.03.004

[8] World Economic Forum. (2023). *The future of jobs report 2023.* https://www.weforum.org/reports/the-future-of-jobs-report-2023/

[9] United Nations Development Programme. (2022). *Labour market research: Tourism and health/wellness sectors in Georgia.* https://www.undp.org/georgia/publications/vocational-education-market-research

[10] Kokashvili, N., Sosanidze, M., & Osadze, L. (2026). Human resources selection criteria in the Georgian tourism industry. *Grail of Science.*https://doi.org/10.36074/grail-of-science.15.05.2026.095

[11] Geostat. (2023). *Tourism statistics.* National Statistics Office of Georgia. https://www.geostat.ge/en/modules/categories/102/tourism-statistics

[12] Lewis, R. E., & Heckman, R. J. (2006). Talent management: A critical review. *Human Resource Management Review, 16*(2), 139-154. https://doi.org/10.1016/j.hrmr.2006.03.001

[13] Davidson, M. C. G., McPhail, R., & Barry, S. (2011). Hospitality HRM: Past, present and the future. *International Journal of Contemporary Hospitality Management.* https://doi.org/10.1108/09596111111112813

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

MARKETING, ADVERTISING AND PR

Moralizing Messages and Vaccine Hesitancy in Kazakhstan

Negmatova Dariya Kadyrzhankyzy[1], Filipov Milen[2]

[1] Higher education student of the Department of Media and Communications;
KIMEP University; Republic of Kazakhstan

[2] Scientific supervisor, Associate Professor
of the Department of Media and Communications;
KIMEP University; Republic of Kazakhstan

Routine childhood immunization (RCI) remains one of the most effective public health interventions for preventing infectious diseases and reducing child mortality worldwide. Despite the demonstrated effectiveness and widespread availability of vaccines, vaccine hesitancy has emerged as a significant challenge to public health systems. Vaccine hesitancy refers to the delay or refusal of vaccination despite the availability of vaccination services and is influenced by factors such as confidence, complacency, and convenience (MacDonald, 2015). In Kazakhstan, routine childhood vaccines are provided free of charge through the national immunization schedule, yet concerns regarding vaccine safety, trust in institutions, and exposure to conflicting information continue to influence parental decision-making. Research among highly educated mothers in Kazakhstan suggests that concerns about vaccine safety, trust, and information sources play an important role in shaping parental perceptions of childhood vaccination (Abdirakhman et al., 2024).

The rapid growth of digital media has transformed how parents access and evaluate health information. In Kazakhstan, social media platforms, messaging applications, and online communities have become important sources of information about childhood vaccination. Recent behavioral insights research conducted by UNICEF Kazakhstan (2023) found that parental vaccination decisions are strongly influenced by trust in information sources and perceptions of message credibility. Consequently, public health campaigns face the dual challenge of providing accurate information while maintaining public trust and engagement among audiences with varying levels of vaccine confidence.

Communication plays a central role in public health efforts to promote immunization. Routine childhood immunization campaigns frequently frame vaccination as a civic responsibility intended to protect both individual and community health. While such framing seeks to encourage positive health behaviors, research in health communication suggests that messages perceived as prescriptive, judgmental, or moralizing may reduce receptivity among hesitant audiences and hinder constructive dialogue (Leask et al., 2012). Psychological Reactance Theory provides one explanation for this phenomenon by proposing that individuals resist persuasive messages when they perceive their freedom of choice to be threatened (Dillard & Shen, 2005). In vaccination contexts, such reactions may contribute to feelings of being judged, reduced trust in public institutions, and lower willingness to engage with future health communication.

This study examines how vaccine-hesitant parents in Kazakhstan perceive and emotionally respond to online routine childhood immunization campaign messages. The research is informed by Risk Communication Theory, which emphasizes the importance of trust, transparency, and emotional responses in shaping public engagement with health-related information. From this perspective, communication effectiveness depends not only on the accuracy of information but also on how messages are interpreted by audiences and whether they foster trust in the institutions delivering them.

The study addresses three research questions: (1) What emotional responses do vaccine-hesitant parents report when exposed to online routine childhood immunization campaign messages? (2) How is perceived moralizing or prescriptive tone associated with institutional trust? and (3) What is the relationship between perceived stigma, institutional trust, emotional responses, and openness to vaccination messaging? Based on existing research, the study hypothesizes that perceived moralizing communication will be associated with lower institutional trust and higher perceptions of stigma. Greater institutional trust is expected to be associated with increased openness to vaccination messages, while emotional responses are expected to influence openness to communication beyond the effects of trust alone.

The study employs a quantitative cross-sectional survey design. Data will be collected through an anonymous online questionnaire administered to vaccine-hesitant parents residing in Kazakhstan who have delayed or refused at least one routine childhood vaccine for their child during the previous five years. Participants will be recruited through parenting-related social media communities and online forums using purposive and snowball sampling techniques. Given the sensitivity of vaccine hesitancy, an anonymous online survey is considered both ethically appropriate and methodologically advantageous because it may encourage more candid responses than face-to-face interactions.

The survey instrument will combine semantic differential scales and Likert-type measures. Participants will evaluate examples of publicly available routine childhood immunization campaign messages currently used in Kazakhstan. Semantic differential scales will assess perceptions of communication tone using dimensions such as judged-respected, pressured-autonomous, moralizing-neutral, and manipulative-transparent. Additional multi-item scales will measure institutional trust, perceived stigma, and openness to vaccination messaging. Institutional trust is particularly important because confidence in health institutions has consistently been identified as a key factor influencing vaccine acceptance and public engagement with immunization programs (Larson et al., 2018).

Data analysis will be conducted using SPSS. Descriptive statistics will summarize participant characteristics and key study variables. Internal consistency of multi-item scales will be assessed using Cronbach's alpha. Correlation analyses will examine relationships among perceived communication tone, emotional responses, perceived stigma, institutional trust, and openness to vaccination messaging. Multiple regression analyses will then assess the predictive influence of communication tone, emotional responses, and trust on openness to vaccination messaging. Because the study uses a cross-sectional design and non-probability sampling, findings will be interpreted as identifying associative rather than causal relationships.

Several measures will be implemented to ensure validity and reliability. The questionnaire will be developed on the basis of established theoretical and empirical research and will undergo pilot testing prior to full deployment. Ecological validity will be enhanced through the use of authentic immunization campaign materials currently circulating within Kazakhstan's digital communication environment. The anonymous survey design will help minimize social desirability bias and encourage honest reporting of attitudes and emotional reactions.

The study is expected to contribute to both scholarship and practice. Academically, it extends research on vaccine hesitancy by examining how communication tone, emotional responses, and institutional trust shape parental engagement with immunization campaigns in a Central Asian context. Practically, the findings may assist public health organizations in developing communication strategies that are more empathetic, transparent, and responsive to parental concerns. Previous research suggests that trust-building and dialogue-oriented approaches are more effective in communicating with vaccine-hesitant parents than approaches that rely primarily on persuasion or moral obligation (Limaye et al., 2021). By identifying communication practices that encourage trust rather than resistance, this study aims to support the development of more effective and socially responsive immunization campaigns in Kazakhstan.

References:

[1] Abdirakhman, T., Toktarkhan, A., Kubik, M., Yerubayeva, G., Akhmetzhanova, Z., Baidildinova, G., Baizhumanova, M., Sharman, A., Ryskulova, A., & Aljofan, M. (2024). Highly educated mothers' perception of childhood vaccination hesitancy in Kazakhstan. *Human Vaccines & Immunotherapeutics*, *20*(1), 2347305. https://doi.org/10.1080/21645515.2024.2347305

[2] Dillard, J. P., & Shen, L. (2005). On the nature of reactance and its role in persuasive health communication. *Communication Monographs*, *72*(2), 144–168. https://doi.org/10.1080/03637750500111815

[3] Larson, H. J., Clarke, R. M., Jarrett, C., Eckersberger, E., Levine, Z., Schulz, W. S., & Paterson, P. (2018). Measuring trust in vaccination: A systematic review. *Human Vaccines & Immunotherapeutics*, *14*(7), 1599–1609. https://doi.org/10.1080/21645515.2018.1459252

[4] Leask, J., Kinnersley, P., Jackson, C., Cheater, F., Bedford, H., & Rowles, G. (2012). Communicating with parents about vaccination: A framework for health professionals. *BMC Pediatrics*, *12*, 154. https://doi.org/10.1186/1471-2431-12-154

[5] Limaye, R. J., Opel, D. J., Dempsey, A., Ellingson, M., Spina, C., Omer, S. B., Dudley, M. Z., Salmon, D. A., & O'Leary, S. T. (2021). Communicating with vaccine-hesitant parents: A narrative review. *Academic Pediatrics*, *21*(4 Suppl), S24–S29.

https://doi.org/10.1016/j.acap.2021.01.018
[6] MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, *33*(34), 4161-4164. https://doi.org/10.1016/j.vaccine.2015.04.036
[7] UNICEF Kazakhstan. (2023). *Behaviour insights research on drivers influencing immunization-related behaviours in Kazakhstan*. https://www.unicef.org/kazakhstan/en/reports/behaviour-insights-research-drivers-influencing-immunization-related-behaviours-kazakhstan

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»

(July 16-18, 2026).
Toronto, Canada

No
301

INTERCONF
Scientific Publishing Center

PEDAGOGY AND EDUCATION

Ecological Education of Preschoolers

Mihailescu Natalia[1]

[1] Doctor of Educational Sciences (DSc), University Lecturer,
at the Department of History and Theory of Education;
Bogdan Petriceicu Hasdeu State University of Cahul; Republic of Moldova

Abstract. The implementation of environmental education of preschoolers in preschool education institutions will be more effective if it continues in the family. A family is a kind of micro-collective that plays a role in the preschooler's education. Modern science has abundant evidence that it is impossible to give up family education without harming the development of the child's personality, since it gives the child the full range of feelings, the widest range of ideas about life.
Keywords: *ecological education, preschoolers, environmental awareness, environmental protection, sustainable development, early childhood education, ecological culture.*

Family education is one of the forms of education of the young generation in society, combining the intentional actions of parents with the objective influence of family life. It is also necessary to consider such a feature of family education as the regulation of the child's various relationships with the outside world. Parents often act as a kind of "buffer", softening external demands and ensuring possible deviations from the norm, relieving the stress received by the child in other areas of life [3].

As a small social group in the structure of society, the family best corresponds to the requirement of the gradual introduction of the child into social life and the gradual expansion of his horizons and experience.

In Cuznetsov L.'s study, the factors that determine the strength and stability of family education are systematized [1].

1. Family education is characterized by a deep emotional and intimate character. The "conductor" of family education is parental love for children and the mutual feelings (affection, trust, tenderness) of children for parents. The effectiveness of family education is largely determined by the emotional states that bind all its members, making

children feel protected from the unknowns and dangers of the world around them. Here you can hide in your mother's arms from real and imaginary fears, learn about everything in the world from your grandfather, who is the "smartest". The warmth of the house is one of the conditions for a happy childhood.

2. Family education is distinguished by the constancy and duration of the educational influences of the mother, father and other family members in a variety of life situations, their repetition from one day to the next. Such a constancy of educational influences is conducive to the development of the child's nervous system, which develops responses to external stimuli. Even if, in terms of content and form of expression, these educational influences are not always pedagogically competent, the child knows and foresees at every moment of life what awaits him. For example, returning from a walk in a dirty jacket, he prepares in advance for his mother's disapproving reaction, adapts to the activity that will be necessary to "calm down" his mother ("I will apologize, kiss, take a brush and clean my jacket").

In the family, the foundations of a human attitude towards nature are laid. Thus, environmental education in the family has a special importance in the formation of the child's extremely moral attitude towards nature.

In preschool education institutions, the solution to the problem related to environmental education is carried out in two interdependent directions:

- educating children's initial forms of ecological culture, conscious attitude towards nature, developing initial practical skills;
- developing environmental awareness, ecological culture of adults raising preschool children.

Ecological education in the family depends to a large extent on parental authority, on how the family as a whole and each adult react individually to the preservation of the natural environment at home, in the park, in the field, in the forest, etc. The upbringing of children in the family is achieved through parents [2]. The behavior of parents and their influence on children is "the most decisive thing". "Don't think that you educate a child only when you talk to him, when you teach him or when you show him. You take care of him in every moment of your life, even when you are not at home. You raise children with your authentic author" (A.S. Makarenko).

Increasing parental education contributes to establishing richer spiritual connections with the environment in children. In environmental education, the power of imitation is important. We need lively, good examples in front of children's eyes. Every word we say, every gesture we make, not to mention our actions, once a child sees them, can serve as an example to follow.

Pedagogical research shows that preschoolers can master norms and rules, as well as restrictions and prohibitions of an ecological nature. A child's moral attitude toward nature manifests itself in moral judgments, moral choices, and moral choices. It is necessary to familiarize children with the rules of behavior in nature, taking into account its preservation and protection (to help master the ability to properly collect the gifts of nature, not to harm the living, not to violate the integrity and conditions of life). Gradually, the child will master the system of environmental behavioral skills, which is an integral part of the individual's ecological culture [4].

To develop creative imagination, it is important for parents to observe and support every creative endeavor. The family is designed to instill in the child an attitude towards nature as a source of unique material and spiritual values. The task of preschool educators is to competently build work with parents on environmental education in the family. Parents of a preschooler are the most receptive to teachers' advice. Preschool age is a time when many of them themselves strive to come into contact and cooperate with teachers, which is very important for environmental education.

Parents' environmental education is one of the most important and, at the same time, one of the most difficult areas of activity of a preschool institution. Working with parents should be gradual and continuous, but the environmental information that educators provide to parents is personally meaningful to them. Particular attention should be paid to the joint activities of children and adults, because through activity a person influences the world around him.

Weekend activities can act as a means of interaction with the family in introducing preschoolers to the nature of their hometown. Such a trip in nature: to the countryside, to the river, to the park, to the forests, promotes cooperation, emotional, psychological closeness of parents and children, allows preschoolers to feel like an "adult" and an adult - to better understand the world of a child [2].

PEDAGOGY AND EDUCATION

Weekend activities are developed seasonally, depending on age and various topics. These may include:
- the purpose of the route;
- useful information about the location;
- proverbs and sayings, signs, riddles, poems;
- experimental activities;
- active and didactic games.

The family as a medium for the formation of personality has an enormous impact on the formation of the foundations of the child's ecological vision. The foundation of moral education, which is inextricably linked to environmental education, is also laid in the family and precisely in the period of early childhood.

The ecological education of preschoolers can be considered a process of continuous growth and education of parents, which aims to form the ecological culture of all family members. G.A. Yagodin has repeatedly emphasized that working with parents is no less important and more difficult than working with children. One of the author's main tasks is to involve adult family members (even grandparents to a greater extent than busy fathers and mothers) in joint work [Apud, 2].

The family helps us to perceive the nature around us correctly. Parents help the child to understand the surrounding nature, to make it interesting and attractive to the child. A child should love everything that surrounds him, with which his sensory knowledge is connected, since his intellectual and emotional growth are closely linked. The educator helps parents stimulate the development of children's sensory perception of their immediate environment, in order to reveal to them the uniqueness, beauty and wonder of the surrounding world.

So, cultivating a love for nature in a person from the first years of life is one of the most important tasks of a family. After all, this is the formation of human character. Thus, modern science emphasizes the priority of the family in raising a child, which is manifested in the variety of forms of influence, in the continuity and duration of the latter, in the range of values that a growing person masters [4].

References:

[1] Cuznetov L. 2008, *Family Education Treatise. Family Pedagogy*. Chisinau, ISBN 978-9975-70-717-6.
[2] Dediu I. 2006, *Introduction to Ecology*. Chișinău: Phoenix Publishing

House, ISBN: 9789975677288
[3] Geamana N. 2013, *Ecological education - a guide for kindergarten and preparatory class activities*. Bucharest: Arlequin, acces link: https://animallife.ro/wp-content/uploads/2017/05/Indrumar-Final-4-decembrie-2016.pdf
[4] Odoleanu N. 2015, *Good practices. Developing competence in solving environmental problems*. Chisinau: Institute of Educational Sciences, ISBN 978-9975-48-078-9.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

Faith, Nation, and Freedom: the Georgian Orthodox Church and the Politics of Religious Diversity

Pareshishvili Giorgi[1], Gogotishvili Kakha[2]

[1] Doctor of Political Science, Associate Professor, Advisor to the Rector Giorgi; *Caucasus International University;* Republic of Georgia

[2] Master of Theology, PhD Candidate in Political Science; Republic of Georgia

Abstract. Freedom, as a political value, is never negotiated in a vacuum. In post-Soviet Georgia, the boundaries of religious freedom have been systematically shaped — and constrained — by the dominant position of the Georgian Orthodox Church within both the constitutional framework and the broader political culture. This paper examines how the institutionalization of Orthodox Christianity as a marker of national identity has produced a contested understanding of religious freedom in contemporary Georgia, one that privileges the majority confession while generating structural pressures on minority faith communities and secular actors alike. Drawing on three decades of church-state relations (1991–2025), the paper traces how the Georgian Orthodox Church evolved from a suppressed institution under Soviet rule into a politically influential actor capable of shaping legislative outcomes, electoral behavior, and public discourse. The Concordat of 2002 and subsequent constitutional amendments formalized the Church's privileged status, creating an asymmetric landscape in which religious diversity is formally tolerated but substantively marginalized. Catholic, Armenian Apostolic, Muslim, and other communities have faced varying degrees of institutional discrimination, social hostility, and legal ambiguity — patterns that illuminate the tension between liberal constitutional commitments and the illiberal logic of religious nationalism. The paper further argues that Orthodox hegemony has increasingly functioned as a resource for illiberal political mobilization, used to delegitimize Euro-Atlantic integration, restrict minority rights, and define the boundaries of authentic Georgian citizenship. Methodologically, the paper combines institutional and discourse analysis with comparative reference to analogous cases in Central and Eastern Europe — particularly Poland and Serbia — to situate Georgia within wider regional debates about religion, populism, and democratic backsliding. Georgia's trajectory ultimately reveals the fragility of religious freedom where the sacred and the national remain deeply entangled.
Keywords: *religious nationalism, church-state relations, democratic backsliding, religious pluralism, post-Soviet Georgia.*

Introduction

Freedom is rarely adjudicated by political institutions alone; it is also negotiated through the symbolic and institutional weight of religion. In Georgia, three decades of post-Soviet state-building have been inseparable from the consolidation of the Georgian Orthodox Church (GOC) as a privileged political actor. This article examines how the institutionalization of Orthodox Christianity as the chief marker of Georgian national identity has produced a contested and asymmetric understanding of religious freedom — one that affords substantial latitude to the dominant confession while constraining the practical freedoms of religious minorities, secular citizens, and sexual minorities alike. Drawing on the Concordat of 2002, subsequent legislative and constitutional debates, and the political crises of 2024-2025, the article situates Georgia's trajectory within the broader Central and Eastern European pattern in which religious institutions function as both a resource for post-communist identity reconstruction and a vector of illiberal political mobilization. The Georgian case is instructive for comparative debates on freedom in the region precisely because it demonstrates that constitutional guarantees of religious liberty are fully compatible with a deeply unequal lived experience of that liberty.

The Institutionalization of Orthodox Privilege

Although Article 9 of the Constitution of Georgia formally separates church and state while recognizing the GOC's "special role" in national history, the Constitutional Agreement (Concordat) signed in October 2002 by President Eduard Shevardnadze and Patriarch Ilia II established a substantively different reality (Gegeshidze & Mirziashvili, 2021). The Concordat confirmed Church ownership of all churches and monasteries on Georgian territory, including non-functioning structures; granted the Patriarch legal immunity; gave the GOC exclusive rights to staff military chaplaincies while exempting its clergy from conscription; and created a unique consultative role for the Church in education policy (Gegeshidze & Mirziashvili, 2021). Crucially, the Concordat made the GOC the only religious institution permitted to register as a "church" under Georgian law; Catholic, Muslim, and other communities could register only as unions or foundations, a distinction with direct consequences for property rights and tax status (Concordat of 2002, n.d.).

These asymmetries were not incidental but constitutive. As Gegeshidze and Mirziashvili (2021) document, the Church's privileged legal position has translated into substantial fiscal transfers, with the Patriarchate receiving significant annual support from state and municipal budgets — resources unavailable to other confessions, which remain subject to standard taxation. The result is a legal architecture in which religious pluralism is formally permitted but substantively hierarchical: one confession enjoys constitutional recognition, property restitution, and budgetary support, while all others operate within a residual category of tolerated but unequal civil status.

Hegemony in Practice: Religious Diversity and Its Limits

The practical consequences of this asymmetry are most visible in the experience of religious minorities. Georgia's Muslim community — concentrated in Adjara and parts of Kvemo Kartli — has faced repeated, often informal, obstruction of mosque construction; Batumi's decades-long inability to secure permission for a second mosque, eventually ruled discriminatory by the Kutaisi Court of Appeals, is illustrative of how administrative discretion has been used to constrain minority worship (Gegeshidze & Mirziashvili, 2021). Armenian Apostolic communities have likewise been engaged in protracted property disputes with the GOC over historic churches in Tbilisi, reflecting tensions inherited from the Soviet period (Gegeshidze & Mirziashvili, 2021).

The clearest illustration of how Orthodox hegemony shapes the boundaries of permissible freedom emerged in July 2021, when radical conservative groups, including several Orthodox priests, violently disrupted Tbilisi Pride events, injuring more than fifty journalists and tearing down the European Union flag in front of parliament (Gegeshidze & Mirziashvili, 2021). The Patriarchate publicly condemned the violence, yet senior clergy simultaneously denounced the Pride march itself as incompatible with Georgian tradition, a duality that left ambiguous whether ecclesiastical authority functioned as a restraint on extremism or as a permissive backdrop for it (Gegeshidze & Mirziashvili, 2021). This was not an isolated rhetorical moment: the Patriarch's Easter epistle earlier that year had already characterized the erosion of fixed gender categories and family values as a central threat to be resisted, establishing a discursive template that the ruling party would later translate into statutory form (Gegeshidze & Mirziashvili, 2021).

These patterns are reinforced by a deeper ideological current: the equation of authentic Georgian identity with Orthodox belonging. Comparative survey data place Georgia among the highest-scoring post-Soviet Orthodox states on the perceived necessity of sharing the dominant religion to be considered "truly" national, a marker more salient in Georgia than in Serbia, Russia, or Greece (Margvelashvili, 2025). This ethno-religious conception of nationhood, consolidated through the Church's role in the independence movement of 1989-1991, leaves limited discursive space for minority confessions, secular citizens, or LGBTQ individuals to claim full belonging within the national community (Margvelashvili, 2025). Where civic-national and Euro-Atlantic integration discourse have pushed against this conception since the 2003 Rose Revolution, the underlying ethno-religious template has persisted as the default frame to which political actors return in moments of perceived crisis (Metreveli, 2016).

Religious Nationalism and Illiberal Mobilization, 2014-2025

The years following Georgia's 2024 parliamentary election cycle illustrate how Orthodox hegemony has been redeployed as an explicit instrument of illiberal politics. As the ruling Georgian Dream party advanced its "foreign influence" legislation — closely modeled on Russia's "foreign agents" framework — the Patriarchate issued a statement in April 2024 endorsing restrictions on civil society organizations and "the propaganda of the LGBT lifestyle," framing both as threats to "traditional values and the state's independence" (Civil Georgia, 2024). Human rights organizations characterized the resulting law as imposing onerous reporting requirements on foreign-funded media and NGOs, explicitly intended to suppress organizations critical of the government and the Church alike (Human Rights Watch, 2024).

This alignment deepened with the passage of the "Family Values and Protection of Minors" package in September 2024, which banned Pride events and public LGBTQ symbols, prohibited gender-affirming care, and nullified same-sex marriages contracted abroad. Parliamentary leaders explicitly justified the law by reference to "centuries-old Christian, Georgian and European values," while Church officials had called for a ban on "LGBT propaganda" months earlier (Al Jazeera, 2024). The episode exemplifies a broader pattern documented in the scholarship on Orthodox political engagement: the Church functions as a societal veto player whose cultural capital is mobilized by governing elites to legitimize restrictions on minority rights and civic freedoms, while the Church itself secures protection from scrutiny and continued material privilege in return (Margvelashvili, 2025; Metreveli, 2016). This is not a relationship of simple instrumentalization in either direction; it is, as Margvelashvili (2025) argues, a discursive struggle in which both Church and ruling party draw legitimacy from one another's cultural and political capital, reinforcing a shared narrative that casts liberal pluralism — and, by extension, the European Union itself — as an external threat to Georgian civilizational identity (Carnegie Endowment for International Peace, 2024).

Comparative Reflections: Georgia in the Central and Eastern European Mirror

Georgia's trajectory is not unique within the region. Comparable dynamics of ecclesiastical nationalism — in which a historically dominant church legitimizes nationalist political projects and contests the boundaries of secular citizenship — have been documented in Serbia and, to varying degrees, Poland and Russia, where dominant confessions have similarly functioned as guardians of an ethnically and religiously defined national community (Metreveli, 2016). In Poland, the Catholic Church's alignment with the Law and Justice government after 2015 produced analogous outcomes, as religious authority was invoked to justify restrictions on reproductive rights and to frame LGBTQ visibility as a foreign import threatening national cohesion. In Serbia, the Serbian Orthodox Church has played a comparable role in legitimizing nationalist narratives tied to Kosovo and regional territorial disputes, illustrating how Orthodox ecclesiology's historical entanglement with national mythology recurs across the post-communist Orthodox world (Metreveli, 2016). What distinguishes Georgia is the comparative weakness of countervailing state institutions: unlike Greece, an Orthodox-majority state with comparable levels of religiosity but considerably more entrenched democratic institutions, Georgia's fragile post-Soviet state structures have offered less institutional buffer against the Church's mobilizing capacity (Margvelashvili, 2025). This comparative weakness helps explain why religious nationalism in Georgia has translated more directly into legislative outcomes than in cases where institutional checks are more developed.

Conclusion

Georgia's experience demonstrates that religious freedom cannot be assessed solely through constitutional text; it must be evaluated against the practical architecture of privilege, fiscal support, and discursive power that determines which communities can fully exercise that freedom. The Concordat of 2002 formalized an asymmetry between Orthodox Christianity and all other confessions that has proven durable across three decades of political change. In the post-2024 period, this asymmetry has been actively mobilized in service of an illiberal political agenda that frames Euro-Atlantic integration, civil society, and minority rights as threats to a religiously defined national identity. Georgia's case suggests that in societies where the sacred and the national remain deeply entangled, the consolidation of democratic freedom requires not merely formal guarantees of religious liberty, but a renegotiation of the relationship between dominant religious institutions and the state itself. For scholars of freedom in Central and Eastern Europe more broadly, the Georgian case offers a cautionary illustration: religious institutions inherited from the Soviet collapse can become durable infrastructures of illiberalism long after the initial moment of national revival has passed, suggesting that comparative research on democratic backsliding in the region should treat church-state entanglement as a structural variable rather than a peripheral cultural detail.

References:

[1] Al Jazeera. (2024, September 17). Georgia's parliament approves law curbing LGBTQ rights. https://www.aljazeera.com/news/2024/9/17/georgias-parliament-approves-law-curbing-lgbtq-rights

[2] Carnegie Endowment for International Peace. (2024, May). Georgia's foreign agent law could presage a geopolitical realignment. https://carnegieendowment.org/russia-eurasia/politika/2024/05/georgia-protests-geopolitics

[3] Civil Georgia. (2024, April 27). Church endorses ruling party policies ahead of crucial vote. https://civil.ge/archives/601802

[4] Concordat of 2002. (n.d.). In Wikipedia. Retrieved June 26, 2026, from https://en.wikipedia.org/wiki/Concordat_of_2002

[5] Gegeshidze, A., & Mirziashvili, M. (2021, July 23). The Orthodox Church in Georgia's changing society. Carnegie Endowment for International Peace. https://carnegieendowment.org/research/2021/07/the-orthodox-church-in-georgias-changing-society

[6] Human Rights Watch. (2024, May 9). Georgia: 'Foreign influence' bill threatens rights. https://www.hrw.org/news/2024/05/09/georgia-foreign-influence-bill-threatens-rights

[7] Margvelashvili, K. (2025). Contested national and digital space, the Orthodox Church, and the new forms of religious engagement: Comparative insights from Georgia and Greece. Frontiers in Political Science, 7, Article 1659335. https://doi.org/10.3389/fpos.2025.1659335

[8] Metreveli, T. (2016). An undisclosed story of roses: Church, state, and nation in contemporary Georgia. Nationalities Papers, 44(5), 694-712. https://doi.org/10.1080/00905992.2016.1200021

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

The Geopolitical Significance of the Middle Corridor in Eurasian Politics

Sultanli Sadig[1]

[1] Science Expert;
University of Opole Global Studies; Republic of Poland

Abstract. In the modern world, the Middle Corridor stands out as an important Eurasian transit corridor linking China and Europe via Central Asia, the Caspian Sea, the South Caucasus, and Türkiye. Growing geopolitical tensions, changes in supply chains, and the shift in global trade flows make this route increasingly relevant in comparison to other Northern and Southern corridors. In this regard, the purpose of this paper is to discuss the geopolitical importance of the Middle Corridor in Eurasian politics of today. The analysis of the interest of China, the EU, Türkiye, Azerbaijan, and Central Asian countries in the Middle Corridor would be conducted based on qualitative methods and comparative analysis of transport corridors. The research reveals that the Middle Corridor ensures better connectivity in the region, lowers the risk of dependence on the transit routes used, and builds economic and geopolitical resilience. However, at the same time, this transport route experiences some infrastructural issues, regulatory fragmentation, and geopolitical competition between the great powers. Despite all difficulties, the continuous investments in modernization of the transport infrastructure, digitization of logistics, and establishment of regional cooperation frameworks show that the Middle Corridor has a high potential for further development.
Keywords: *Middle Corridor, Eurasian geopolitics, connectivity, transport corridors, Belt and Road Initiative.*

Introduction

Over the past years, the interdependence between the world markets has brought into focus the issue of international transports and corridors. Given the increasingly strong economic relations between Asia and Europe, there is a need for diversified, effective and reliable transport network infrastructure. Under these circumstances, the Middle Corridor, or Trans-Caspian International Transport Route (TITR) has turned out to be one of the most important connectivity projects in Eurasia.

The Middle Corridor connects China and Europe through Central Asia, Caspian Sea, South Caucasus and Türkiye as an alternative transport route. The relevance of the Middle

Corridor has risen due to geopolitical tension, supply chain interruptions and the need for diversification of transport routes. It was the COVID-19 outbreak and the war between Russia and Ukraine that highlighted the weaknesses of current transport routes and made countries look for alternative ones.

Apart from economic significance, the Middle Corridor also bears significant geopolitical importance. Firstly, it helps improve regional connectivity and increases the strategic importance of transit countries like Azerbaijan, Kazakhstan, Georgia, and Türkiye; secondly, it is helpful in improving economic relations between Europe and Asia. Thirdly, being part of China's Belt and Road Initiative, it has also been increasingly noticed by European Union and other international actors interested in diversifying trade routes and avoiding traditional corridors.

As the Middle Corridor gains more importance, it has also started attracting the attention of researchers as a subject of Eurasian geopolitics. This paper will explore geopolitical implications of the Middle Corridor. More specifically, the focus will be on regional connectivity, economic integration, and strategic competition of key actors. The study will rely on qualitative approach, with document analysis and corridor comparison.

2. The Middle Corridor: Concept and Strategic Importance

Middle Corridor is also referred to as the Trans-Caspian International Transport Route (TITR), and it constitutes one of the connectivity initiatives connecting East Asia and Europe. It represents a multimodal transportation system consisting of rail, marine, and road transport networks running from China via Kazakhstan, the Caspian Sea, Azerbaijan, Georgia, and Türkiye into Europe.

In particular, development of this route has been fostered by the emergence of the Belt and Road Initiative (BRI) in 2013, which has contributed to infrastructure development, as well as modernization of logistic and customs activities. Due to its geographical location, the Middle Corridor can be viewed as an alternative to Northern Corridor passing via Russia and to International North-South Transport Corridor (INSTC).

Geopolitical significance of the Middle Corridor does not only include transport but diversification of routes and decrease in dependence on old routes and networks exposed to geopolitical problems and regional confrontations. Russia-Ukraine war particularly emphasized vulnerabilities of traditional logistics chains and created interest towards alternative trade routes between Europe and Asia. In result, amount of goods moved along the Middle Corridor increased noticeably in recent years.

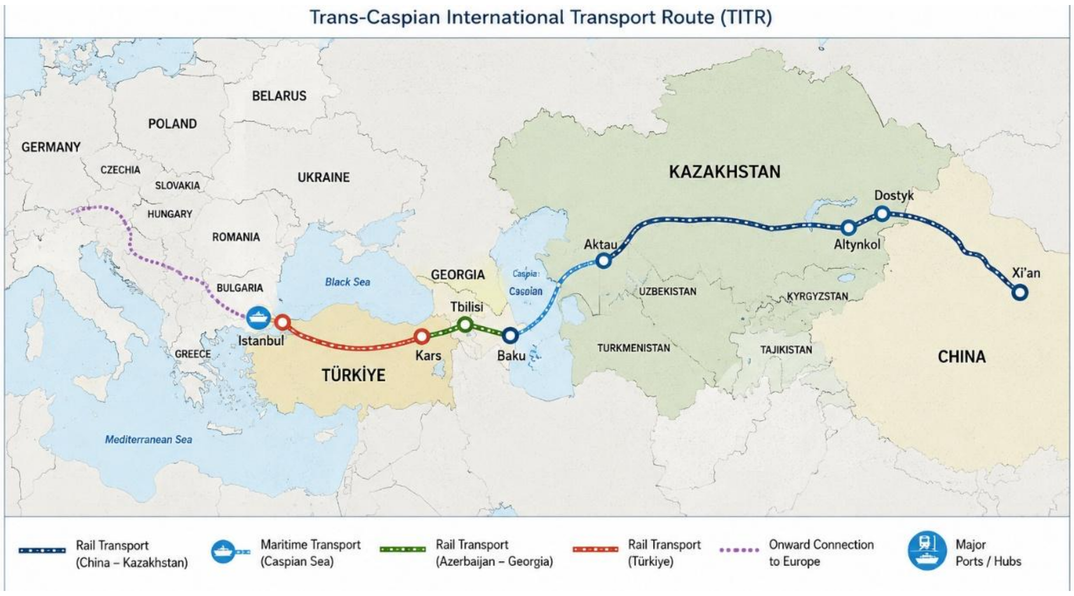

Figure 1
Map of the Middle Corridor
Source: Adapted from the Trans-Caspian International Transport Route (TITR) Association (2025) and European Commission (2025)

Also, geopolitical significance of the Middle Corridor is confirmed by major infrastructure projects like Baku-Tbilisi-Kars railway, Port of Baku Alat, Aktau and Kuryk ports in Kazakhstan, as well as logistics centers in Central Asia and South Caucasus.

For transit countries like Azerbaijan and Türkiye, Middle Corridor means great chance for increasing their role of regional logistics hubs. In addition, this project contributes to economic cooperation and integration of Central Asian, South Caucasian, and European countries. In terms of development of global trade relations, Middle Corridor is turning into increasingly significant tool of economic and geopolitical influence.

3. Geopolitical Significance of the Middle Corridor

3.1. China's Belt and Road Initiative and the Middle Corridor

Geopolitical significance of the Middle Corridor is strongly associated with China's Belt and Road Initiative

(BRI) project aimed at increasing infrastructure connectivity between Asia and Europe. Geopolitical instabilities and interruptions in traditional transit corridors in Eurasia made the Middle Corridor more appealing as an alternative route for trade and transportation.

For China, it helps to diversify export routes, ensures the stability of the supply chain, and deepens economic collaboration with the countries of Central Asia and South Caucasus.

3.2. Azerbaijan as a Strategic Transit Hub

Azerbaijan holds a significant place in the Middle Corridor because of its particular geographic location, which makes it an intersection of Europe and Asia. It is considered an important link between Central Asia and the South Caucasus region along with Europe. Major developments in infrastructure, such as the construction of the Port of Baku at Alat and the railway Baku-Tbilisi-Kars, have increased the transiting ability of Azerbaijan.

Moreover, Azerbaijan has recently been using transport diplomacy in order to increase its geopolitical power in the region. By developing and supporting initiatives for regional connection, Azerbaijan has significantly expanded its influence. Thus, the importance of the Middle Corridor has contributed to this process as well.

3.3. Türkiye and European Connectivity

Türkiye is the western entrance to the Middle Corridor and an essential link between the Eurasian and European marketplaces due to its transport connections. In terms of transport infrastructure, Türkiye allows transferring cargo from the South Caucasus to Europe through railways, highways, and ports. Furthermore, it considers the corridor to be an effective tool to become a logistic and trading center in the region.

The partnership between Azerbaijan and Türkiye has had a positive impact on the development of the corridor.

3.4. European Union Interests and the Global Gateway Initiative

In recent times, the EU has shown increasing interest in the Middle Corridor through its attempts to diversify transport corridors and enhance economic ties with Central Asia and the South Caucasus countries. The Global Gateway Initiative is designed by the EU to finance sustainable infrastructure development to enhance connections between Europe and its key partners.

From the point of view of geopolitics, the corridor provides the EU with the chance to decrease reliance on conventional transport corridors while gaining better access to energy sources, vital raw materials, and new markets. Therefore, the Middle Corridor is seen as an essential part of Eurasian connectivity for European organizations.

3.5. Strategic Interests of Key Actors

The geopolitical significance of the Middle Corridor can be better understood through the strategic objectives pursued by the main stakeholders involved in its development.

Table 1

Strategic Interests of Key Actors in the Middle Corridor

Actor	Strategic Interests	Expected Benefits
China	Diversification of trade routes; Belt and Road Initiative implementation	Increased connectivity with Europe; supply-chain resilience
Azerbaijan	Strengthening transit hub status; regional influence	Transit revenues; geopolitical importance
Türkiye	Expansion of logistics and transport role	Enhanced regional leadership; economic growth
European Union	Diversification of transport and energy routes	Improved economic security and connectivity
Kazakhstan	Access to global markets; export diversification	Increased trade and transit opportunities
Georgia	Strengthening transit function between Asia and Europe	Economic development and foreign investment

Source: Author's compilation based on European Commission (2025), TITR Association (2025), World Bank (2025), and OECD (2025)

As shown by the information provided in Table 1, despite the fact **that** the parties have different national interests, all of them have one common goal, which is increasing the connectivity in Eurasia. Such interests' convergence has made the Middle Corridor move from being merely a regional transport project to becoming a geopolitically significant project as well. With the increase in competition between major transport corridors, the significance of the Middle Corridor will only keep increasing.

4. Challenges and Opportunities

However, the increasing significance of the Middle Corridor has presented various chances for the participating countries, as well as posing some infrastructural, political, and geopolitical risks. Despite becoming increasingly viable for Eurasian trade and connectivity, the long-term success of the corridor will depend on the ability of the parties involved to overcome these constraints and maximize on their strengths.

4.1. Infrastructure Challenges

Although many investments have been made recently, infrastructure continues to be one of the key factors hindering the effectiveness of the Middle Corridor. The passage goes through several states with different stages of transport development that result in different railway capacities, port infrastructure, customs procedures, and logistics services.

One of the biggest obstacles is the transition via the Caspian Sea, where freight should be loaded from rail transport into maritime transport. Even though such ports as Baku, Aktau, and Kuryk have been modernized, the increase in cargo volume continues to put strain on the ports. Besides, differences in technical standards and border procedures may cause delays and additional transportation expenses.

The fast growth of cargo flows makes additional investment in the modernization of infrastructure inevitable.

Table 2

Growth of Cargo Transportation through the Middle Corridor (2021-2025)

Year	Cargo Volume (Million Tons)
2021	0.8
2022	1.5
2023	2.8
2024	4.5
2025	5.2

Source: Compiled by the author based on TITR Association (2025), World Bank (2025), and European Commission (2025).

This is illustrated in Table 2, where it is clear that the quantity of goods transported via the Middle Corridor significantly rose from 2021 until 2025. This is an indication of the increasing need for alternative ways of transporting goods across Eurasia.

4.2. Political risks

Maintaining political stability is still an important condition for the effective functioning of the Middle Corridor. Considering that this route goes through several sovereign countries, the necessity of coordinated policy-making becomes obvious for securing continuous transport movements.

Potential political problems, shift of government's interests, and changes in the diplomatic situation could have an effect on the implementation of transport infrastructure projects and agreements. In addition, the ongoing unresolved regional conflicts in some parts of Eurasia could create threats for the safety of transport and investors.

An issue that needs to be addressed concerns regulatory fragmentation. Inconsistency of rules and regulations concerning customs, transport, and administration in different participating countries can lower effectiveness of the work.

4.3. Geopolitical competition

The formation of the Middle Corridor occurs against the background of general geopolitical competition on the territory of Eurasia, when transport corridors become tools of economic and political influence. China sees the corridor as a part of the Belt and Road Initiative and as a tool to increase market access to Europe. The European Union promotes the use of the corridor under the Global Gateway Initiative to improve connectivity and diversity of transportation. On the other hand, Russia perceives the Eurasian transport network as an element of regional influence strategy. In addition, the corridor faces competition with the Northern Corridor and the International North-South Transport Corridor (INSTC). Thus, the future of the corridor depends not only on infrastructure but also on its competitiveness in the Eurasian transport system.

4.4. Future opportunities

Even in the face of current difficulties, the Middle Corridor represents a lot of promise in terms of economic development and collaboration in the region. Growing trade volumes between Asia and Europe are likely to increase demand for dependable transport corridors, which will add to the significance of the route. The use of digital solutions, including electronic customs clearance procedures and modern freight platforms, can increase efficiency through shorter transit periods and lower costs. Additionally, investments in sustainable transport infrastructure will enhance the appeal of the Middle Corridor in the context of global environmental initiatives. For countries taking part in the project, including Azerbaijan, Kazakhstan, Georgia, and Türkiye, there are benefits in terms of increased transit revenues, attracting investments, improving infrastructure, and gaining geopolitical influence.

5. Comparative Assessment of Eurasian Corridors

The growing significance of the connectivity between Eurasia has increased rivalry between the major transport corridors connecting Asia and Europe. The Middle Corridor, Northern Corridor, and the International North-South Transport Corridor (INSTC) have become the most important transport corridors. Every route has some special features which affect their competitive capacity and significance in international trade and transportation. Comparative analysis of these transport corridors allows to better understand the potential and restrictions of the Middle Corridor.

5.1. Middle Corridor versus Northern Corridor

Traditionally, the Northern Corridor has served as the main transport link between China and Europe. This route covers countries such as China, Kazakhstan, Russia, and Belarus prior to reaching Europe. Its development is due to well-established railway transport and significant capacity. Before 2022, the Northern Corridor was the main one for rail cargo transport between Asia and Europe.

Geopolitical changes in the region significantly affected the attractiveness of the route. Due to the Russia-Ukraine conflict and the sanctions imposed on Russia from Western countries, there are new challenges related to the Northern Corridor. Many logistics firms try to find new routes to avoid possible uncertainties and disruptions in transport process. As a result, the Middle Corridor attracts more international attention due to its geopolitical diversity.

Despite the existing benefits of infrastructure and transport capacity for the Northern Corridor, the Middle Corridor offers more flexibility from a geopolitical perspective. The route passes Central Asia, the Caspian Sea, the South Caucasus, and Türkiye. This factor increases the resilience of supply chains. Moreover, infrastructure investments make this corridor more attractive and competitive.

5.2. Middle Corridor versus the International North-South Transport Corridor (INSTC)

While the Middle Corridor goes from east to west, connecting India, Iran, Azerbaijan, Turkey, and Europe, the International North-South Transport Corridor (INSTC) joins India, Iran, the Caucasus, Russia, and Northern Europe using a north-south transport route. Although the INSTC can provide several benefits regarding reduced time and expenses related to transportations against the conventional way through the Suez Canal, the project's implementation is hampered by sanctions and politics of participating states. On the contrary, increasing attention has been paid to the Middle Corridor in recent years from the EU, Türkiye, Azerbaijan, Kazakhstan, and many others because of its participation in the Belt and Road Initiative and the general European connectivity strategy. Thus, even though both corridors facilitate regional connectivity, they perform different geopolitical roles – while the INSTC builds up north-south transport corridors, the Middle Corridor acts as a link between East Asia and Europe.

Table 3

Comparative Characteristics of Major Eurasian Transport Corridors

Criteria	Middle Corridor	Northern Corridor	INSTC
Main Route	China-Central Asia-Caspian Sea-South Caucasus-Türkiye-Europe	China-Kazakhstan-Russia-Belarus-Europe	India-Iran-Caucasus/Russia-Europe
Primary Direction	East-West	East-West	North-South
Geopolitical Risk	Moderate	High	Moderate to High
Dependence on Single Transit State	Low	High	Medium
EU Support	High	Limited	Low
BRI Relevance	High	High	Medium
Infrastructure Maturity	Developing	High	Developing
Strategic Flexibility	High	Medium	Medium
Growth Potential (2025-2030)	High	Moderate	Moderate

Source: Author's compilation based on European Commission (2025), World Bank (2025), OECD (2025), TITR Association (2025), and Asian Development Bank (2025).

The key differences among the principal Eurasian transport corridors are summarized in Table 3.

6. Conclusion and recommendations

In light of the current geopolitical landscape and diversification of the supply chains, the Middle Corridor has become a valuable and reliable transport route in the Eurasian region. Based on the analysis, one can conclude that the route is a viable alternative to the traditional transit corridors, offering opportunities for increasing regional connectivity and eliminating reliance on other routes. Although there are certain problems associated with the lack of infrastructure development, the inefficiency of multimodal logistics, issues of customs, and geopolitical competition, the corridor still receives considerable international attention. In light of projects like the EU's Global Gateway and the Belt and Road Initiative by China, along with the engagement of such nations as Azerbaijan and Türkiye, its future perspectives appear promising. In order to take advantage of its capabilities, participants of the route should concentrate on developing infrastructure, customs coordination, digitalization of logistics, and cooperation in the region.

References:

[1] Asian Development Bank (2023). *Central Asia Regional Economic Cooperation (CAREC) Program: Transport Sector Progress Report*. Manila: ADB.
[2] Asian Infrastructure Investment Bank (2024). *Eurasian Connectivity and Infrastructure Development Report*. Beijing: AIIB.
[3] Bechev, D. (2022). *Russia and Eurasia's Transport Geopolitics*. London: Oxford University Press.
[4] European Commission (2025). *Global Gateway: EU Strategy for Connectivity in Eurasia*. Brussels: European Commission.
[5] European Commission (2026). *Sustainable Transport Connections between Europe and Central Asia*. Brussels: EC Directorate-General for Mobility and Transport.
[6] European Bank for Reconstruction and Development (2024). *Trade and Transport Facilitation in Central Asia*. London: EBRD.
[7] ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) (2023). *Enhancing Eurasian Transport Corridors*. Bangkok: United Nations.
[8] International Transport Forum (OECD) (2025). *Transport Connectivity in Eurasia: Policy Perspectives*. Paris: OECD Publishing.
[9] Kenderdine, T. (2023). "The Trans-Caspian Corridor and Eurasian Logistics Shifts." *Journal of Eurasian Studies*, 14(2), 101-118.
[10] Laruelle, M. (2021). *Central Asia in the Global Economy: Connectivity and Geopolitics*. Washington, DC: George Washington University Press.
[11] OECD (2024). *Eurasian Transport Corridors: Competitiveness and Risks*. Paris: OECD Publishing.
[12] Oxford Business Group (2025). *The Middle Corridor: Trade and Infrastructure Outlook*. London: OBG.

[13] Pomfret, R. (2022). *The Central Asian Economies in the Twenty-First Century*. Princeton University Press.
[14] Shahbazov, F. (2024). "Azerbaijan as a Key Transit Hub in the Middle Corridor." *Caucasus Strategic Review*, 9(1), 45-62.
[15] Steadman, L. (2023). *Belt and Road Initiative and Eurasian Connectivity*. London: Routledge.
[16] Trans-Caspian International Transport Route Association (2025). *Annual Report on TITR Development*. Astana.
[17] UNCTAD (2024). *Review of Maritime Transport and Multimodal Connectivity*. Geneva: United Nations.
[18] World Bank (2023). *Resilient Supply Chains and Transport Corridors in Eurasia*. Washington, DC: World Bank Group.
[19] World Bank (2025). *Middle Corridor Performance and Trade Facilitation Analysis*. Washington, DC: World Bank.
[20] Zhang, H. (2024). "China's Belt and Road and the Middle Corridor Evolution." *Asia Europe Journal*, 22(3), 233-251.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

Big Data Technologies in Modern Philological Studies within the SHIVA and WARMI Era

Goncharenko Svitlana[1]

[1] Senior Lecturer;
Department of philology and translation,
Kyiv National University of Technologies and Design; Ukraine

Abstract. The article explores the possibilities of applying Big Data technologies in modern philology in the conditions of SHIVA and WARMI worlds. The features of the analysis of large-scale text corpora, digital discourse and language data using artificial intelligence are considered. The role of Big Data in the transformation of the methodology of philological research and the development of digital humanities is substantiated.
Keywords: *modern philology; Big Data; digital humanitarianism; artificial intelligence; natural language processing; digital discourse; SHIVA; WARMI.*

Introduction.

The current stage of development of world science is characterized by an unprecedented complication of the information environment, acceleration of the pace of knowledge generation, digitalization of scientific activity and qualitative change of principles of information processing [1]. After all, if a few decades ago philology mainly relied on qualitative analysis of limited arrays of texts, today the object of research is multimillion-dollar collections of digital documents, electronic libraries, archives, media content, social networks, Internet communication and multimodal language data. Such comprehensive changes in information provision necessitate the adaptive implementation of a complex of Big Data technologies, which allow adaptively performing analysis and analytics of processes at a qualitatively higher level of scale, accuracy, efficiency and objectivity [2].

The development of Digital Humanities, computational linguistics, corpus philology, intelligent text analysis and artificial intelligence is gradually transforming traditional research approaches. Instead of studying individual works or limited language samples, the researcher gets the opportunity to analyze millions of texts of different genres, eras, languages, and communicative situations, revealing patterns that were previously inaccessible to classical methods of philological analysis. In the conditions of Big Data technology, it becomes not just a tool for automating scientific work, but one of the fundamental factors in the methodological transformation of modern philology. Such processes become particularly relevant in the conditions of the formation of a new global model of social development, which is increasingly characterized through the concepts of SHIVA and WARMI worlds. These concepts reflect qualitatively different, but interconnected characteristics of the modern global space. SHIVA world symbolizes a state of high uncertainty, nonlinearity, rapid technological change, the destruction of established models of the functioning of social systems, the constant emergence of new information flows and digital ecosystems. At the same time, the concept of the WARMI world emphasizes the growing role of sustainability, adaptability, interdisciplinary integration, intellectual collaboration, human-centeredness and harmonization of interaction between technologies and society. It is the combination of high turbulence of the SHIVA environment and the need to form sustainable WARMI research practices that determines the modern requirements for the development of the humanities.

For philology, such a transformation means the need to transition from mainly local research to the analysis of global language processes, which are on the scale of the global information space. Digital traces of human communication daily form colossal volumes of textual information, covering fiction, scientific publications, mass media, Internet communication, social networks, digital archives, multimedia resources and various forms of digital discourse. Processing such data sets is impossible exclusively by traditional methods of philological analysis, which determines the growing importance of Big Data technologies.

Therefore, taking into account the above, the author argues that the main purpose of this article is to study the features of the application of Big Data technologies in modern philology, determine their role in the conditions of the SHIVA and WARMI worlds, and identify the main directions of transformation of philological research under the influence of digital technologies.

Main Part.

Big Data technologies are a set of methods, algorithms, software platforms and computing infrastructures designed for storage, processing, integration and intelligent analysis of extremely large arrays of structured and unstructured information [3]. Their fundamental difference lies not only in the volumes, modes and types of processed data [4], but also in the ability to identify complex patterns, hidden relationships and dynamic processes inaccessible to traditional statistical methods [5].

In relation to modern philology, Big Data forms a new research paradigm. If classical philology was based mainly on detailed qualitative analysis of individual literary works, text corpora or linguistic phenomena, then modern digital technologies allow for large-scale quantitative analysis of almost all available textual production of humanity. As a result, the object of research is not individual texts, but complex information ecosystems, including millions of different types of documents.

Big Data technologies are most actively used in the creation and analysis of national and international text corpora. Modern corpora contain billions of word usages, cover different historical periods, genres, functional styles, territorial variants of the language and features of professional communication. The analysis of such arrays allows us to study language dynamics, the processes of the emergence of new words, changes in the semantics of lexical units, the transformation of grammatical constructions, the evolution of syntactic models and the development of communicative practices.

Of particular importance is the analysis of Internet discourse, the volume of which is increasing exponentially every year. Social networks, news resources, blogs, forums, video hosting, user comments and digital platforms form a unique array of linguistic data, reflecting the almost instantaneous reaction of society to political, economic, cultural and technological changes. That is why the study of digital discourse is becoming one of the most promising areas of modern philology.

Big Data technologies allow analyzing not only the content of texts, but also the features of their distribution, citation, information impact, emotional coloring, communicative effectiveness and interaction of various discursive communities. The use of Text Mining, Natural Language Processing, machine learning and neural networks methods significantly expands the analytical capabilities of the researcher. Automatic identification of thematic clusters, analysis of message tone, detection of hidden semantic connections, construction of graphs of semantic relations and modeling of language evolution are becoming important elements of modern philological methodology.

In the conditions of the SHIVA-world, such technologies are becoming particularly relevant. The high rate of emergence of new texts, the constant transformation of digital platforms, the rapid change of language norms and the emergence of new communicative forms require almost continuous monitoring of the information space. Traditional research methods are not operational enough to analyze such processes. On the contrary, Big Data technologies provide the ability to process information in a mode close to real time, which allows recording the emergence of new language trends at the early stages of formation.

At the same time, the concept of the WARMI-world assumes that digital technologies should be used not only to increase the efficiency of analysis, but also to ensure the sustainable development of scientific knowledge. This means the need to form open research platforms, develop international digital corpora of texts, standardize methods for processing language data, ensure the reproducibility of scientific results and wide interdisciplinary cooperation of specialists in the fields of philology, computer science, mathematical statistics, artificial intelligence and cognitive sciences.

It should be noted that the implementation of Big Data technologies means abandoning traditional philological methods, and, on the contrary, contributes to the formation of a new integrative methodology for studying language and text. Quantitative analysis, based on the processing of huge amounts of information, allows you to identify statistically significant patterns, but their scientific interpretation, as before, requires the use of classical methods of linguistic, literary, stylistic, discursive and hermeneutic analysis. It is the combination of computing technologies with deep humanitarian interpretation that ensures the most reliable and scientifically sound results.

Big Data technologies are beginning to play a special role in the study of literary heritage. Digital libraries, electronic archives and repositories open up the possibility of a comprehensive analysis of works of different eras, national literatures and authorial schools. Automated text processing allows us to study the features of the author's idiostyle, the dynamics of vocabulary use, the structure of the story, the evolution of artistic images, intertextual connections, the features of translations and reception of literary works in different cultural spaces. At the same time, network analysis methods allow us to model complex relationships between authors, works, literary trends and cultural traditions, forming new ideas about the development of world literature.

The study of digital communication is also a promising direction. Modern people create significant amounts of text information every day using social networks, messengers, blogs, forums, news platforms and other digital services. Such data reflect not only linguistic changes, but also the transformation of communicative behavior, changes in speech strategies, the formation of new genres of digital communication, the spread of Internet slang, emojis, memes and other multimodal means of communication. Thanks to big data technologies, it is possible to study such processes at the global level, revealing the patterns of development of digital language practically in real time.

In the conditions of the SHIVA-world, the ability of philological research to respond promptly to rapidly changing information flows is of particular importance. Modern digital platforms generate billions of text messages every day, the content of which reflects the dynamics of public sentiment, cultural processes, political events and social transformations. The use of Big Data technologies allows monitoring such changes, identifying the emergence of new concepts, tracking changes in the semantics of words, the spread of new terms and the formation of relevant discursive practices. Thus, philology becomes not only a science of language and literature, but also an effective tool for studying modern social processes.

At the same time, the principles of the WARMI-world orient the scientific community towards ensuring sustainable, ethically responsible and human-centered development of digital technologies. This involves compliance with the requirements of information security, protection of personal data, transparency of information processing algorithms, reproducibility of scientific results and open access to research data. In humanities research, these aspects are of particular importance, since the analysis of linguistic data is directly related to the study of human communication, cultural identity and social consciousness.

The development of artificial intelligence technologies significantly expands the analytical capabilities of Big Data processing in philology. Modern large language models are capable of performing automatic classification of texts, thematic modeling, detection of hidden semantic structures, machine translation, automatic summarization, entity extraction, determination of emotional coloring of messages and prediction of further development of language processes. At the same time, the use of such technologies requires a critical assessment of the results obtained, since artificial intelligence algorithms are able to reproduce statistical patterns, but do not always take into account the cultural, historical, pragmatic and intertextual context of language phenomena.

Thus, the further development of modern philology is associated with the formation of a new adaptive research paradigm based on the synergy [6] of humanitarian knowledge, mathematical methods, Big Data technologies, artificial intelligence and digital infrastructure of science. Such integration allows to significantly expand the scope of philological research, increase the objectivity of scientific conclusions and provide a deeper understanding of the patterns of language functioning in a rapidly changing digital society.

Conclusions.

The conducted study allows us to conclude that Big Data technologies are becoming one of the key factors in the transformation of modern philology. Their use ensures the transition from the analysis of limited text samples to the study of global information arrays, significantly expanding the possibilities of studying linguistic, literary and communicative processes. Unlike traditional methods, Big Data allows us to identify hidden patterns of language development, model complex semantic and discursive relationships, monitor the dynamics of digital communication and analyze language changes in a mode as close to real time as possible.

It has been established that in the conditions of the SHIVA-world, Big Data technologies act as a tool for adapting philological science to high uncertainty, rapid changes in the information environment and continuous growth in the volume of digital texts. At the same time, the WARMI-world concept determines the need to use these technologies on the basis of sustainability, openness, interdisciplinary interaction, scientific reproducibility and ethical responsibility. It is the combination of the computing power of modern digital platforms with the humanitarian methodology of interpretation that ensures the receipt of scientifically reliable results. Prospects for further research are related to the development of intelligent systems for natural language analysis, the improvement of methods for processing multilingual text corpora, the integration of artificial intelligence technologies with traditional philological approaches, the creation of new generation digital ecosystems and the development of complex models for studying language dynamics in the context of digital transformation [7]. The implementation of these areas will contribute to the further development of modern philology as a high-tech interdisciplinary field of scientific knowledge, capable of effectively investigating linguistic and cultural processes in the new global information reality.

References:

[1] I. Hrashchenko, S. Krasniuk, T. Tsalko, S. Nevmerzhytska, N. Liubymova (2024). Effective computer modeling in educational management. *ScientificWorldJournal*. – September 2024. – Issue 27, Part 3. – pp. 3-17. – URL: https://www.sworldjournal.com/index.php/swj/issue/view/swj27-03

[2] Krasnyuk M.T. (2006). Problemy zastosuvannia system upravlinnia korporatyvnymy znanniamy ta yikh taksonomiia [Problems of applying corporate knowledge management systems and their taxonomy]. Modeliuvannia ta informatsiini systemy v ekonomitsi - Modeling and information systems in the economy, vol. 73, p. 256 [in Ukrainian].

[3] Naumenko, M. (2024). Models of business knowledge in artificial intelligence systems for an effective competitive enterprise. International scientific journal "Internauka". Series: "Economic Sciences". № 6. DOI: https://doi.org/10.25313/2520-2294-2024-6-10010 [In Ukrainian].

[4] Naumenko, M. (2024). Analiz ta analityka velikykh danykh v marketynh i torhivli konkurentospromozhnoho pidpryiemstva [Analysis and analytics of big data in marketing and trade of a competitive enterprise]. Grail of Science, # 40, pp. 117-128. DOI: https://doi.org/10.36074/grail-of-science.07.06.2024.013 (in Ukrainian).

[5] M. Krasnyuk, T. Motsyuk, S. Krasniuk (2021). Relevanz des wahlfaches «Wissensdetektion in unstrukturierten daten» bei der ausbildung von mastern der technischen und humanitären fachrichtungen. Education and science of today: intersectoral issues and development of sciences : *collection of scientific papers "ΛΌΓOΣ"* with proceedings of the I International scientific and practical conference,

Cambridge, United Kingdom, March 19, 2021. Vol. 3. Cambridge-Vinnytsia : P.C. Publishing House & European Scientific Platform, 2021. pp. 66-67.

[6] Derbentsev, V. D., Serdiuk, O. A., Soloviov, V. M., & Sharapov, O. D. (2010). *Synergistic and econophysical methods of studying dynamic and structural characteristics of economic systems*. Cherkasy: Brama-Ukraine. - 2010 [in Ukrainian].

[7] Goncharenko S. (2025). Intelligent information technologies for innovative management of advanced philology projects. *Innovations and New Directions in Scientific Research* : Proceedings of the 2nd International Scientific Conference (Manchester, United Kingdom, 20 September 2025). - Lulu Press, Inc., 2025. - P. 176-179. URL: https://er.knutd.edu.ua/handle/123456789/31648

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

Metaheuristics for Linguistic Optimization in the SHIVA Era

Krasniuk Svitlana[1]

[1] Senior Lecturer;
Department of philology and translation,
Kyiv National University of Technologies and Design; Ukraine

Abstract. The article considers the possibilities of applying metaheuristic optimization methods in modern linguistics under the conditions of the SHIVA world. The main metaheuristic algorithms and their use in natural language processing, language model optimization, machine translation, and big text data analysis are analyzed. The advantages of integrating metaheuristic methods with artificial intelligence and machine learning technologies to increase the efficiency of digital linguistic research are substantiated.
Keywords: *modern linguistic; computational linguistics; metaheuristic optimization; SHIVA-world; natural language processing; artificial intelligence; language models; machine learning.*

Introduction.

The current stage of linguistic science development is characterized by the rapid complication of research objects, the constant increase in the volume of language data and the growing need for their intellectual processing [1]. The mass digitalization of communication, the spread of social networks, electronic text corpora, multimodal resources and generative language models have significantly changed both the subject of research and the methodological apparatus of modern linguistics [2]. As a result, traditional methods of language analysis do not always allow for effective solutions to the problems of processing extremely large arrays of heterogeneous information, optimizing the parameters of complex models, identifying hidden patterns of language functioning and modeling natural communication processes [3].

Additional complexity is created by the formation of a new global environment for the development of science and technology, which is increasingly characterized by the concept of the SHIVA-world. Unlike previously widespread models of instability (VUCA and BANI environments), the SHIVA world reflects a qualitatively new level of system dynamics, in which structural fragmentation, high variability, intellectual saturation of digital ecosystems, variability of development scenarios and increasing autonomy of artificial intelligence are simultaneously manifested. In such complex (often crisis) conditions, the importance of mathematical methods that can function effectively in multidimensional, nonlinear and difficult-to-formalize solution search spaces increases radically [4], [5]. One of the most promising directions for solving such problems is the methods of metaheuristic optimization [6]. Unlike classical deterministic optimization algorithms, focused mainly on finding a local optimum in the presence of a strict mathematical model of the problem, metaheuristic methods use universal strategies of intellectual search based on modeling natural, biological, physical and social processes. This makes it possible to find solutions close to optimal [7] even in the absence of an analytical description of the problem under study, the presence of a large number of constraints, high dimensionality of the search space and significant uncertainty of the initial data.

The use of metaheuristic algorithms is particularly relevant in modern linguistics, where many research tasks belong to the class of NP-hard problems. Optimization of language model parameters, automatic construction of semantic networks, machine translation, thematic modeling, text tone analysis, automatic summarization, knowledge acquisition, document clustering and ontology construction require finding solutions in extremely complex spaces of possible combinations [8]. In many cases, the use of a complete search of options turns out to be computationally impossible, while the use of metaheuristic algorithms allows obtaining high-quality results at acceptable computational costs.

Thus, the study of the possibilities of using metaheuristic optimization methods in modern linguistics acquires not only theoretical, but also significant practical significance. Their use allows to significantly increase the efficiency of intelligent processing of language information in the conditions of the SHIVA-world, which is characterized by high dynamism, uncertainty, complexity of digital communications and constant development of artificial intelligence technologies.

Main Part.

Metaheuristic optimization methods are a universal class of intelligent algorithms for finding solutions designed to effectively explore complex multidimensional spaces without the need for a complete enumeration of all possible options. The term metaheuristic combines a wide range of methods that use general principles of search organization that can be adapted to different subject areas regardless of the specifics of a particular problem. The main feature of these methods is the balance between two interrelated strategies - the study of new areas of the search space (exploration) and the in-depth search for the most promising solutions (exploitation); it is this combination that allows you to avoid premature convergence to local extrema and significantly increases the probability of finding a globally effective solution.

In modern computational linguistics, such an approach is particularly in demand, since most natural language processing tasks are characterized by high data dimensionality, a complex structure of linguistic dependencies, ambiguity of interpretation, and the absence of a single optimal solution. Moreover, many linguistic tasks belong to the class of combinatorial optimization, where the number of possible combinations grows exponentially with the amount of material analyzed.

The concept of the SHIVA-world significantly enhances the relevance of the use of metaheuristic algorithms. While traditional optimization methods are focused mainly on relatively stable conditions for the functioning of systems, the SHIVA-environment assumes a constant change in the data structure, the rapid emergence of new information flows, continuous transformation of language practices, active development of generative artificial intelligence and constant evolution of digital communications. In such conditions, the effectiveness of algorithms is determined not only by the accuracy of the solution found, but also by the ability to quickly adapt to changing search conditions. One of the most famous representatives of this group is genetic algorithms, based on modeling the processes of biological evolution. Each possible solution is perceived as a separate individual of the population, and the optimization process is implemented in the form of selection, crossover and mutation operations. The sequential evolution of generations allows you to gradually improve the quality of solutions, while maintaining the diversity of the options under study. In modern linguistics, genetic algorithms are successfully used in the automatic construction of grammars, optimization of language model parameters, selection of the most informative features of text classification, optimization of machine translation rules, and even the formation of effective dictionary resources.

Particle Swarm Optimization algorithms, which model the collective behavior of flocks of birds or schools of fish, have become no less widespread: each particle moves in the search space taking into account its own experience and information about the best solutions of the entire group. Such a mechanism provides a high convergence rate and good adaptation to high-dimensional tasks. In the field of natural language processing, particle swarm algorithms are actively used to tune the hyperparameters of neural language models, optimize the architecture of deep neural networks, select the most effective features of document classification, and improve the quality of thematic modeling.

Another effective direction of metaheuristic optimization is Ant Colony Optimization (ACO) algorithms, which are based on modeling the collective behavior of ant colonies when searching for the shortest paths to a food source. In the process of solving the optimization problem, artificial agents leave a kind of "digital pheromones", the intensity of which is determined by the quality of the solution found. As information accumulates, the algorithm gradually concentrates the search in the most promising areas of the solution space. Due to the ability to effectively solve routing and combinatorial optimization problems, ant algorithms have found application in automatic parsing of sentences, optimization of semantic networks, construction of ontologies, search for the most probable chains of words in language models, as well as in automatic alignment of parallel corpora.

Of great interest is the Simulated Annealing method, based on the analogy with the process of gradual cooling of metals. At the initial stages, the algorithm allows for less efficient solutions, which allows overcoming local extrema, and then gradually focuses on finding the highest quality result. Such a strategy is especially effective in the presence of a large number of local optima, which for many natural language processing tasks. The method is successfully used in the automatic formation of thematic models, optimization of the structure of semantic graphs, selection of parameters of language models and clustering of text collections.

Differential Evolution is becoming increasingly widespread, which is characterized by a high speed of finding solutions in continuous spaces of high dimension. The main mechanism of the algorithm is based on the use of differences between existing solutions to form new candidates. Due to its relatively low computational complexity, this method is actively used in the optimization of hyperparameters of neural networks, training natural language processing models, tuning transformer architectures and optimizing word embeddings.

A promising direction remains Artificial Bee Colony (ABC) algorithms, which simulate the collective activity of bees during the search for nectar sources. This class of algorithms provides an effective distribution of computing resources between the study of new search areas and the refinement of already found solutions. In modern linguistics, such methods are used in automatic document clustering, intelligent information retrieval, terminology extraction, optimization of thematic modeling and intelligent processing of multi-corpus text collections.

A special place is occupied by memetic algorithms, which are a hybrid of evolutionary methods and local optimization procedures. Their feature is the combination of global search, inherent in genetic algorithms, with local refinement of found solutions in the form of specialized algorithms. Such an architecture allows significantly accelerating the achievement of high-quality results and at the same time avoiding premature convergence of the algorithm. In computational linguistics, memetic algorithms are used in automatic language model training, machine translation system optimization, semantic space construction, and intelligent processing of specialized text corpora.

It should be noted that almost all modern natural language processing methods are multi-criteria optimization tasks. When developing language models, it is necessary to simultaneously take into account classification accuracy, processing speed, memory size, computational costs, data noise resistance, interpretability of results, and the model's ability to adapt to new language phenomena. The use of classical optimization methods in such conditions often proves to be insufficient, since improving one criterion often leads to worsening another. That is why multi-objective metaheuristic algorithms are becoming increasingly popular, allowing for finding compromise solutions based on a set of Pareto-optimal options.

The role of metaheuristic optimization in the development of Natural Language Processing (NLP) technologies is becoming especially noticeable. Modern language models contain millions and even billions of parameters, the tuning of which is an extremely complex optimization task. Despite the widespread use of gradient learning methods, it is metaheuristic algorithms that are increasingly used at the stages of choosing the model architecture, optimizing hyperparameters, automatic feature selection, tuning attention mechanisms, searching for optimal combinations of training data, and forming model ensembles. Their use allows for a significant reduction in computational costs while maintaining high accuracy of natural language processing.

In the conditions of the SHIVA world, the importance of adaptive intelligent systems that are able to continuously change their own structure in accordance with the dynamics of the external environment is growing. Modern language data is characterized by high variability: new terms appear, communicative practices change, digital discourses are actively developing, multimodal forms of communication are spreading, and the number of automatically generated texts is increasing. In such conditions, static models quickly lose relevance. The use of metaheuristic methods allows you to create self-adaptive intelligent systems that can quickly adjust their own parameters without completely retraining the model.

However, the use of metaheuristic methods is accompanied by a number of limitations: these include the lack of a guarantee of finding a global optimum, the need for careful tuning of algorithm parameters, the dependence of results on the choice of the fitness function, as well as significant computational costs when working with very large language models. In addition, the effectiveness of various algorithms significantly depends on the specifics of a particular task, as a result of which there is no universal optimization method that solves all classes of linguistic problems equally successfully. That is why the current development trend is associated with the creation of hybrid intelligent systems that combine the advantages of various metaheuristic approaches, machine learning methods and deep neural architectures. Despite the existing limitations, it is metaheuristic optimization that is becoming one of the key tools for the further development of digital linguistics. Its application allows you to significantly increase the efficiency of language information processing, ensure the adaptability of intelligent systems, accelerate the training of complex artificial intelligence models and improve the quality of decisions made in the conditions of constantly growing complexity of modern digital communication.

Conclusions.

The conducted research shows that metaheuristic optimization methods are becoming one of the most promising areas of development of modern digital linguistics. Their versatility, ability to function effectively under conditions of high dimensionality of the search space, nonlinearity of the studied processes and absence of strict analytical models allow to successfully solve a wide range of natural language processing tasks, the analysis of which by traditional deterministic methods is either significantly difficult or requires excessive computational resources.

It has been established that in the conditions of formation of SHIVA-world, which is characterized by high dynamism of the digital environment, intellectualization of information processes, constant transformation of language practices, growth of volumes of weakly structured data and accelerated development of artificial intelligence technologies, the importance of metaheuristic methods is significantly increasing. Unlike classical optimization algorithms, they provide the possibility of effective search of close to optimal solutions even in the presence of numerous constraints, high uncertainty and multi-criteria nature of the studied tasks.

Analysis of modern directions of application of metaheuristic algorithms has shown that genetic algorithms, particle swarm algorithms, ant algorithms, simulated annealing, differential evolution, artificial bee colony algorithms and memetic algorithms are of the greatest practical significance in modern linguistics. Their use contributes to increasing the efficiency of automatic syntactic and semantic analysis of texts, machine translation, thematic modeling, intelligent clustering of documents, automatic summarization, knowledge acquisition, construction of ontologies, optimization of language models and processing of super-large text corpora. The hybrid integration of metaheuristic optimization methods with machine learning technologies, deep neural networks, generative artificial intelligence and big data analysis is of particular perspective and importance [9]. Such integration allows to form hybrid intelligent systems of a new generation that combine high adaptability, self-learning ability and effective optimization of computational processes. As a result, the quality of speech data analysis, the speed of information processing, and the stability of intelligent systems to changing operating conditions are significantly improved.

At the same time, the further development of this scientific direction is associated with the need to solve a number of methodological and computational problems, among which a special place is occupied by increasing the interpretability of the obtained solutions, reducing the computational complexity of algorithms, developing adaptive mechanisms for automatic parameter tuning, improving hybrid optimization models, and ensuring the scalability of calculations in distributed digital systems [10].

Thus, metaheuristic optimization methods should be considered not only as an effective computational tool for solving individual problems of computational linguistics, but also as one of the key methodological principles for the development of intelligent speech technologies in the conditions of the SHIVA world. It is advisable to link the prospects of further research with the development of self-adaptive metaheuristic algorithms, their integration with artificial intelligence agent systems, large-scale language models, and cognitive information processing technologies, which will allow to provide a qualitatively new level of efficiency of digital linguistic research and intelligent processing of natural speech.

References:

[1] Goncharenko S. (2025). Methodological bases of innovative information systems in the field of computer linguistics. Trends, Issues, and Challenges in Modern Science : Proceedings of the 2nd International Scientific Conference (Cambridge, United Kingdom, 5 September 2025). - Lulu Press, Inc., 2025. - P. 100-103. URL: https://er.knutd.edu.ua/handle/123456789/31071
[2] Goncharenko S. (2025). Innovative IT technologies of computational linguistics. Trends, Issues, and Challenges in Modern Science : Proceedings of the 2nd International Scientific Conference (Cambridge, United Kingdom, 5 September 2025). - Lulu Press, Inc., 2025. - P. 109-113.URL: https://test.knutd.edu.ua/handle/123456789/31072
[3] Goncharenko S. (2025). Intelligent information technologies for innovative management of advanced philology projects. Innovations and New Directions in Scientific Research : Proceedings of the 2nd International Scientific Conference (Manchester, United Kingdom, 20

September 2025). - Lulu Press, Inc., 2025. - P. 176-179. URL: https://er.knutd.edu.ua/handle/123456789/31648

[4] Naumenko M., Hrashchenko I. (2024). Suchasnyi shtuchnyi intelekt v antykryzovomu upravlinni konkurentnymy pidpryiemstvamy ta kompaniiamy [Modern artificial intelligence in anti-crisis management of competitive enterprises and companies]. *Grail of Science*. No. 42. P. 120–137. DOI: https://doi.org/10.36074/grail-of-science.02.08.2024.015

[5] Kulynych Y., Krasnyuk M., Krasniuk S. (2022). Efficiency of evolutionary algorithms in solving optimization problems on the example of the fintech industry. Grail of Science, № 14-15, May 2022, (pp. 63-70). DOI: https://doi.org/10.36074/grail-of-science.27.05.2022

[6] Goncharenko S. (2025). Mathematical optimization as element of innovative educational management in modern complex conditions. Science and Global Challenges in the Modern World : Proceedings of the 2nd International Scientific Conference (Leicester, United Kingdom, 5 October 2025). - Lulu Press, Inc., 2025. - P. 90-94. URL: https://er.knutd.edu.ua/handle/123456789/31667

[7] Krasnyuk M.T., Naumenko M.A. (2024) Efektyvne zastosuvannia henetychnykh alhorytmiv u vyrishenni bahatoekstremumnykh optymizatsiinykh zadach v menedzhmenti konkurentnoho pidpryiemstva [Effective application of genetic algorithms in solving multi-extremum optimization problems in the management of a competitive enterprise]. Grail of Science, № 41, June 2024, 65-73. URL: https://archive.journal-grail.science/index.php/2710-3056/issue/view/05.07.2024/29 [in Ukrainian].

[8] Maxim Krasnyuk, Svitlana Krasniuk (2024). CHAPTER 6. Evolutionary technologies and genetic algorithms in machine translation. Innovation in modern science: Education and Pedagogy, Philosophy, Philology, Art History and Culture, The current stage of development of scientific and technological progress February 2026 Conference proceedings 214 Medicine and Healthcare. Monographic series «European Science». Book 30. Part 3. 2024. pp. 91-98, Published by: ScientificWorld-NetAkhatAV, Lußstr. 1376227 Karlsruhe, Germany https://desymp.promonograph.org/index.php/sge/issue/view/sge30-03/sge30-03

[9] Krasnyuk, M. (2014). Hybridization of intelligent methods of business data analysis (anomaly detection mode) as a standard tool of corporate audit. *The state and prospects of the development Education and science of today:* materials of the III International science and practice conf. [m. Ternopil, October 10-11. 2014]. TNEU, 2014. pp. 211-212 [in Ukrainian].

[10] Derbentsev, V. D., V. M. Soloviov, and O. V. Serdiuk (2005) Precursors of critical phenomena in complex economic systems. Modeling of nonlinear dynamics of economic systems. - Donetsk: DonNU, 1 (2005). pp. 5-13 [in Ukrainian].

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

LITERARY STUDIES

Тема свободы воли в произведении Д. Киза «Таинственная история Билли Миллигана»

Ходжалакова Диана[1], Ауелбекова Бакитжан Алпамышовна[2], Ауельбекова Назгуль Жайыковна[3]

[1] Студентка 3 курса специальности Русский язык и литература;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

[2] Кандидат филологических наук, ассоциированный профессор;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

[3] Магистр социологических наук, старший научный сотрудник;
НАО Национальный научно-практический институт «Өркен»; Республика Казахстан

Аннотация. В статье анализируется роман Д. Киза «Таинственная история Билли Миллигана» с точки зрения литературного изображения раздвоенного сознания героя и проблемы свободы воли. Основное внимание уделяется художественному раскрытию системы альтер-личностей Билли Миллигана (Артур, Рейджен, Адалана) и их роли в построении образа персонажа. Рассматривается через поведение, речь и смену личностей в произведении раскрывается внутреннее разъединение персонажа. Приводится вывод о том, что роман демонстрирует сложную структуру личности, в которой автор показывает средствами литературы размытость границ между сознанием, волей и поступками.
Ключевые слова: *художественный образ, внутренний конфликт, множественная личность, диссоциативное расстройство идентичности.*

Введение.

Тема свободы воли является ключевой категорией литературы, философии, психологии, которая определяет способность человека принимать самостоятельные решения и нести за действия моральную ответственность. Данную проблему также рассматривает Г. Мейнен [1]. Философы и психологи (Кант, Шопенгауэр, Фрейд, Юнг и др.) изучали, способен ли человек нести ответственность за свои поступки. Компатибилисты считают, что свобода воли и моральная ответственность связаны с детерминизмом. Инкомпатибилисты утверждают несовместимость данных философских категорий. Детерминизм, включающий в себя полное отрицание свободы воли, определяется как «жесткий детерминизм».

LITERARY STUDIES

Произведение Дэниэла Киза «Таинственная история Билли Миллигана» подходит для подробного анализа свободы воли и моральной ответственности. Главный герой является носителем диссоциативного расстройства личности с внушительным количеством личностей, выказывающих автономную психологическую структуру, которая характеризуется индивидуальными чертами. Это показано при исследовании диссоциативного расстройства личности Бурдзик Е., Бурдзик М. [2]. В этом заключается проблема: рассматривая одну сторону, можно прийти к выводу, что действия индивида осознанные, но с другой стороны, воля разделена между альтер-личностями и не контролируется основным соединяющим звеном. М. М. Бахтин разработал идею множественности сознаний как совокупность равноправных голосов, что соотносится с множественностью личностей Билли [3]. Однако в гипотезе Бахтина речь идет о полифонии в тексте, в то время как в произведении Д. Киза «голоса» имеются внутри сознания человека. Благодаря этому сходство имеет условный характер и способствует раскрытию внутреннего мира персонажа как взаимодействие «голосов», которые находятся в пределах одной личности.

Основная часть.

Известно, что человек свободен в своем выборе, осознает мотивы и не принужден к действию. И. Кант [4], как и многие сторонники данной концепции, рассматривал общие черты между свободой воли и детерминизмом.

В художественном романе Дэниэла Киза, в моменте предъявления Билли Миллигану обвинений в изнасилованиях и ограблениях возникает вопрос о юридической и моральной ответственности за совершенные действия. По данным концепциям рассматривается поведение субъекта через разрозненность личностей, каждая из которых обладает индивидуальным характером, поведением и мышлением (см. таблица 1).

Таблица 1

Характеристика личностей и их функциональная роль

Личность.	**Возраст/ происхождение**	**Основные черты характера**	**Функциональная роль**	**Роль в системе личности**
Артур	22 года. Англичанин	Рациональный, бесчувственный, дисциплинированный	Разговаривает с британским акцентом, контролер и лидер	Стратег, организатор
Рейджен Вадасковинич	23 года. Югослав	Агрессивный, решительный, защитник, физически сильный	Разговаривает со славянским акцентом, специалист по оружию и амуниции, решает насилием	«Хранитель ненависти», защитник

Продолжение табл. 1

Аллен	18 лет. Американец	Мошенник, манипулятор, общительный, агностик	Вступает в контакт с посторонними, единственный курит сигареты	«Социальное лицо»
Томми	16 лет. Американец	Асоциален, замкнутый, прямолинейный	Технически одаренный, специалист по освобождению из пут, талант к побегу	Исполнитель технических задач
Дэнни	14 лет. Американец	Тревожный, травмированный	Боится людей и замкнутых пространств, избегает контакт	Носитель травмы и страха
Дэвид	8 лет. Американец	Эмпат, чувствительный	Берет на себя боль и страх	«Хранитель боли»
Кристин	3 года. Англичанка	Умная малышка, наивная, зависимая	Умеет читать и писать, страдает дислексией	Уязвимая часть личности
Кристофер	13 лет. Англичанин (брат Кристин)	Разговаривает с британским акцентом, послушный, беспокойный	Аккуратно пишет и поддерживает Кристин	Поддержка
Адалана	19 лет. Американка	Замкнутая, стеснительная, одинокая, интровертная	Лесбиянка, готовит и ведет хозяйство, участница эпизодов насилия	Выступает как подавленные чувства
Филип	20 лет. Американец	Говорит с сильным британским акцентом, сквернослов, импульсивен	Совершал мелкие преступления, бандит, конфликтный	Протестант
Кевин	20 лет. Американец	Гений, агрессивный	Стратег, мелкий криминалист	Деструктивная функция
Уолтер	22 года. Австралиец	Замкнутый, сдерживает эмоции, эксцентричен	Считает себя охотником на крупных животных, ориентируется в местности, используется для поиска	Ищейка
Эйприл	19 лет. Американка	Злобная, стерва	Говорит с бостонским акцентом, стремится всем навредить, помогает по дому	Внутренняя агрессия
Сэмюель	18 лет. Американец	Замкнутый, спокойный, творческий	Скупой, верующий, увлекается скульптурой и резьбой по дереву	Моральный ориентир
Марк	16 лет. Американец	Ленивый, пассивный	Безынициативный, выполняет монотонную работу, второстепенные задачи	Поддержка
Стив	21 год. Американец	Самовлюбленный, раздражительный, прямой	Обманщик, конфликтный и проявляет агрессию, пародирует и высмеивает людей, не верит в диагноз разрозненности личности	Нестабильность

Продолжение табл. 1

Ли	20 лет. Американец.	Веселый, оптимистичный, остряк, вспыльчивый	Пофигистически относится к своим действиям и к жизни, виновник всех проблем	Конфликт
Джейсон	13 лет. Американец	Эмоциональный, тревожный, истеричный	Берет на себя давление и выплескивает эмоции, причина амнезии	Защитная реакция
Роберт (Бобби)	17 лет. Американец.	Фантазер, легкомысленный, наивный, замкнутый, отстраненный	Ищет развлечения, грезит о путешествиях и приключениях, считает себя самым умным	Эмоциональный побег
Шон	4 года. Американец	Изолированный, считается отсталым, морально слабый	Глухой, жужжит, чтоб чувствовать вибрации, часто теряет сознание	Отстраненность
Мартин	19 лет. Американец	Интеллектуальный, врун, хвастун, позер, сноб	Любит производить впечатление	Социальная маска
Тимоти (Тимми)	15 лет. Американец	Тихий, спокойный, мягкий	Подвергался домогательству из-за чего замкнулся, наблюдательный	Пассивная роль
Учитель	26 лет. Объединение всех личностей	Собранный, логичный, опрятный, 23 в 1, умный, чуткий, с юмором	Научил личности всему, что умел, имеет полную память, способствовал появлению романа	Попытка интеграции
Уильям Стэнли Миллиган («Билли»)	26 лет. Американец	Подавленный, дезориентированный, суицидальный	Теряет память и не осознает смену личностей	Ядро, базовая личность

Примечание: Личности делятся на «желательные» и «нежелательные» в зависимости от их контроля над поведением и приемлемости действий

Данная таблица позволяет изучить различия между теми или иными личностями. В ней также присутствуют личности женского пола и несовершеннолетние. Общая картина дифференцированного расстройства личностей дает детально изучить подобный диагноз. Из всего списка более подробно в статье описываются ипостаси Артур и Рейджен Вадасковинич.

В романе «Таинственная история Билли Миллигана» лидером и интеллектуальным центром является Артур.

Его появление фиксируется не только изменением речи, но и через поведение: взгляд становится сосредоточенным, движения сдержанные, а манера общения – рациональной. Автор через описание изменения мимики указывает на переход личности, которая подавляет эмоции и контролирует ситуацию. Сдержанность в движениях и продуманные действия писатель интерпретирует как внутреннюю дисциплину и желание полного самоконтроля. Д. Киз изображает изменения личностей через других персонажей: врачи, психологи, адвокаты. Например: «У Хардинга вспотели ладони. Когда пациент открыл глаза, поменялось и лицо: вместо мрачного Билли появился высокомерный Артур с тяжелыми веками. Стиснутые челюсти, губы едва шевелятся, отчетливый акцент британской аристократии. Выражение лица Билли мгновенно переменилось, глаза широко распахнулись. Он удивленно осмотрелся вокруг» [5, с. 142]. Во время беседы с доктором Дороти Тернер Миллиган внезапно меняет тип поведения: «Я рассудил, что тебе лучше пребывать в неведении, - произносит он спокойно, с отчетливым британским акцентом. - Мы считали правильным дождаться подходящего момента, чтобы посвятить тебя в эту тайну» [5, с. 142]. Доктор отмечает: «его голос стал ровнее, а выражение лица – холодным и отстраненным», что подчеркивает преобладание логики над эмоциями. Таким образом, ровный голос и отсутствие интонационных изменений демонстрируют подавленность эмоции, а отстраненная мимика показывает дистанцию между Артуром и собеседниками. Автору удается через интонации и мимику персонифицировать других героев. Передача внутреннего состояния героя через речь, мимику и поведение соответствует идеям Льва Выготского [6].

Контроль проявляется не только в речи, но и в стремлении управлять ситуацией и ходом общения. Его отстраненность является лидирующим качеством Артура и проявляется в эпизодах допроса: «Мадам, мне не нужна помощь. Но меня это не беспокоит» [5, с. 64]. В отрывке наблюдается вежливый стиль общения, но при этом отстраненные конструкции показывают, что он не вовлекается эмоционально в разговор, а стремится контролировать диалог. При этом мимика остается нейтральная, что усиливает ощущение эмоциональной закрытости. По показаниям докторов, личность сменяет другую, сопровождается телесными изменениями: «Взгляд подернулся, поза сменилась. Миллиган сложил кончики пальцев пирамидкой. Потом поднял подбородок, выражение лица стало другим» [5, с. 68]. Смена позы и взгляда указывает, как тело «перестраивается» под другую личность. Осанка становится либо более жесткой, либо расслабленной.

Артур верен своим убеждениям и отстаивает свою позицию: «Голос Артура стал ледяным. – Рейджен никого не насиловал. – Но есть доказательства… - Плевал я на доказательства!» [5, с. 69]. «Ледяной» голос функционирует как давление: отсутствует эмоциональное тепло, заменяется жесткой интонацией, а мимика, вероятно, фиксируется застывшей, что усиливает контроль. В общении с адвокатами он также проявлял качества отстаивания своих прав: «Артур холодно посмотрел на него и сказал, едва шевеля губами: - Вы не вправе ссылаться на невменяемость от моего имени» [5, с. 149]. Заметна минимальная подвижность губ, что говорит о сдержанных эмоциях и демонстрации превосходства над собеседником.

Он увлекается наукой, химией, медициной и чтением сложных книг. Артур является стратегом и действует логично и холодно, не учитывая желания других альтер-личностей.

Эта личность является «желательной» и держит под контролем «пятно», то есть тех, кто контролирует тело во внешнем мире. В произведении присутствует строка: «Артур просил передать, что сам хочет решить, кто может принимать участие в этой встрече» [5, с. 143].

Индивидуальность героя заключается в его холодности и в решении задач без импульсивных действий. Способность анализировать чувства не является для него поводом для сочувствия.

В системе личности он играет роль координатора. Благодаря его качествам способность принимать жесткие решения дается без затруднений: «Артур говорит, что я хранитель боли. Когда становится больно, я встаю в пятно и беру ее на себя» [5, с. 51].

Артур – одна из «желательных» и главных личностей в сознании Билли. Выполняя роль координатора, лидера и стратега, он принимает окончательное решение. Индивидуальность данной личности заключается в высокой образованности, контроле и сдержанности. Используется разум в противовес эмоциональной импульсивности.

Противоположностью личности является Рейджен Вадасковинич, проявляющий иной метод поведения. Данная личность агрессивная, физически сильная, также присутствует защитная функция, что проявляется как в действиях, так и в речи.

Образ Вадасковинича индивидуализирован через славянский акцент, благодаря которому грубость и прямолинейность раскрываются подробней: «Голос стал низким и грубым, в нем слышалась уверенность в своих силах и враждебный настрой. Говорил собеседник с ярко выраженным славянским акцентом. Не похоже было, что он лишь имитировал акцент, речь действительно шипела и свистела, как у человека, выросшего в Восточной Европе» [5, с. 72]. Изменение тембра голоса и фонетики речи сопровождается и поведенческой реакцией: мимика – более напряженная, взгляд становится тяжелым и прямым, что указывает на импульсивный и прямой характер.

Появление Рейджена сопровождается напряжением в теле, появляется грубость в движениях, взгляд становится тяжелее: «Челюсть напряглась. Затем он сменил позу: напряженная спина изогнулась, и перед адвокатами предстал агрессивный, настороженный борец» [5, с. 71]. Напряженность челюсти, резкость движений и изменение осанки указывают на готовность к защите и атаке. Однако его агрессия не хаотична, она охарактеризована личными убеждениями защищать слабых, женщин и детей: «Я буду делать такие поступки, только если кто-то начнет обидеть Билли или принести при нем вред женщине или ребенку» [5, с. 197].

В отличие от хладнокровного Артура личность Рейджена изображена через импульсивные действия, а также эмоциональность. Ключевой ролью является защита эмоциональной системы и борьбы против угроз извне: «Рейджен подскочил, как кот, настороженный, готовый обороняться, приняв каратистскую позу» [5, с. 74]. Движения его более пружинистые и энергичные, что противопоставляется поведению Артура.

Так же важно отметить интерес личности к оружию (в основном огнестрельному), военному делу и физической подготовке, что дополняет образ защитника. По его убеждениям, имеет право на ношение и использование оружия в ситуациях крайней необходимости: «…Рейджен достал из кармана финку и пошел на них» [5, с. 254].

Подводя общую характеристику Рейджена, важно отметить импульсивность и эмоциональность альтер-личности. В системе личностей является «желательным» и берет на себя лидерство в опасных ситуациях.

В числе «нежелательных» личностей выделяется Адалана. В романе она описывается как замкнутая, чувствительная и неуверенная личность. Ее присутствие распознается через тихий голос, мягкую мимику и растерянную реакцию: «Наконец после нескольких смен ролей лицо Миллигана приобрело мягкое слезливое выражение. Он заговорил сдавленно, через нос. Лицо стало почти женским. Глаза дергались. - Мне больно говорить» [5, с. 119]. Мимика становится подвижней и эмоциональнее, появляется слезливость, дрожание губ, избегание прямого взгляда, что указывает на уязвимость и неуверенность. В отличие от Рейджена и Артура, действует под влиянием эмоций.

Писатель выделяет женский образ потребностью в любви и заботе: «…ей очень хотелось, чтобы ее обнимали, ласкали, любили…» [5, с. 101]. Речевая характеристика отличается мягкостью, спокойствием, что противоположно двум ранее описываемым личностям мужского пола. Во время допроса звучит реплика: «Я не хочу говорить с Рейдженом… Я хотела бы уйти от парней. Не хочу больше портить им жизнь… Черт, я так перед ними виновата.… Ну почему я это сделала?» [5, с. 120]. В интонации при разговоре присутствуют скачки, голос переходит от спокойного тона к более напряженному, жесты становятся неуверенными и хаотичными.

Во время разговора с личностями ее образ отличается внутренними переживаниями и эмоциональностью. Голос переходит на крик, а после возвращается к обычной манере: «- Вы ненормальные! - заорала Адалана. - Оба! - Потом ее голос снова стих. - Если бы вы только пережили что-то подобное, если бы вас кто-то обнимал и заботился о вас, вы бы поняли, что это такое» [5, с. 125]. Переход к крику демонстрирует неспособность держать эмоции под контролем, после чего возвращается к тихой речи.

Адалана характеризуется увлеченностью творчеством, каллиграфией, поэзией и готовкой, что говорит о ее творческой натуре. Девушку привлекает эстетичность, она тайком пишет стихи.

Рассматриваемые три личности имеют ряд различий. Их эмоциональное состояние влияет на поведение и восприятие, что подтверждается исследованиями Хогана П. К. [7]. Артур выражает холодный разум и расчет, Рейджен - физическую силу и защиту, Адалана представляет совокупность чувств, потребности и уязвимости. Артур характеризуется минимализмом мимики, контролем жестов и структурированностью речи, Рейджен - напряженностью телесности, резкими движениями и грубой интонацией, Адалана - эмоциональной мимикой, хаотичными жестами и прерывистостью речи. Артур является стратегом, стремится удерживать контроль, Рейджен символизирует защитника и действия импульсивного характера, пытаясь перехватить контроль в момент угрозы, а Адалана показывает уязвимость и эмоциональную сторону Билли, при этом утрачивает контроль под влиянием чувств. Однако их взаимодействие формирует целостность, рациональность Артура сдерживает импульсивность Рейджена, а эмоциональность Адаланы раскрывает внутренние переживания, которые доступы не всем. Д. Киз показывает, что в сознании способна уместиться система субъектов, каждый из которых отличается конкретными качествами и моделями поведения. По ходу описания личностей ставится вопрос об ограничении свободы воли и ответственности человека при действиях иного сознательного субъекта.

Таким образом, рассмотрение системы личностей Билли

Миллигана в романе связана со сложным и неоднозначным решением вопроса свободы воли и моральной ответственности. Автор раскрывает диссоциативное расстройство через анализ поведения героев, демонстрируя ситуацию, при которой человек не всегда способен в полной мере отвечать за свои действия. Кроме того писателем, решена сложнейшая задача персонификации множества личностей в одном человеке через отображение психологических, портретных, речевых характеристик. Детально рассмотрены поступки. Множественность персонажа показана через контрасты.

Большое значение автором уделяется художественный деталям, которые обнаруживаются через восприятие второстепенных персонажей. Достоверность произведению придает существование реального прототипа.

References:

[1] Meynen G. Free will and mental disorder: Exploring the relationship // Theoretical Medicine and Bioethics. — 2010. — Vol. 31, № 3. — P. 187-199. — URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2975916/ - (дата обращения: 26.03.2026).
[2] Бурдзик Е., Бурдзик М. Диссоциативное расстройство идентичности как междисциплинарная проблема. Часть I — психиатрические и психологические аспекты // Psychiatr Pol. — 2023. — Vol. 57, № 1. — P. 147-162. — doi: 10.12740/PP/146969. — PMID: 37350721. — URL: https://journals.viamedica.pl/psychiatria_polonica/article/view/PP.2023.146969 - (дата обращения: 26.03.2026).
[3] Бахтин М. М. Проблемы поэтики Достоевского. - М.: Советская Россия, 1972. - 400 с.
[4] Кант И. Основы метафизики нравов [Электронный ресурс]. - URL: https://ru.wikisource.org/wiki/Основы_метафизики_нравов - Дата обращения: 10.03. 2026.
[5] Дэниэл Киз «Таинственная история Билли Миллигана. - М.: Издательство Эксмо 2022 - 608 с.
[6] Выготский Л. С. Психология искусства. - М.: Искусство,1986. - 573.
[7] Hogan P. C. Affection Narratology: The Emotional Structure of Stories. - Lincoln: University of Nebraska Press, 2011. - 344 p.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

LAW AND INTERNATIONAL LAW

Поняття та система нотаріальних актів - документів

Баранкова Вікторія Валеріївна[1]

[1] кандидат юридичних наук, доцент кафедри цивільної юстиції та адвокатури;
Національний юридичний університет імені Ярослава Мудрого; Україна

У літературі неодноразово наголошувалось, що у чинному законодавстві України відсутнє визначення категорії «нотаріальний акт» [1, с. 153], так само як і на нагальній необхідності його розробки й можливого унормування.

Детальний аналіз розроблених сучасних підходів до визначення поняття нотаріального акту було проведено М. Дякович, і на його підставі авторка запропонувала наступне визначення нотаріального акта – це публічне рішення нотаріуса, яке приймається та виражається у формі документа на підставі правових норм та закріплює волю сторін або нотаріуса, спрямоване на виникнення, зміну або припинення відповідних правовідносин, яке забезпечує охорону прав та інтересів суб'єктів цих правовідносин і наділене доказовою й виконавчою силою [2, с. 25-26].

Запропоноване визначення викликає деякі заперечення. Так, не можна погодитися з твердженням, що нотаріальний акт – документ закріплює волю сторін або нотаріуса, позаяк, по-перше, серед суб'єктів різних нотаріальних дій не завжди є сторони, тому доцільніше вживати такий термін як заінтересовані учасники нотаріальної дії (або нотаріального процесу). По-друге, нотаріальний акт – документ є результатом реалізації публічних повноважень нотаріуса як уповноваженої державою особи, а тому, відповідно, закріплює він саме волевиявлення нотаріуса з приводу вчинення конкретної нотаріальної дії. Винятково волевиявлення нотаріуса як правозастосовника й утворює юридичну вірогідність нотаріально посвідчених прав, фактів та документів, офіційну та доказову силу нотаріального посвідчення. Звісно, волевиявлення заінтересованих учасників нотаріальної дії також фіксується в межах нотаріального процесу, але в інших за своїми правовими характеристиками документах. Наведене зумовлює необхідність чітко розділяти документи, що фіксують волевиявлення різних суб’єктів нотаріального процесу.

Нотаріальні акти – документи закріплюють судження, висновки, волевиявлення нотаріуса як органу цивільної безспірної юрисдикції (ст. 48 Закону «Про нотаріат», далі – Закон). Документи ж, які закріплюють волевиявлення заінтересованих учасників нотаріальної дії – це документи, що подаються для вчинення нотаріальних дій (ст. 47 Закону). Ці документи розрізняються між собою за вимогами, що до них ставляться законом, за своїм правовим значенням, реквізитами та змістом. Наприклад, у випадку вчинення такої нотаріальної дії як посвідчення договору купівлі – продажу сам текст договору буде фіксувати волевиявлення сторін цього правочину і саме до нього буть ставитися вимоги, передбачені статтею 47 Закону як до документу, що подається для вчинення нотаріальної дії, а нотаріальним актом – документом, що фіксує волевиявлення нотаріуса є посвідчувальний напис на цьому договорі. При цьому договір є правовстановлювальним документом (але лише за умови, якщо він містить посвідчувальний напис нотаріуса), а сам посвідчувальний напис – актом органу безспірної цивільної юрисдикції.

Також не можна погодитися з твердженням, що усі нотаріальні акти – документи наділені виконавчою силою з наступних міркувань. У літературі справедливо відзначалося, що виконавча сила нотаріального акта повинна пов’язуватися та пов’язується у законодавстві з його примусовим виконанням органами примусового виконання рішень [3, с. 180]. Оскільки зазначена якість є характерною лише для таких нотаріальних актів як виконавчий напис та протест векселя, то вона є радше винятком із загального правила, аніж визначальною ознакою усіх нотаріальних актів. Натомість, вважаємо, нотаріальні акти як юрисдикційні рішення мають характеризуватися юридичною силою, складовими елементами якої є офіційна та доказова сила.

Виходячи з наведеного, можна виснувати, що нотаріальні акти-документи служать юридичною формою, якою наділяються процесуально оформлені рішення, прийняті нотаріусом при здійсненні своїх повноважень в межах вчинення нотаріальних дій (або відмови у їх вчиненні) за участю заінтересованих осіб, на яких поширюється юридична чинність цих актів.

Нотаріальні акти-документи мають обов'язкову юридичну силу, оскільки нотаріуси здійснюють свою діяльність від імені держави. Внаслідок цього фактично у всіх країнах латинського нотаріату визнається особлива важливість письмових доказів, передусім, тих, що попередньо набули нотаріального посвідчення [4, с. 146; 5, с. 153].

Скасування нотаріальних актів допускається тільки судом. Офіційний характер цих документів виражається не тільки в тім, що вони оформляються спеціально уповноваженими на те суб'єктами, але й у тім, що їх природа, структура і реквізити закріплені в законодавстві. Порушення закріпленої законом форми нотаріальних актів-документів тягне визнання їх недійсними. З точки зору потреб правозастосовної практики можна виснувати, що це положення має бути прямо закріплене в ст. 48 Закону. Такий варіант унормування значно полегшив би розв’язання судових справ, пов'язаних із попереднім вчиненням нотаріальних дій або відмови у їх вчиненні.

Система нотаріальних актів – документів охоплює низку процесуальних за своїм характером документів, що мають різний зміст та призначення, тому не можна погодитися з твердженням, що нотаріальні акти – це юридично обов’язкова форма вираження результату нотаріальних дій у письмових індивідуальноправових актах [6, с.3]. Актами, які фіксують результат нотаріальної дії, склад нотаріальних актів – документів не вичерпується, він є набагато ширшим за складом.

У ході розгляду нотаріальної справи і здійснення нотаріальної діяльності можливе постановляння цілого ряду нотаріальних актів-документів. За юридичним значенням і функціям їх можна розділити на три групи: 1) акти, що виступають підсумком діяльності нотаріуса, і фіксують результат застосування норм матеріального права та вирішення нотаріальної справи; 2) акти, що фіксують відсутність умов для застосування норм матеріального права і не виникнення чи припинення нотаріального процесу з цієї причини; 3) акти, що оформляють процесуальні дії, необхідність здійснення яких виникає в ході розгляду нотаріальної справи.

До першої групи відносяться наступні види нотаріальних актів –документів: нотаріальні свідоцтва; посвідчувальні написи; виконавчі написи; акти про протест векселів у несплаті, чи неакцепті чи не датуванні акцепту; написи про заборону відчуження нерухомого майна; акти про морський протест.

Відмітною рисою цих нотаріальних актів-документів є те, що вони наділяють якістю безспірності і вірогідності права, факти і документи, впливають на правовий статус заінтересованих у вчиненні нотаріальної дії осіб, і дозволяють їм згодом (поза рамками нотаріального процесу) реалізувати свої права й інтереси, вчинити певні дії. Такі правозастосовні акти, виступаючи підсумком діяльності нотаріуса, фіксують результати вирішення нотаріальної справи та, відповідно, вчинення нотаріальної дії, оформляють основні висновки, отримані в ході нотаріального процесу.

До другої групи актів-документів відносяться постанова про відмову у вчиненні нотаріальної дії (ст. 49 Закону), акт про неможливість вжиття заходів до охорони спадкового майна п. 8 гл. 9 розд. П Порядку вчинення нотаріальних дій нотаріусами України, далі - Порядок). Винесена нотаріусом постанова про відмову у вчиненні нотаріальної дії має відповідати вимогам, закріпленим у п. 3 гл.13 Порядку. Юридичне значення цих документів полягає у створенні процесуальних гарантій законності, обґрунтованості відмови у вчиненні нотаріальної дії і забезпечення реалізації прав і законних інтересів громадян та юридичних осіб, заінтересованих у виникненні нотаріального процесу.

Третю групу документів, що характеризують процесуальне оформлення нотаріальної діяльності, складають такі документи як: постанова про призначення експертизи (ч. 2 ст. 51 Закону); акт опису спадкового майна (п. 3 гл. 9 розд. П Порядку); постанова про призначення хранителя спадкового майна (ч. 2 ст. 61 Закону); розпорядження про видачу зі спадкового майна грошових сум на покриття витрат, зв'язаних з доглядом за спадкодавцем, його похороном і т.д. (ст. 64 Закону). Вважаємо за доцільне законодавчо передбачити також необхідність постановлення низки процесуальних документів, які сьогодні не унормовані нотаріальним законодавством: постанов нотаріуса про направлення документів на експертизу, про відкладення вчинення нотаріальної дії, про зупинення вчинення нотаріальної дії.

Усе це документи, що фіксують дії нотаріуса, здійснювані на підставі застосування нотаріальних процесуальних норм, і забезпечують хід нотаріального процесу.

References:

[1] Вдовічена Л. Нотаріальні акти як елемент функціонування нотаріальної юрисдикції. *Публічне право.* № 3 (51). 2023. С. 152 - 159. DOI 10.32782/2306-9082/2023-51-16. URL: https://www.publichne-pravo.com.ua/files/51/16.pdf
[2] Дякович М. М. Нотаріальний акт як інструмент охорони (захисту) прав та законних інтересів учасників цивільних правовідносин. *Бюлетень Міністерства юстиції України.* 2013. № 9. С. 20-27. URL: URL: http://nbuv.gov.ua/UJRN/bmju_2013_9_4
[3] Снідевич О. С. Теоретичні проблеми юридичної сили нотаріального акта у доктрині нотаріального процесу України. *Право України.* 2020. № 9.

С. 170-182. URL: http://nbuv.gov.ua/UJRN/prukr_2020_9_14
[4] Бондарєва М. Особливості організації системи нотаріальних органів в країнах латинського нотаріату. *Право України.* 2006. № 4. С. 146 – 149
[5] Мартинюк О.А. Специфіка організації нотаріальної діяльності в країнах із нотаріальними системами англосаксонського та латинського типів. *Науковий вісник публічного та приватного права.* 2017. Вип.2. с. 152-156. URL: https://www.nvppp.in.ua/vip/2017/2/32.pdf
[6] Дергільова О. Г. Нотаріальні акти в системі правових актів сучасного права: загальнотеоретичне дослідження. Автореф. канд. дис. Одеса. 2017. 18 с. URL: https://dspace.onua.edu.ua/server/api/core/bitstreams/6db36af5-0713-4b22-9f18-43a50a4e66da/content

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

A Group of Painted Vessels from the II Kultepe Settlement

Mammadova Aida[1]

[1] 1Phd., Researcher at the Department of «Archaeology of the Bronze Age»;
Azerbaijan National Academy of Sciences Institute of Archeology, Ethnography and Anthropology; Republic of Azerbaijan

Abstract. Painted pottery is characteristic of the Bronze Age culture of Nakhchivan. The potters of Nakhchivan - particularly those of II Kültepe — distinguished themselves from their contemporaries in other regions of the Bronze Age by producing not only simple vessels for everyday and economic use but also finely crafted painted pottery that attracted artistic attention. The patterns and primitive drawings depicted on these vessels are genuine works of art and provide valuable scientific insights into the daily life, economic activities, religious ideology, as well as the fauna and flora of ancient peoples. According to researchers, Nakhchivan's close socio-economic and cultural ties with the Near East, particularly with Urmia and Mesopotamia, created favorable conditions for the emergence of painted pottery.
Keywords: *Bronze Age, city-fortress II Kültepe, painted pottery culture, monochrome and polychrome painted pottery, pottery painting, socio-economic and cultural connections.*

During the Bronze Age in Azerbaijan, various branches of handicrafts developed in accordance with the needs of the ancient population, with pottery occupying a particularly important place. It went through an independent development path and became increasingly refined. This development was also influenced by economic and cultural relations; within the framework of local progress, pottery became widespread, and ceramic products-especially painted vessels-played an important role in exchange. In the Middle Bronze Age, monochrome and polychrome painted vessels held a significant place. Geometrically decorated monochrome painted pottery, which developed based on the forms and ornaments of simple vessels, laid the foundation for the formation of a new cultural tradition - the Painted Pottery Culture [10].

Technological innovations in the production and decoration of ceramics indicate the beginning of a new stage in the development of this craft [1, p.96].

During the Bronze Age in Nakhchivan, at II Kültepe, the demand for clay vessels in household and economic life led to the expansion of their production. The quality of pottery improved, and its forms became considerably more sophisticated. Clay vessels of the Middle Bronze Age were divided into plain and painted types, meeting the needs of the period. Painted vessels were further subdivided into polychrome and monochrome painted ware [11, p.115].

Researcher V.H. Aliyev, studying the Painted Pottery Culture, identified four stages of its development from the Middle Bronze Age to the Early Iron Age. Based on excavations carried out between 1969 and 1980 at the multi-layered settlement of II Kültepe, he proposed these conclusions.

One of the most remarkable multi-layered settlements in Azerbaijan and Nakhchivan, II Kültepe is 11 meters high and covers an area of 3 hectares. At one time, the site extended over more than 6 hectares. It is located between the Jehriçay and Nakhchivanchay rivers, between the villages of Uzunobya and Didivar. Over time, part of it was eroded and destroyed by the Jehriçay river. As a result, cultural layers belonging to different Bronze Age phases have been revealed in the exposed sections. The lowest layer of II Kültepe (6 m) is characteristic of the Early Bronze Age - specifically the Kura-Araz culture. Above it lie the Middle and Late Bronze Age layers. The uppermost layer, belonging to the Early Iron Age, has been heavily damaged.

Although painted pottery from the Eneolithic period is rare at II Kültepe, during the Middle Bronze Age, alongside plain vessels, finely crafted painted pottery decorated with various colors and high artistic taste was produced. Painted pottery is highly characteristic of the Bronze Age culture of Azerbaijan and the South Caucasus. The production of such vessels was especially well developed in Nakhchivan pottery-making traditions. Nakhchivan potters distinguished themselves from those in other regions of the Bronze Age by producing not only simple utilitarian clay vessels but also finely decorated painted ware of high artistic quality.

Most painted vessels were hand-made without the use of a potter's wheel, skillfully formed in symmetrical and delicate shapes. Their surfaces were decorated with straight, wavy, and zigzag lines, as well as geometric patterns such as triangles, rhombuses, rectangles, and angular motifs. The successful execution of such colorful designs on oval-shaped vessels, rather than flat surfaces, demonstrates the rich experience of ancient craftsmen of Nakhchivan and II Kültepe during the Bronze Age. Some painted vessels also feature more complex scenes depicting humans, animals, birds, and celestial bodies [3, pp.33-44].

The ornaments and primitive drawings depicted on vessels are true works of art and are connected with the everyday life and economic activities of ancient people, their religious ideology, as well as the surrounding environment - fauna and flora. Scenes consisting of human and various animal depictions on the painted pottery of Gizilburun, Shahtakhti, Nehcir, and II Kultepe were dedicated to religious rituals associated with ancient pastoralism and hunting. Worship and belief in natural forces such as fire, water, the sun, mountains, and others are reflected in geometric motifs on painted vessels. Painted pottery was used for various purposes. These vessels were produced for household use as well as for religious ceremonies [11, p.118].

The production of painted pottery was not a simple process. It required the selection of high-quality clay, its kneading, the addition of fine sand or shiny minerals, firing at the appropriate temperature, decoration with various colors, and refiring. This process was labor-intensive and, naturally, highly valued in exchange systems. It can be assumed that such vessels were accessible only to higher social strata.

The settlement of II Kultepe is one of the earliest centers of pottery production in Nakhchivan. It differs from other pottery centers in its production characteristics.

In 2010, fragments of both monochrome and polychrome painted vessels were collected at II Kultepe. One of these fragments belonged to a goblet with a bulging body; fine sand had been added to its clay. Its surface was covered with a yellow slip and decorated with geometric motifs in black and red colors—net-like triangles, wide slanted black and red lines. The triangles were outlined with black and red lines, while their interiors were filled with red and, in some cases, black grid patterns [6].

The most interesting finds are medium-sized jars discovered intact around the kiln structure in the workshop. Two of them were brown in color, decorated with black designs; another was a black-polished vessel of the Uzarliktapa type with special zigzag ornamentation. The fourth was a plain light brown jar. Numerous kilns, paint-filled vessels, intact pots, and large quantities of plain and painted pottery fragments found in the workshop indicate that this was a highly developed pottery production center.

The jars discovered at II Kultepe are of great interest. They are characterized by a bulging body, long or short necks, flat bases, and no handles, with their rims folded outward. Their height ranges from 20-28 cm, body diameter from 10-22 cm, mouth diameter from 6-14 cm, and base diameter from 4-8 cm. The rims are bordered with incised lines and decorated with short strokes; the necks are divided into equal sections by paired vertical lines in three places. The spaces between these lines are filled with wavy patterns. Below the neck, the vessels are decorated with horizontal wavy and straight lines. Beneath these lines are angles, upward-facing triangles, and zigzag patterns. The interiors of geometric motifs are filled with wavy lines, and their lower ends are completed with small circles. In some vessels, small circles are also placed between triangles and zigzag patterns. Human, animal, and bird depictions are also occasionally found on the vessels [4, p.50].

Some elements of the ornamentation of painted jars are identical to incised and stamped patterns on polished vessels from the Middle Bronze Age layer of Uzarliktapa. During the Middle Bronze Age, the use of zigzag ornamentation on both plain and painted vessels was widespread in the South Caucasus [12, p.91].

Research has shown that in the second half of the 2nd millennium BC, pottery production in Azerbaijan further developed, and significant progress was made in the creation of painted pottery. As in the first stage, the painted vessels of the second stage were decorated on a light (white or yellow) background with various polychrome colors (black, red, brown, white, yellow, orange) and with relatively high artistic taste and precision. During this period, Azerbaijani potters created beautiful examples of painting and true works of art with complex compositions using multiple colors. In vessels of this stage, painted decoration covers the main part of the body. Polychrome jar fragments are most frequently found at II Kultepe settlement. These vessels, decorated with geometric motifs (net-like triangles), were predominantly painted with white color [4, pp.57, 60].

One of the most interesting aspects is the production of different colors used in ornamentation. Based on the analysis of painted ceramic materials, researchers suggest that during the Middle Bronze Age, ancient Azerbaijani potters not only created fine vessels but also invented various pigments of complex chemical composition. Undoubtedly, the development of local metallurgy played an important role in this process [4, p.61].

Their assumptions were confirmed in 2009 during the excavation of a workshop built adjacent to the northwestern wall of II Kultepe (its main wall was constructed along the fortress wall). In the first room of the workshop, the process of obtaining colors from minerals over a hearth was observed. A vessel containing a mixture of white, black, yellow, red, orange, gray, and brown colors was discovered on the hearth. It was determined that wood fuel and bones of large and small animals and birds were used to achieve high temperatures necessary for melting minerals and producing pigments. Inside the vessel, partially burned bird bones, white ash, and at the bottom of the jar, remains of burnt wood, charcoal, and ash were found. A shiny layer was observed at the bottom of the bone-fired section of this medium-sized vessel. Near the hearth, a grinding stone (large) and a pestle with traces of pigment were also found. A pile of orange ochre powder was discovered near the stone tools.

This unique discovery, which confirms earlier assumptions, has not been recorded in pottery workshops not only in Azerbaijan but also in the South Caucasus and even the Near East. Apart from the vessel filled with minerals found in the workshop (which consisted of four rooms), most of the collected ceramic fragments were monochrome and decorated with red paint. The ceramics were thin-walled, and circular traces of the potter’s wheel were visible on them. Traces of white, red, and yellow shiny minerals were also observed on vessels from the kiln. Similar minerals were present in the composition of the substances inside the vessel. It is highly likely that potters added such crushed shiny minerals into the clay during kneading.

The discovery of well-formed, finely made plain and painted vessels in a single pottery workshop, together with numerous kilns, provides valuable scientific evidence that local production processes existed in ancient Nakhchivan at II Kultepe. The abundance of vessels of different shapes and sizes suggests that this local production enabled the ancient inhabitants of Kultepe to develop independently and produce more advanced, symmetrical, thin-walled pottery using the potter’s wheel for exchange purposes [9].

In the second phase, the motifs characteristic of the painted vessels of the first phase (downward-oriented angles and triangles with ends finished by circles and filled with wavy lines, paired zigzag lines, and bird depictions with bodies divided by nets) disappeared and were replaced by more perfected geometric designs (rhombuses, triangles with upward and downward bases, with net-filled and adjoining interiors, and rectangles). While human, animal, and bird figures on monochrome painted vessels were rendered in a stylized form, in polychrome painted vessels these motifs were depicted in a highly realistic and creative manner, as if drawn by a skilled artist [4, p.63]. Polychrome painted vessels found at the ancient settlement of II Kultepe are rare and original examples of Azerbaijan's ancient pottery art due to the richness of their colors. These vessels are decorated with black, red, and brown colors in more complex compositions, featuring geometric patterns, swans, cranes, storks, oxen, deer, horsemen, and human figures. On one fragment, two human figures are depicted in black, along with a checkered pattern (consisting of 34-36 squares), and a swan painted in red. The human figures are shown in motion; one is a woman and the other a man. In the depiction, the leading figure has his left arm bent at the elbow and raised, with the hand open, seemingly signaling caution to the person following behind. The man's shoulders are relatively broad, and he wears a feathered crown on his head. It is clearly a scene of people engaged in some activity. The man holds a tool or weapon on his right shoulder. As seen from the painted pottery and rock engravings, animal, bird, and human depictions were frequently used as key motifs in the visual art of the Bronze Age in Nakhchivan, including II Kultepe. During this period, the depiction of snakes was newly introduced in visual art. On both plain and painted vessels, as well as in rock art, the snake was likely represented as a symbolic force—a totem [2, pp.62-63].

Based on research, it is concluded that the territory of Nakhchivan (including I and II Kultepe) had cultural and economic connections with the southern regions through its painted pottery, as well as with northern regions and other parts of the South Caucasus through its plain ceramics [7, pp.96, 98].

Archaeological investigations clearly show that II Kultepe played a key role in economic and cultural relations. The discovery of monochrome painted vessels in pottery workshops in the northern regions of Azerbaijan, such as Mil-Karabakh and the Ganja River area, as well as the presence of

Uzarliktapa-type black-polished vessels at II Kultapa, confirms these connections.

During the transition from the Late Bronze Age to the Early Iron Age, significant changes occurred in ceramic production. Innovations are noticeable in their form and manufacturing techniques. Most jars have short necks, bulging bodies, and flat bases. They were carefully made on a potter's wheel, with well-smoothed surfaces covered by slip. The interior and rim were painted red. The rims are often outward-curved, many with a raised band-like edge. Some jars have cylindrical and short necks, with bulging shoulders. In some cylindrical-necked jars, dark red paint was applied to the body, and brown paint to the inner rim. Some vessels have symbolic stamped "S"-shaped decorations on the shoulder [6, pp.119-121].

From this, it can be concluded that craftsmanship and its various branches had a distinctive place and high level of development in the territory of Azerbaijan. Pottery, in particular, stood out in this field. During the Bronze Age, Azerbaijan had several independent pottery production centers. The homeland of painted pottery was Nakhchivan, and only later, as a result of intertribal economic and cultural relations, did it spread along the Araz Valley to the Ghuruchay-Kondalanchay basin. Grey and black polished vessels with special ornamentation from the Middle Bronze Age settlements of the Mil-Karabakh plain were also brought to Nakhchivan in this way [8].

While in other regions of Azerbaijan during the Bronze Age grey and black vessels of various forms were produced, in Nakhchivan - especially at II Kultepe - priority was given to painted pottery. One of the main reasons for this was Nakhchivan's strong economic and cultural ties with the Near East, particularly Urmia and Mesopotamia. Nevertheless, archaeological research in Nakhchivan, Mil-Karabakh, the Ganja River region, and other areas shows that these regions were interconnected. This allows us to conclude that the ancient history of present-day Azerbaijan, its territory, and its culture were formed during the Bronze Age through the unity of tribes sharing the same roots and cultural traditions (Kura-Araxes, Nakhchivan Painted Pottery, Khojaly-Gadabay, Talysh-Mugan, etc.).

HISTORY AND ARCHEOLOGY, ARCHIVAL STUDIES

References:

[1] Cəfərov H.F. Qədim Qarabağ. Bakı: Elm, 2020, 526 s.
[2] Əliyev V.H. Gəmiqaya abidələri. Бакы, 1992, 78 с.
[3] Əliyev V.H. Tarixin izləri ilə. Bakı: Gənclik, 1975. 77 s.
[4] Əliyev V.H. Azərbaycanda tunc dövrünün boyalı qablar mədəniyyəti. Bakı: Elm, 1977. 165 s.
[5] Əliyev V.H., Məmmədova A.Ə. II Kültəpədə yeni tədqiqatlar (2010-cu il) / Azərbaycanda arxeoloji tədqiqatlar 2010. Arxeologiya və Etnoqrafiya İnstitutu, Bakı, 2011, Xəzər Universiteti, s.126-134.
[6] Əliyev V.H., Məmmədova A.Ə. II Kültəpədə yeni tədqiqatlar. / Azərbaycanda arxeoloji tədqiqatlar. Arxeologiya və Etnoqrafiya İnstitutu. Bakı, 2011, s.115-124
[7] Həbibullayev O.H. Kültəpədə arxeoloji qazıntılar. Bakı: Azərbaycan SSR Elmlər Akademiyası nəşriyyatı, 1959. 134 s.
[8] İsmayılov Q.S. Quruçay və Köndələnçay vadisində qədim mədəniyyət izləri. Bakı: Elm, 1981, 51 s.
[9] Məmmədova A.Ə. II Kültəpə Azərbaycanda ilkin boyalı qablar istehsalı ocağıdır / Naxçıvan Muxtar Respublikasının 90 illiyi Elmi konfrans materialları. Azərbaycan Arxeologiya və Etnoqrafiya elmlərinin inkişafında Naxçıvan məktəbinin rolu elmi konfransın materialları. Bakı, 2014, s.86-88.
[10] Məmmədova A.Ə. Tunc və antik dövr boyanaxışlı qabların müqaisəli təhlili. / Urbanization in the Caucasus and beyond during classical antiqutty İnternational scintific conference. Book of summaries Baku. 07.08.July. 2025, p.67-68
[11] Məmmədova, A.Ə. Azərbaycanın tunc dövrü mədəniyyətinin öyrənilməsi tarixi və onun problemləri. Bakı, Adiloğlu, 2001, 212 s.
[12] К.Х.Кушнарева. Новые данные о поселении Узерликтепе. МИА СССР, № 125, М-Л, 1965.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

BIOLOGY AND BIOTECHNOLOGY

Pathogenic Helminths of Domestic Birds in Azerbaijan and their Potential Threat to Human Health

Mammadova S.N.[1], Suleymanova L.M.[2], Azizov A.P.[3], Kerimov V.M.[4], Valiyeva G.A.[5], Huseynova L.S.[6]

[1] *Azerbaijan Medical University, Department of Medical Biology and Genetics;* Republic of Azerbaijan

[2] *Azerbaijan Medical University, Department of Medical Biology and Genetics;* Republic of Azerbaijan

[3] *Azerbaijan Medical University, Department of Medical Biology and Genetics;* Republic of Azerbaijan

[4] *Azerbaijan Medical University, Department of Medical Biology and Genetics;* Republic of Azerbaijan

[52] *Azerbaijan Medical University, Department of Medical Biology and Genetics;* Republic of Azerbaijan

Helminthiases constitute a widespread group of parasitic diseases affecting both domestic and wild birds and represent a significant constraint to poultry production by causing considerable economic losses. These parasites adversely affect the growth and development of birds, reduce productivity, and, in severe cases, may lead to mortality. The diverse geographical and climatic conditions of Azerbaijan provide favorable environments for the dissemination of helminths and their intermediate hosts. This review analyzes the principal pathogenic helminths recorded in domestic birds in Azerbaijan, their biological characteristics, distribution patterns, pathogenic effects on avian hosts, and their potential implications for human health. A synthesis of available literature indicates that *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria* spp., *Syngamus trachea*, *Raillietina* spp., and *Echinostoma* spp. are among the most frequently encountered helminths in the country. Particular attention is drawn to the zoonotic significance of trematodes belonging to the genus *Echinostoma*. Existing data highlight the necessity for more

comprehensive and systematic investigations of the helminth fauna of domestic birds in Azerbaijan.

Helminth infections of birds are among the most widespread parasitic diseases worldwide and are of considerable importance from both veterinary and public health perspectives. Various helminth species parasitize the digestive, respiratory, and other organ systems of birds, thereby negatively affecting their physiological condition, productivity, and reproductive performance. High levels of infection may result in substantial economic losses in poultry production.

The Republic of Azerbaijan is characterized by remarkable landscape diversity, climatic heterogeneity, and a wide range of biogeographical conditions. The variety of ecosystems present within the country creates favorable conditions for the completion of helminth life cycles and the survival of their intermediate hosts. Consequently, the investigation of regional patterns in the distribution of avian helminthiases remains an important scientific and practical issue.

Recent studies have demonstrated that chickens, ducks, geese, and turkeys raised in small-scale rural households are more frequently exposed to helminth infections. This increased susceptibility is primarily associated with free-range management systems, which facilitate contact with contaminated soil, infective stages of parasites, and intermediate hosts.

Helminths infecting domestic birds can generally be classified into three major groups: nematodes, cestodes, and trematodes.

Nematodes represent the most common helminths infecting domestic birds. Among them, *Ascaridia galli* is the causative agent of avian ascariasis and primarily inhabits the small intestine of chickens. Heavy infections may result in digestive disturbances, weight loss, and decreased productivity (1).

Heterakis gallinarum predominantly inhabits the ceca and plays a crucial role in the transmission of several protozoan pathogens, particularly *Histomonas meleagridis*. Therefore, its pathogenic significance extends beyond its direct effects on the host (2).

Species of the genus *Capillaria* inhabit various sections of the digestive tract and may induce inflammatory lesions under severe infection conditions. *Syngamus trachea*, commonly known as the gapeworm, parasitizes the trachea of birds, causing respiratory distress and occasionally mortality, especially among young birds (3).

Cestodes of the genus *Raillietina* are among the most common tapeworms infecting domestic poultry. Their life cycles involve various arthropods serving as intermediate hosts. Infection can result in damage to the intestinal mucosa, impaired nutrient absorption, and general debilitation.

Among domestic waterfowl, trematodes of the genus *Echinostoma* are of particular importance. Their life cycle involves aquatic mollusks and other aquatic organisms as intermediate hosts. Several *Echinostoma* species are capable of infecting humans, making them significant from a zoonotic perspective (4).

The diversity of climatic and landscape zones across Azerbaijan has a direct impact on the distribution of helminths. In humid subtropical regions, particularly within the Lankaran-Astara zone, elevated humidity promotes the prolonged survival of helminth eggs and larvae in the environment.

In areas rich in water bodies, trematode infections are more commonly observed in ducks and geese due to their feeding habits, which involve mollusks, crustaceans, and other intermediate hosts. In contrast, soil-transmitted nematodes predominate in lowland and foothill regions.

While free-range management systems significantly increase the risk of helminth transmission, infection rates are generally lower in modern intensive poultry production facilities employing closed housing systems (5).

Most helminths of domestic birds exhibit a high degree of host specificity and are incapable of completing their life cycles in humans. Nevertheless, certain species may pose potential public health risks.

The most significant zoonotic helminths belong to the genus *Echinostoma*. Human infection may occur through the consumption of inadequately cooked aquatic food products containing infective stages of the parasite. Clinical manifestations may include gastrointestinal disorders, abdominal pain, and other digestive symptoms.

Some species of the genus *Capillaria* are also regarded as potential zoonotic parasites. However, transmission of avian *Capillaria* species to humans appears to be relatively uncommon.

In contrast, *Ascaridia galli*, *Heterakis gallinarum*, and

Syngamus trachea are generally considered to pose minimal risk to human health. Nevertheless, their economic impact on poultry production remains substantial.

Systematic investigations of the helminth fauna of domestic birds in Azerbaijan began during the early 1960s. The pioneering contributions in this field were made by the distinguished helminthologist N.M. Shirinov. In 1962, he reported ten helminth species recorded for the first time from domestic geese and ducks in Azerbaijan. This study represented a milestone in the investigation of helminths infecting domestic waterfowl within the country. In the following year, Shirinov published a more comprehensive analysis addressing the helminth fauna of domestic geese and ducks, associated helminthiases, and measures for their control. These studies demonstrated the richness of the helminth fauna of waterfowl across different ecological regions of Azerbaijan and emphasized the important role of environmental factors in shaping parasite communities (6, 10-11).

Between the 1960s and 1980s, helminthological research in Azerbaijan developed largely within the framework of the Soviet helminthological school. During this period, the complete helminthological dissection method developed by K.I. Skryabin was widely employed for the identification of nematodes, cestodes, and trematodes inhabiting various organs of birds. Research efforts focused primarily on taxonomy, biology, and epizootiological characteristics of avian helminths (7-9).

Following the 1990s, the overall volume of helminthological studies declined; however, investigations into the prevalence of helminthiases in poultry farms continued in several regions. These studies revealed the widespread occurrence of ascariasis, heterakidosis, and capillariosis among domestic birds.

Interest in avian helminthology has increased again in recent years. In particular, studies conducted in western regions of Azerbaijan in 2023 demonstrated the extensive distribution of ascariasis among poultry and highlighted the importance of preventive and control measures.

Research published in 2025 investigated the prevalence of helminthiases and other parasitic diseases among domestic chickens in the Shaki and Gakh districts. The results revealed that ascariasis, heterakidosis, and capillariosis are widespread in both backyard and farm-based poultry systems.

Infection rates were shown to depend significantly on bird age and management conditions. In the same year, extensive helminthological surveys conducted in the Mountainous Shirvan economic region identified five nematode species, one cestode species, and one trematode species in domestic chickens. Among these, *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria obsignata*, and *Syngamus trachea* were found to be the most prevalent. Furthermore, hematological and biochemical studies carried out in 2025 demonstrated that helminth infections exert significant adverse effects on the physiological condition of domestic chickens. Notable alterations in blood parameters were observed in birds infected with *Capillaria obsignata*, *Heterakis gallinarum*, and *Raillietina tetragona*.

Overall, research on domestic bird helminths in Azerbaijan has evolved considerably since 1962, progressing from basic taxonomic descriptions to modern ecological, epizootiological, and physiological investigations. Existing evidence indicates that the helminth fauna of domestic birds is highly diverse across the country's various ecological regions. Nevertheless, comprehensive assessments of helminth distribution in relation to climate change, anthropogenic influences, and zoonotic risks remain important priorities for future research (4, 12).

The available literature demonstrates that helminthiases remain an important veterinary concern in domestic birds throughout Azerbaijan. The most frequently reported helminths include *Ascaridia galli*, *Heterakis gallinarum*, *Capillaria* spp., *Syngamus trachea*, *Raillietina* spp., and *Echinostoma* spp. Their distribution is strongly influenced by the ecological and geographical diversity of the country. Although most of these parasites primarily affect bird health and productivity, certain trematodes possess zoonotic potential and may pose risks to human health. Therefore, continuous monitoring of helminth infections, implementation of effective preventive measures, and comprehensive regional surveys are essential for improving both poultry health and public health protection.

References:

[1] Anderson R.C. 2000, Nematode Parasites of Vertebrates. Their Development and Transmission, 2nd ed. CAB International, Wallingford, Oxon, UK, pp. 265,290-299. ISBN 0-85199-421-0
[2] Levine N.D. 1978, Textbook of Veterinary Parasitology, Minneapolis, Burgess Pub. Co, 236 p.

BIOLOGY AND BIOTECHNOLOGY

[3] Mammadova S., Jafarov R, 2025, Spread of Parasitic Diseases in Domestic Chickens in Azerbaijan, *Bulletin of Science and Practice*, Volume 11, Issue 9, 387-391 pp, DOI: 10.33619/2414-2948/118/46).
[4] Verdiyeva G., Taghiyeva A. 2023, Measures to combat widespread ascardiosis among birds in the western zones of the republic. Nature and Science International scientific journal. Volume 5, Issue 5, 66-71 pp
[5] Панова О.А., Курносова О.П. Хрусталев А.В. Арисов М.В. 2023, Методы копрологической диагностики паразитозов животных. Биохимия, Биотехнология, Диагностика М., Том 7, Выпуск 3, с. 365-377
[6] Рыжиков К. М. 1978, Определитель гельминтов домашних водоплавающих птиц, М., Наука, 264 с.
[7] Скрябин К.И. 1928, Метод полного гельминтологического вскрытия животного, МГУ, 23 с.
[8] Скрябин К.И., Шульц Р.С. 1935, Гельминтозы птиц и методы борьбы с ними, Тез. докл. вет. секции ВАСХНИЛ, с. 50-65.
[9] Скрябин К. И. 1949, Определитель паразитических нематод, М., АН СССР, 524 с.
[10] Ширинов Н.М. 1962, 10 видов гельминтов, впервые обнаруженные у домашних гусей и уток, Тр. Азерб. н.-и. вет. ин-та. Т. 16. с. 75-80.
[11] Ширинов Н. М. 1963, Гельминты и гельминтозы домашних гусей и уток Азербайджана, и меры борьбы с ними Матер, науч. сессии гельминтологов Закавказья, Тбилиси, АН Гр. ССР, с.198-205.
[12] Шульц Р. С., Гвоздев Е. В. 1972, Основы общей гельминтологии, Т. 1. М., Наука, 430 с.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

MEDICINE AND PHARMACY

Принципы работы аппарата искусственного кровообращения и особенности проведения открытого массажа сердца в современной кардиохирургии и реаниматологии

Хамитова Жансая Сагиндыковна[1],
Утаров Нурбол Торегалиевич[2], **Мадалиев Сабит Нурханович**[3]

[1] Резидент кафедры: Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[2] Резидент кафедры: Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[3] Научный руководитель;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

Аннотация. В данной статье подробно рассматриваются теоретические и практические аспекты временного замещения функции сердца и легких с помощью аппарата искусственного кровообращения (АИК). Описаны ключевые компоненты экстракорпорального контура, физиологические принципы перфузии, а также патофизиологические изменения, возникающие в организме пациента во время обхода системного кровотока. Вторая часть работы посвящена методологии и показаниям к проведению открытого (прямого) массажа сердца как критического метода реанимации при неэффективности закрытых реанимационных мероприятий или в условиях открытой грудной клетки. Авторы анализируют гемодинамическую эффективность обоих методов, их синергию и возможные осложнения.
Ключевые слова: *Аппарат искусственного кровообращения, экстракорпоральная гемодинамика, оксигенатор, роликовый насос, открытый массаж сердца, реанимация, кардиоплегия, гипотермия.*

Введение

Современная кардиохирургия и интенсивная терапия критических состояний немыслимы без технологий экстракорпоральной поддержки жизни. Разработка и внедрение в клиническую практику аппарата искусственного кровообращения (АИК) в середине XX века Джоном Гиббоном революционизировали медицину, позволив выполнять сложные оперативные вмешательства на «сухом» и остановленном сердце.

Искусственное кровообращение (ИК), или экстракорпоральный контур (ЭКК), представляет собой метод временного полного или частичного замещения насосной функции сердца и газообменной функции легких. Это сложный биотехнический процесс, требующий строгого контроля гидродинамических параметров, системного гемостаза и метаболического статуса организма.

С другой стороны, в ургентной медицине возникают ситуации экстремального падения сердечного выброса или полной остановки эффективной сердечной деятельности (асистолия, фибрилляция желудочков), когда стандартный закрытый массаж сердца не позволяет достичь адекватного перфузионного давления в коронарных и церебральных артериях. В этих случаях, особенно в операционной или при травмах грудной клетки, методом выбора становится открытый (прямой) массаж сердца.

Цель данной работы — комплексный научно-теоретический анализ принципов функционирования современных систем искусственного кровообращения и детальное изучение топографо-анатомических и физиологических основ открытого массажа сердца, а также определение их места в алгоритмах спасения жизни.

1. Принципы работы аппарата искусственного кровообращения (АИК)

1.1. Компоненты экстракорпорального контура

Современный аппарат искусственного кровообращения состоит из нескольких функциональных модулей, соединенных между собой системой стерильных полимерных магистралей (трубок). К основным элементам относятся:

1. **Венозные канюли и магистрали.** Служат для забора деоксигенированной (венозной) крови из организма пациента. Обычно канюли вводятся через правое предсердие в верхнюю и нижнюю полые вены (раздельная канюляция) или устанавливаются однократно в правое предсердие (двухпросветная канюляция).
2. **Венозный резервуар.** Емкость, куда кровь поступает самотеком (за счет гравитационного дренажа). Выполняет роль буфера, сглаживающего колебания объема циркулирующей крови, и служит местом для деаэрации (удаления пузырьков воздуха).
3. **Артериальный насос.** Главный «двигатель» системы, замещающий левый желудочек. В практике используются два основных типа насосов:
   - **Роликовые насосы:** вытесняют кровь путем механического пережатия вращающимися роликами эластичной трубки. Плюсы — простота контроля объема (производительности); минусы — риск гемолиза при избыточном прижатии роликов.
   - **Центрифужные (центробежные) насосы:** используют вращающийся ротор или конус, создающий vortex (вихрь) и

отрицательное давление на входе, плавно ускоряя кровь. Они менее травматичны для форменных элементов крови и исключают риск массивной воздушной эмболии при пустом резервуаре.

4. **Оксигенатор («искусственное легкое»).** Устройство, где происходят процессы диффузии кислорода в кровь и выведения углекислого газа. Современный стандарт — **мембранные оксигенаторы** из половолоконных microporous (микропористых) или полипропиленовых мембран, исключающих прямой контакт «кровь-газ», что минимизирует денатурацию белков и активацию комплемента.

5. **Теплообменник.** Интегрирован в оксигенатор. Регулирует температуру перфузата. Позволяет проводить управляемую гипотермию (снижение температуры тела до 28–32°C или ниже для снижения метаболической потребности тканей в кислороде) и последующее согревание.

6. **Артериальный фильтр.** Устанавливается на линии возврата крови в артериальное русло. Задерживает микроагрегаты клеток, микропузырьки газа и фрагменты жира (размер пор обычно составляет 20–40 мкм).

7. **Артериальная канюля.** Вводится чаще всего в восходящую аорту, реже — в бедренную или подключичную артерии, через нее оксигенированная кровь возвращается в системный кровоток под давлением.

1.2. Физиологические основы экстракорпоральной перфузии

При подключении АИК классический пульсирующий кровоток, генерируемый сердцем, чаще всего заменяется **линейным (постоянным)** кровотоком. Хотя ведутся дискуссии о преимуществах пульсирующей перфузии для микроциркуляции органов-мишеней, на практике постоянный ламинарный поток остается базовым из-за технической надежности.

Расчет необходимого объемного расхода крови (объема перфузии) базируется на площади поверхности тела (ППТ) пациента и целевом **сердечном индексе (СИ)**, который в условиях нормотермии должен составлять 2,2-2,4 л/мин/м^2. При гипотермии потребность в кислороде падает, что позволяет снижать скорость перфузии.

Управление системным сосудистым сопротивлением (ССС) во время ИК осуществляется медикаментозно (вазодилататоры/вазопрессоры). Среднее артериальное давление (САД) поддерживается в диапазоне 60–80 мм рт. ст. для обеспечения адекватного перфузионного давления в головном мозге и почках.

1.3. Защита миокарда (Кардиоплегия)

Для выполнения прецизионных манипуляций внутри камер сердца его необходимо остановить и обескровить. Метаболическая защита миокарда в этот период достигается сочетанием:

1. Местной и системной гипотермии.

2. Введения специальных **кардиоплегических растворов** (кристаллоидных или кровяных), содержащих высокую концентрацию ионов калия (K^{+}). Ионы калия вызывают стойкую деполяризацию клеточной мембраны кардиомиоцитов, блокируя фазу 0 потенциала действия, что приводит к немедленной остановке сердца в фазе диастолы, когда потребление энергии минимально.

2. Патофизиология искусственного кровообращения

Контакт крови с чужеродной поверхностью магистралей и оксигенатора запускает каскад патологических реакций, известных как **системный воспалительный ответ (СВОР)**.

2.1. Гематологические изменения и гемодилюция

Перед началом ИК контур заполняется стартовым раствором (кристаллоиды, коллоиды). Это вызывает вынужденную **гемодилюцию** (разведение крови). Умеренная гемодилюция (снижение гематокрита до 24-26%) полезна: она снижает вязкость крови, улучшая микроциркуляцию в условиях гипотермии. Однако глубокая гемодилюция снижает кислородную емкость крови.

Травматизация форменных элементов (механический сдвиг, shear stress) приводит к:

- Разрушению эритроцитов (гемолиз) с высвобождением свободного гемоглобина, обладающего нефротоксичностью.
- Активации и дисфункции тромбоцитов, что в сочетании с обязательным введением антикоагулянтов (**гепарина**) создает риски коагулопатии и кровотечений в постперфузионном периоде. Нейтрализация гепарина по окончании ИК проводится введением **протамина сульфата**.

2.2. Изменения в органах-мишенях

- **Легкие:** Во время полного ИК легкие выключаются из вентиляции. Спадение альвеол и перфузия по бронхиальным артериям могут приводить к развитию интерстициального отека и синдрома «постперфузионного легкого».
- **Почки:** Отсутствие пульсового давления и периоды гипотензии могут спровоцировать острое почечное повреждение (ОПП).
- **Головной мозг:** Риски связаны с микроэмболией (воздушной, атероматозной) и флуктуациями мозгового кровотока.

3. Открытый (прямой) массаж сердца

В клинических ситуациях, когда экстракорпоральная поддержка недоступна мгновенно, а функции миокарда критически нарушены, базовые реанимационные мероприятия включают компрессию грудной клетки. Однако закрытый массаж сердца обеспечивает не более 20-30% от нормального коронарного кровотока и около 15-20% мозгового. При определенных условиях единственным способом восстановить перфузию является открытый массаж сердца (ОМС).

3.1. Показания к проведению открытого массажа сердца

Открытый массаж сердца не является рутинной процедурой и строго регламентирован. Основными показаниями служат:

1. Остановка сердца в операционной во время выполнения внутригрудных или внутрибрюшных операций (когда доступ к сердцу уже осуществлен или может быть получен за секунды).
2. Тяжелая травма грудной клетки (проникающие ранения, разрывы перикарда, флотирующие переломы ребер), исключающая возможность эффективной наружной компрессии.
3. Остановка кровообращения, вызванная тампонадой сердца или массивным внутригрудным кровотечением (требуется экстренная торакотомия для устранения причины).
4. Выраженная деформация грудной клетки или тяжелый кифосколиоз.
5. Неэффективность закрытого массажа сердца в течение 15-20 минут при наличии условий для проведения экстренной торакотомии в условиях реанимационного зала (торакотомия «отчаяния»).
6. Остановка сердца на фоне глубокой гипотермии (для возможности прямого согревания полостей сердца).

3.2. Хирургический доступ и техника выполнения

Если грудная клетка закрыта, выполняется экстренная **левосторонняя переднебоковая торакотомия** в 4-м или 5-м межреберье. Мышцы пересекаются, плевральная полость вскрывается, ребра разводятся ретрактором (при его отсутствии — подручными средствами). Перикард вскрывается продольно, кпереди от диафрагмального нерва.

Технические варианты мануальной компрессии:

- **Бемануальный метод (двумя руками):** Сердце берется в ладони обеих рук. Пальцы смыкаются, ладони плоско прижимаются к желудочкам. Сжатие производится по направлению от верхушки к основанию сердца. Этот метод наиболее эффективен, так как обеспечивает равномерное распределение давления и больший ударный объем.
- **Мономануальный метод (одной рукой):** Используется при небольшом размере сердца или узком доступе. Сердце обхватывается одной рукой: большой палец располагается на

передней поверхности (правый желудочек), а остальные четыре пальца — на задней поверхности (левый желудочек). *Важно:* избегать точечного давления кончиками пальцев, чтобы не перфорировать истонченную стенку правого желудочка.

- **Прижатие к грудине:** Сердце прижимается ладонной поверхностью одной руки к внутренней поверхности грудины. Метод применяется редко из-за риска повреждения задней стенки органа.

Частота компрессий при ОМС должна составлять **80–100 в минуту.** Сжатие должно быть плавным, но быстрым, а расслабление (диастола) — полным, чтобы обеспечить адекватное заполнение полостей сердца кровью.

3.3. Физиологические преимущества и недостатки ОМС

Преимущества:

- Достижение существенно более высоких цифр САД (>60 мм рт. ст.) и коронарного перфузионного давления по сравнению с закрытым массажем.
- Возможность непосредственной визуальной и пальпаторной оценки эффективности (наполнение полостей, тонус миокарда).
- Возможность проведения прямой дефибрилляции (ложками-электродами непосредственно на миокард), требующей значительно меньшей энергии разряда (10–30 Дж вместо 200–360 Дж).
- Возможность визуального контроля и устранения тампонады или остановки кровотечения из ранений сердца.

Недостатки и риски:

- Высокая инвазивность, требующая хирургических навыков.
- Риск механического повреждения миокарда (разрыв, сквозная перфорация желудочка, повреждение коронарных артерий).
- Обязательное инфицирование плевральной полости и перикарда (требует массивной последующей санации и антибиотикотерапии).
- Необходимость перевода пациента на искусственную вентиляцию легких (ИВЛ) с положительным давлением из-за возникновения открытого пневмоторакса.

4. Сравнительный анализ и синергия методов в критических ситуациях

Экстракорпоральная поддержка (АИК) и открытый массаж сердца преследуют одну цель — поддержание жизни за счет обеспечения системного кровотока, однако они находятся на разных ступенях терапевтической лестницы.

В современной практике реаниматологии возникла концепция **E-CPR (Extracorporeal Cardiopulmonary Resuscitation)** —

экстракорпоральная сердечно-легочная реанимация. В рамках этого алгоритма при неэффективности стандартной СЛР пациенту экстренно, зачастую параллельно с продолжающимся массажем сердца (включая открытый), проводят канюляцию бедренных сосудов и подключают портативный АИК (аппарат ЭКМО). Это позволяет выиграть время для проведения экстренной коронароангиографии или оперативного вмешательства.

Критерий сравнения	**Аппарат искусственного кровообращения (АИК)**	**Открытый массаж сердца (ОМС)**
Природа метода	Высокотехнологичный, аппаратный	Мануальный, хирургический
Оксигенация крови	Полная (через встроенный оксигенатор)	Зависит от проведения сопутствующей ИВЛ
Гемодинамический профиль	Стабильный, контролируемый (до 100% нормы)	Субкомпенсированный (30-50% от нормы)
Время развертывания	10-20 минут (требует сборки и заполнения контура)	1-3 минуты (экстренная торакотомия)
Продолжительность применения	Часы (при ЭКМО — дни и недели)	Ограничена физической усталостью хирурга (до 30-60 мин)

Заключение

Аппарат искусственного кровообращения представляет собой вершину инженерной и медицинской мысли, позволившую исключить фактор времени при проведении сложнейших реконструктивных операций на сердце. Понимание физических законов гидродинамики, газообмена и теплопередачи, заложенных в основу работы АИК, является обязательным для кардиохирургических бригад и перфузиологов.

В то же время, открытый массаж сердца остается важнейшим, жизнеспасающим приемом «последней надежды» в арсенале хирургов и реаниматологов. Обладая более высокой гемодинамической эффективностью по сравнению с закрытой компрессией грудной клетки, он требует жесткого соблюдения техники выполнения для минимизации ятрогенных повреждений миокарда.

Дальнейшее развитие данных направлений идет по пути миниатюризации систем экстракорпоральной поддержки, создания биосовместимых покрытий для контуров ИК и разработки четких междисциплинарных протоколов экстренного перехода от мануальной реанимации к механической поддержке кровообращения.

References:

[1] Бураковский В. И., Бокерия Л. А. *Сердечно-сосудистая хирургия: руководство.* — М.: Медицина, 2015. — 752 с.
[2] Локшин Л. С., Лурье Г. О., Дементьева И. И. *Искусственное кровообращение: практическое руководство.* — М.: НЦССХ им. А.Н. Бакулева РАМН, 2012. — 416 с.
[3] Неговский В. А., Мороз В. В. *Актуальные вопросы реаниматологии и патофизиологии критических состояний.* // Общая реаниматология. — 2018. — Т. 14, № 4. — С. 56-68.
[4] Gravlee G. P., Davis R. F., Stammers A. H., Ungerleider R. M. *Cardiopulmonary Bypass: Principles and Practice.* — 4th ed. — Lippincott Williams & Wilkins, 2014. — 816 p.
[5] Hensley F. A., Martin D. E., Gravlee G. P. *A Practical Approach to Cardiac Anesthesia.* — 5th ed. — Philadelphia: Wolters Kluwer Health, 2013. — 912 p.
[6] Subramaniam K., Park K. W., Kellum J. A. *Acute Kidney Injury After Cardiac Surgery.* // Journal of Cardiothoracic and Vascular Anesthesia. — 2021. — Vol. 35, No. 6. — P. 1745-1755.
[7] European Resuscitation Council Guidelines for Resuscitation 2021: Cardiac arrest in special circumstances. // Resuscitation. — 2021. — Vol. 161. — P. 152-219.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

MEDICINE AND PHARMACY

Современные принципы интенсивной терапии критических гемодинамических нарушений при некоронарогенной сердечной недостаточности и синдроме сосудистой дистонии (нарушениях сосудистого тонуса)

Шедірбаева Әйгерим Мендібайқызы[1], **Қадырбай Төребек Айдарұлы**[2], **Жайсанбаева Лаура Аргыновна**[3], **Батырханова Сауле Байтурсыновна**[4]

[1] Резидент кафедры Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[1] Резидент кафедры Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[1] Резидент кафедры Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[4] Научный руководитель, доцент кафедры Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

Аннотация. В данной научной статье представлен комплексный патофизиологический и клинический анализ стратегий интенсивной терапии при острых гемодинамических расстройствах, развивающихся вне связи с ишемической болезнью сердца. Рассматриваются ключевые механизмы некоронарогенной сердечной недостаточности (на примере миокардитов, кардиомиопатий и септического поражения миокарда) и сопутствующих нарушений вазомоторного тонуса (вазодилатации и вазоконстрикции при шоковых состояниях). Особое внимание уделено алгоритмам дифференцированного применения инотропных препаратов, вазопрессоров, инфузионной терапии под контролем расширенного гемодинамического мониторинга (PiCCO, Сван-Ганца), а также перспективам использования методов механической поддержки кровообращения.
Ключевые слова: *Некоронарогенная сердечная недостаточность, сосудистый тонус, вазоплегия, интенсивная терапия, инотропная поддержка, вазопрессоры, гемодинамический мониторинг, сердечный выброс.*

Введение

Острая сердечно-сосудистая недостаточность и критические нарушения гемодинамики традиционно ассоциируются с острой формой ишемической болезни сердца (ИБС) — инфарктом миокарда и его осложнениями. Однако в структуре отделений реанимации и интенсивной терапии (ОРИТ) значительную долю составляют пациенты, у которых критическое падение сердечного выброса и тканевой перфузии обусловлено некоронарогенной патологией миокарда или первичным поражением сосудистого русла.

К некоронарогенной сердечной недостаточности (НСН) относятся поражения миокарда воспалительного (тяжелые миокардиты), токсического, метаболического генеза, терминальные стадии дилатационной и гипертрофической кардиомиопатий, а также дисфункция миокарда, индуцированная сепсисом (синдром сепсис-индуцированной кардиомиопатии). Ситуация часто осложняется глубокими нарушениями регуляции сосудистого тонуса — синдромом вазоплегии (патологической вазодилатацией) при септическом, анафилактическом или нейрогенном шоке, либо избыточным компенсаторным вазоспазмом.

Лечение таких состояний представляет собой сложную клиническую задачу. Стандартные алгоритмы управления гемодинамикой, разработанные для коронарогенного кардиогенного шока, зачастую оказываются неэффективными или опасными при НСН из-за принципиально иных патофизиологических триггеров.

Цель статьи — систематизировать и научно обосновать современные принципы и алгоритмы интенсивной терапии критических нарушений гемодинамики, вызванных некоронарогенной сердечной недостаточностью и патологией сосудистого тонуса, с опорой на принципы доказательной медицины.

1. Патофизиологическая структура нарушений

Гемодинамический профиль критического пациента определяется уравнением среднего артериального давления (САД):

САД = СВ x ССС

Где СВ — сердечный выброс (минутный объем кровообращения), а ССС — системное сосудистое сопротивление. При некоронарогенных патологиях атаке подвергаются оба компонента данного уравнения.

1.1. Механизмы депрессии миокарда при НСН

В отличие от ИБС, где наблюдается локальный очаг ишемии/некроза, при НСН депрессия миокарда носит диффузный характер:

- **Цитокининдуцированная дисфункция:** При сепсисе и системном воспалении интерлейкины (IL-1β, IL-6) и фактор некроза опухоли (TNF-α) напрямую угнетают чувствительность миофибрилл к кальцию (Ca^{2+}) и нарушают работу митохондрий кардиомиоцитов.

КРИТИЧЕСКАЯ ГЕМОДИНАМИЧЕСКАЯ НЕСТАБИЛЬНОСТЬ

НЕКОРОНАРОГЕННАЯ СЕРДЕЧНАЯ НЕДОСТАТОЧНОСТЬ
(Миокардиты, КМП, Сепсис-индуцированная ЦМП)
↓
Снижение ССС
(Инотропная дисфункция)

НАРУШЕНИЯ СОСУДИСТОГО ТОНУСА
(Сепсис, Анафилаксия, Вазоплегия)
↓
Снижение ССС
(Патологическая вазодилатация)

ТКАНЕВАЯ ГИПОПЕРФУЗИЯ И ШОК

- **Перегрузка объемом или давлением:** Развивается декомпенсация сократимости вследствие структурной перестройки (ремоделирования) желудочков при кардиомиопатиях.
- **Прямая инвазия и аутоиммунный лизис:** При вирусных и бактериальных миокардитах происходит разрушение цитоскелета клеток миокарда.

1.2. Патофизиология вазоплегических состояний

Критическое падение ССС (дистрибутивный шок, вазоплегический синдром после кардиохирургических операций) связано с гиперпродукцией оксида азота (NO) индуцибельной NO-синтазой (iNOS). Избыток NO активирует гуанилатциклазу, что ведет к накоплению цГМФ в гладкомышечных клетках сосудов, закрытию кальциевых каналов и их стойкой релаксации, резистентной к эндогенным катехоламинам.

2. Мониторинг гемодинамики как фундамент терапии

Интенсивная терапия критических состояний «вслепую» недопустима. Рутинного измерения АД и ЧСС недостаточно, так как нормальное АД может маскировать глубокую тканевую гипоперфузию (скрытый шок).

2.1. Расширенный инвазивный мониторинг

1. **Трансторакальная термодилюция (технология PiCCO):**

Позволяет в реальном времени оценивать не только сердечный индекс (СИ) и системное сосудистое сопротивление (ССС), но и волемический статус пациента через волемические показатели: глобальный конечный диастолический объем (ГКДО) и индекс внесосудистой воды легких (ИВВЛ). Это критически важно при некоронарогенных отеках легких для дифференциальной диагностики кардиогенного и некардиогенного (ОРДС) гидроторакса.

2. **Катетеризация легочной артерии (катетер Сван-Ганца):**

Остается стандартом при выраженной правожелудочковой недостаточности (например, на фоне легочной гипертензии или ТЭЛА), позволяя измерять давление заклинивания легочной артерии (ДЗЛА) и давление в правом предсердии (ДПП).

2.2. Метаболические маркеры перфузии

- **Уровень лактата плазмы:** Динамический маркер анаэробного гликолиза. Целью терапии является «клиренс лактата» (снижение его уровня более чем на 10% каждые 2–4 часа).
- **Сатурация центральной венозной крови ($ScvO_2$):** Отражает баланс между доставкой (DO_2) и потреблением (VO_2) кислорода. Падение $ScvO_2 < 70\%$ указывает на несостоятельность сердечного выброса.

3. Стратегия инфузионной терапии: концепция «четырех Х»

Управление волемическим статусом при НСН требует ювелирной точности. Избыток жидкости ведет к перерастяжению правого желудочка, усугублению митральной/трикуспидальной регургитации и отеку легких. Дефицит — к падению преднагрузки и критическому снижению.

Современный подход базируется на фазовом ведении инфузии (модель ROSE / 4 стадии):

1. **R (Resuscitation) / Реанимация:** Агрессивное восстановление ОЦК при шоке (кристалоиды 30 мл/кг).
2. **O (Optimization) / Оптимизация:** Оценка восприимчивости к инфузии (тест с подъемом ног, оценка вариабельности пульсового давления PPV). Жидкость вводится мелкими болюсами по 100–200 мл.
3. **S (Stabilization) / Стабилизация:** Нулевой водный баланс. Поддержание достигнутых параметров.
4. **E (Evacuation) / Эвакуация:** Активное выведение жидкости (диуретики, ультрафильтрация) при признаках гипергидратации и росте ИВВЛ.

4. Медикаментозная модуляция гемодинамики

При сочетанных нарушениях (НСН + вазоплегия) терапия требует одновременного использования препаратов с инотропным и вазопрессорным действием.

4.1. Вазопрессорная терапия (борьба с вазоплегией)

- **Норадреналин (Норэпинефрин):** Препарат первой линии. Обладает мощным α_1-адреномиметическим действием, повышает тонус магистральных и периферических сосудов. Обладает умеренным β1-эффектом, что может слегка поддерживать миокард, не вызывая выраженной тахикардии.
- **Вазопрессин:** Используется как препарат второй линии при катехоламинрезистентном шоке (вазоплегии). Активирует V_1-

рецепторы гладких мышц сосудов, минуя заблокированные адренорецепторы, и снижает потребность в критических дозах норадреналина.

4.2. Инотропная поддержка (борьба с сердечной недостаточностью)

Выбор инотропного агента зависит от исходного уровня ССС и ЧСС:

Препарат	Механизм действия	Гемодинамические эффекты	Клиническое применение
Добутамин	Стимуляция β1-адренорецепторов	Увеличение СВ, умеренное снижение ССС, высокий риск тахиаритмий	Классический инотроп при нормальном или повышенном ССС
Левосимендан	Кальциевый сенситизатор, открытие K^+ АТР-каналов	Увеличение сократимости без роста потребности в O_2, мощная вазодилатация	Оптимален при НСН с высоким ССС и риском ишемии
Милринон	Ингибитор фосфодиэстеразы-3 (ФДЭ-3)	Инотропный и выраженный лузитропный (расслабляющий) эффект, вазодилатация	Выбор при правожелудочковой НСН и легочной гипертензии

Критическое правило ОРИТ: При сочетании НСН с тяжелой вазоплегией (например, септический шок) инотропная поддержка (Добутамин) должна подключаться *только после* достижения целевого САД > 65 мм рт. ст. с помощью вазопрессоров (Норадреналин).

5. Коррекция метаболических и электролитных нарушений

Стабильность гемодинамики невозможна в условиях метаболического хаоса.

- **Кальциевый гомеостаз:** Ионы калия и кальция критичны для электромеханического сопряжения. Уровень ионизированного Ca^{2+} должен поддерживаться строго в пределах 1,1-1,3 ммоль/л.
- **Кислотно-основное состояние (КОС):** Выраженный ацидоз (pH < 7,2) резко снижает чувствительность адренорецепторов сосудов и сердца к эндогенным и экзогенным катехоламинам. Введение гидрокарбоната натрия оправдано только при сопутствующем тяжелом дефиците оснований (BE < -10 ммоль/л) на фоне адекватной вентиляции.

6. Механическая поддержка кровообращения (МПК)

При неэффективности максимальных доз медикаментозной поддержки (рефрактерный шок) показано применение методов МПК. В отличие от коронарогенного шока, где широко применима внутриаортальная баллонная контрпульсация (ВАБК), при диффузных некоронарогенных поражениях эффективность ВАБК ограничена.

6.1. Вено-артериальная экстракорпоральная мембранная оксигенация (ВА-ЭКМО)

ВА-ЭКМО является методом выбора при рефрактерной НСН (например, фульминантный миокардит или терминальная КМП). Система забирает кровь из венозного русла, оксигенирует ее и возвращает под давлением в артериальную систему, полностью разгружая оба желудочка сердца и обеспечивая системный кровоток до 4-5 л/мин. ВА-ЭКМО служит «мостом» к восстановлению миокарда (bridge to recovery) или к трансплантации сердца.

6.2. Системы обхода желудочков (Impella, левожелудочковый обход)

Микроаксиальные насосы (например, Impella), устанавливаемые трансаортально в левый желудочек, активно перекачивают кровь в аорту. Это снижает преднагрузку и напряжение стенок ЛЖ, снижая его метаболические потребности.

Заключение

Интенсивная терапия критических гемодинамических нарушений при некоронарогенной сердечной недостаточности и патологии сосудистого тонуса требует ухода от эмпирических схем в сторону персонализированной, патофизиологически обоснованной медицины.

Основой успешного лечения является ранняя дифференциальная диагностика ведущего компонента циркуляторных расстройств (инотропная дисфункция миокарда, вазоплегия или относительная гиповолемия) с использованием современных методов инвазивного мониторинга (PiCCO, ЭхоКГ). Сочетанное применение селективных вазопрессоров и кальциевых сенситизаторов, жесткий контроль волемического баланса и своевременное подключение механической поддержки кровообращения позволяют существенно снизить летальность у данной крайне тяжелой категории пациентов.

References:

[1] Малышев В. Д. *Интенсивная терапия. Реанимация: учебное пособие.* — М.: Медицина, 2017. — 560 с.
[2] Мороз В. В., Никифоров Ю. В., Кричевский Л. А. *Кардиомиопатии в практике анестезиолога-реаниматолога.* // Общая реаниматология. — 2019. — Т. 15, № 2. — С. 78-89.

[3] Румянцев О. Н., Бабаев М. А. *Синдром вазоплегии в интенсивной терапии: патогенез и подходы к лечению.* // Вестник анестезиологии и реаниматологии. — 2021. — Т. 18, № 5. — С. 44-53.
[4] Singer M., Deutschman C. S., Seymour C. W. et al. *The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).* // JAMA. — 2016. — Vol. 315, No. 8. — P. 801-810.
[5] Rhodes A., Evans L. E., Alhazzani W. et al. *Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2021.* // Intensive Care Medicine. — 2021. — Vol. 47, No. 11. — P. 1181-1247.
[6] Monnet X., Marik P. E., Teboul J. L. *Prediction of fluid responsiveness: an update.* // Annals of Translational Medicine. — 2020. — Vol. 8, No. 5. — P. 166.
[7] Guglin M., Zucker M. J., Borlaug B. A. et al. *Evaluation and Management of Cardiogenic Shock: A Scientific Statement From the American Heart Association.* // Circulation. — 2019. — Vol. 140, No. 16. — P. e267-e294.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

MEDICINE AND PHARMACY

Оптимизация медицинской помощи и оценка качества реанимационных мероприятий на догоспитальном и раннем госпитальном этапах при септическом шоке: фокус на преемственность и раннюю стационарную реабилитацию

Ықтиярұлы Бақадыр[1], Қалдыбай Нұрбақыт Жомартұлы[2], Батырова Айгуль Нурлановна[3]

[1] Резидент кафедры: Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[2] Резидент кафедры: Анестезиологии и реаниматологии № 2;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

[3] Научный руководитель;
КазНМУ имени С. Д. Асфендиярова; Республика Казахстан

Аннотация. В данной статье представлен комплексный анализ стандартов оказания медицинской помощи и критериев оценки качества реанимационных мероприятий у пациентов с септическим шоком на этапах, предшествующих развернутому клинико-лабораторному исследованию. Рассматриваются современные протоколы стратификации риска, экспресс-диагностики и инициальной волемической и гемодинамической поддержки (согласно обновленным международным рекомендациям Surviving Sepsis Campaign). Вторая часть работы посвящена критически важному аспекту комплексного лечения сепсиса — ранней стационарной реабилитации в условиях отделения реанимации и интенсивной терапии (ОРИТ) и профильных отделений. Авторами анализируются концепция синдрома послеинтенсивной терапии (PICS) и протоколы ранней активизации, направленные на предотвращение долгосрочной инвалидизации пациентов.
Ключевые слова: *Септический шок, интенсивная терапия, оценка качества медицинской помощи, ранняя реабилитация, синдром послеинтенсивной терапии (PICS), волемическая ре resuscitation, протокол ABCDEF, лактат-клиренс.*

Введение

Сепсис и септический шок остаются ведущими причинами летальности и тяжелой долгосрочной когнитивно-физической дезадаптации пациентов во всем мире. Согласно современному консенсусу *Sepsis-3*, септический шок определяется как вариант дистрибутивного шока, при котором глубокие метаболические, клеточные и гемодинамические нарушения ассоциированы со значительно более высоким риском смертности, чем при изолированном сепсисе.

Исторически основное внимание исследователей и клиницистов было сосредоточено на госпитальном этапе — моменте, когда пациент уже находится в ОРИТ, а диагноз подтвержден развернутыми посевами крови, маркерами воспаления и данными инвазивного мониторинга. Однако критическое окно терапевтических возможностей открывается задолго до этого. Время от манифестации первых признаков гипоперфузии до инициации базового комплекса реанимации (скрининг, инфузия, раннее введение антибиотиков) во многом предопределяет исход. В связи с этим возникает необходимость жесткой стандартизации и объективной оценки качества медицинской помощи на этапе «до детального исследования септического шока».

С другой стороны, выживание пациента в острой фазе шока больше не является единственным критерием успешности лечения. Порядка 50–85% выживших сталкиваются с синдромом послеинтенсивной терапии (*Post-Intensive Care Syndrome, PICS*), включающим глубокую нейромышечную слабость, депрессию и когнитивный дефицит. Мультидисциплинарный подход, объединяющий ультрараннюю реанимацию и раннюю стационарную реабилитацию, представляет собой наиболее перспективный вектор развития современной реаниматологии.

Цель данной работы — систематизация критериев качества реанимационных мероприятий на начальном этапе курации пациента с подозрением на септический шок и научное обоснование внедрения программ ранней реабилитации на госпитальном этапе.

1. Организация медицинской помощи и скрининг до подтверждения диагноза

Начальный этап оказания помощи (приемное отделение, линейные палаты, скорая медицинская помощь) характеризуется дефицитом времени и лабораторных данных. Оценка качества работы на этом этапе базируется на скорости выявления пациентов из группы высокого риска.

1.1. Инструменты экспресс-оценки и стратификации

Традиционное использование шкалы *qSOFA* (quick Sequential Organ Failure Assessment) в качестве изолированного инструмента скрининга сепсиса за пределами ОРИТ претерпело изменения ввиду ее низкой чувствительности. Современные стандарты рекомендуют интегративный подход:

- **NEWS2 (National Early Warning Score):** Шкала, наиболее точно прогнозирующая риск декомпенсации. Включает оценку ЧДД, сатурации (SpO_2), необходимости в оксигенотерапии, температуры, САД, ЧСС и уровня сознания. При наборе \ge 5 баллов инициируется неотложный осмотр реаниматологом.
- **Капиллярный ответ (Capillary Refill Time, CRT):** Экспресс-тест оценки периферической перфузии (время наполнения капилляров более 3 секунд указывает на тканевую гипоксию и служит триггером для немедленного начала терапии, зачастую превосходя по прогностической ценности уровень изолированного АД).

ПАЦИЕНТ С ПОДОЗРЕНИЕМ НА ИНФЕКЦИЮ

↓

Скрининг: NEWS2 ≥ 5 или CRT > 3 сек

ЭТАП 1: РЕАНИМАЦИЯ (Часы 1-3)	ЭТАП 2: РЕАБИЛИТАЦИЯ (Сутки 2+)
• Забор лактата и гемокультур	• Протокол ABCDEF в ОРИТ
• Кристаллоиды 30 мл/кг	• Ранняя вертикализация
• Антибиотики широкого спектра	• Эрготерапия и нутритивная поддержка

1.2. Пакет стартовых мероприятий первого часа (Hour-1 Bundle)

Качество реанимационных мероприятий до полноценного обследования оценивается по строгому соблюдению временного протокола «первого часа». Данный пакет включает пять ключевых шагов:

1. Измерение уровня лактата в плазме (повторно, если исходный > 2 ммоль/л).
2. Получение культур крови до введения антимикробных препаратов (без задержки терапии более чем на 45 минут).
3. Введение антибиотиков широкого спектра действия.
4. Наочальное введение кристаллоидных растворов в дозе 30 мл/кг при наличии артериальной гипотензии или лактата ≥ 4 ммоль/л.
5. Применение вазопрессоров (норадреналин) при неэффективности инфузии для поддержания САД ≥ 65 мм рт. ст.

2. Критерии оценки качества и физиологические ориентиры ранней реанимации

Для объективизации качества медицинской помощи используются индикаторы, разделенные на временные и физиологические суррогатные точки.

2.1. Волемическая нагрузка и гемодинамические мишени

Историческая концепция жестко фиксированной ранней целенаправленной терапии (*EGDT* по Риверсу) уступила место более гибкой, индивидуализированной реанимации. Фиксированный объем инфузии (30 мл/кг) обязателен на старте, однако дальнейшее введение жидкости должно контролироваться динамическими показателями волемического статуса, чтобы предотвратить гипергидратацию:

- Тест с пассивным подниманием ног (*Passive Leg Raising, PLR*).
- Вариабельность ударного объема (VV) или пульсового давления (PPV) у пациентов на ИВЛ.

Эффективность стартовой реанимации оценивается по достижению суррогатных точек перфузии:

2.2. Оценка качества антибиотикотерапии

Каждый час задержки введения адекватного антибиотика при септическом шоке увеличивает госпитальную летальность в среднем на 7.6%. В связи с этим временной отрезок «экспресс-осмотр \rightarrow введение первой дозы антибиотика» является главным проверяемым критерием качества медицинской помощи на долабораторном этапе.

3. Проблема долгосрочных исходов сепсиса и синдром PICS

Успешное завершение гемодинамической реанимации и стабилизация жизненно важных функций — лишь первый шаг. Снижение ранней смертности обнажило вторичную проблему: синдром послеинтенсивной терапии (*Post-Intensive Care Syndrome*).

СИНДРОМ ПОСЛЕИНТЕНСИВНОЙ ТЕРАПИИ (PICS)

Физическая дисфункция
- Миопатия ОРИТ
- Полинейропатия
- Контрактуры суставов

Когнитивный дефицит
- Снижение памяти
- Утрата концентрации
- Депрессия и ПТСР

Патофизиология мышечной дисфункции при септическом шоке многофакторна. Системное воспаление и митохондриальная цитопатия приводят к ускоренному протеолизу. В сочетании с вынужденным постельным режимом и седацией мышечная масса квадрицепса может снижаться на 10-20% уже за первые 5-7 дней нахождения в ОРИТ. Это состояние классифицируется как **нейромышечная слабость, приобретенная в отделении интенсивной**

терапии (ICUAW).

4. Ранняя стационарная реабилитация пациентов

Ранняя реабилитация при септическом шоке должна начинаться не после выписки из ОРИТ, а непосредственно в процессе проведения интенсивной терапии, как только достигнут минимальный гемодинамический и респираторный плато-статус (обычно через 24–48 часов от начала шока).

4.1. Внедрение протокола ABCDEF (A-F Bundle)

Основой профилактики PICS и ранней реабилитации является структурированный пакет мер ABCDEF, признанный международным стандартом:

1.A (Assess, Prevent, and Manage Pain):Ежедневно.

Объективная оценка и адекватное купирование боли с использованием валидированных шкал (BPS, CPOT) до введения седативных препаратов.

2.B (Both Spontaneous Awakening and Breathing Trials):Ежедневно.

Сочетанное проведение ежедневного теста спонтанного пробуждения (прекращение инфузии седатиков) и теста спонтанного дыхания для ускорения экстубации.

3.C (Choice of Analgesia and Sedation):В процессе.

Оптимальный выбор седативных средств. Рекомендуется отказ от бензодиазепинов в пользу дексмедетомидина или пропофола с целью поддержания целевого уровня седации по шкале RASS от 0 до -1 (легкое пробуждение по требованию).

4.D (Delirium: Assess, Prevent, and Manage):Каждые 12 часов.

Мониторинг делирия с помощью шкалы CAM-ICU или ICDSC. Раннее выявление гиперактивного и гипоактивного делирия.

5.E (Early Mobility and Exercise):При стабилизации.

Ультраранняя мобилизация: от пассивных упражнений в постели до вертикализации и шагов, в зависимости от критериев безопасности.

6.F (Family Engagement and Empowerment): Постоянно.

Вовлечение членов семьи в процесс ухода и ранней реабилитации, что снижает уровень тревоги и ПТСР как у пациента, так и у родственников.

4.2. Алгоритм и этапы ранней двигательной реабилитации

Процесс физической активизации строится иерархически на основании стабильности пациента. Переход на следующий уровень осуществляется при отсутствии критериев исключения (таких как рост дозы норадреналина, сатурация <88\%, декомпенсированная аритмия).

Уровень мобилизации	Физические мероприятия	Оборудование / Персонал
Уровень 1 (Пациент без сознания / глубокая седация)	Пассивная гимнастика, пассивные циклические упражнения на прикроватном велотренажере, частая смена положения тела (каждые 2 часа)	Инструктор ЛФК, функциональная кровать
Уровень 2 (Минимальное сознание, RASS \ge -2)	Активно-пассивные упражнения, перевод кровати в положение «кресло», тренировка баланса сидя в постели	Медсестра, прикроватные упоры
Уровень 3 (Пациент в сознании, выполняет команды)	Присаживание на край кровати со спущенными ногами, тренировка статического равновесия, использование вертикализатора	Инструктор ЛФК, подъемные системы
Уровень 4 (Полная стабилизация)	Ортостатическая нагрузка, подъем на ноги, пересаживание в кресло, инициация ходьбы на месте/по палате	Реабилитолог, ходунки, непрерывный мониторинг ЭКГ/SpO2

Важное замечание: Наличие центрального венозного катетера, артериальной линии или проведение постоянного почечно-заместительного лечения (ППЗТ) *не являются* противопоказаниями к ранней мобилизации при условии их надежной фиксации и контроля гемодинамики.

5. Преемственность между ОРИТ и профильными отделениями

Оценка качества помощи включает этап перевода пациента из реанимационного контура в соматическое (профильное) отделение. Обрыв реабилитационных мероприятий на данном этапе — частая ошибка, ведущая к повторным госпитализациям (до 40% выживших после септического шока регоспитализируются в течение 90 дней).

Эффективная модель перевода подразумевает наличие «переходного эпикриза реабилитации», где отражены:

1. Исходный и достигнутый статус мышечной силы (по шкале MRC-sum score).
2. Степень дисфагии (оценка функции глотания после длительной интубации для исключения аспирационных пневмоний).
3. Индивидуальный план нутритивной поддержки (потребность в белке у пациентов, перенесших септический шок, остается повышенной — 1.5\text{--}2.0 \text{ г/кг/сут} в течение всего периода госпитальной реконвалесценции).

Заключение

Качество оказания медицинской помощи при септическом шоке складывается из двух равнозначных векторов: прецизионной, агрессивной стартовой терапии в первые часы до окончательной верификации диагноза и планомерной, научно обоснованной реабилитационной программы на протяжении всего периода госпитализации.

Инициальная фаза требует жесткого соблюдения протоколов (*Hour-1 Bundle*, контроль лактат-клиренса и периферического микрокровотока), что позволяет минимизировать время тканевой ишемии и снизить летальность. Последующая госпитальная фаза должна быть сфокусирована на снижении бремени синдрома послеинтенсивной терапии через повсеместное внедрение протоколов ранней мобилизации и минимизации седации (*ABCDEF*). Только непрерывность и преемственность этих этапов позволяют не просто сохранить жизнь пациенту с септическим шоком, но и обеспечить восстановление его социального и физического функционирования.

References:

[1] Ярустовский М. Б., Абрамян М. В., Комардина Е. В. *Сепсис в кардиохирургии: современные стандарты диагностики и интенсивной терапии.* — М.: НМИЦ ССХ им. А.Н. Бакулева, 2020. — 210 с.
[2] Белкин А. А., Давыдова Н. С., Алашеев А. М. *Ориентиры ранней реабилитации в интенсивной терапии критических состояний.* // Вестник анестезиологии и реаниматологии. — 2019. — Т. 16, № 3. — С. 34-42.
[3] Singer M., Deutschman C. S., Seymour C. W. et al. *The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).* // JAMA. — 2016. — Vol. 315, No. 8. — P. 801-810.
[4] Prescott H. C., ESICM/SCCM Panel. *Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2026.* // Critical Care Medicine. — 2026. — Vol. 54, No. 4. — P. 725-812.
[5] Rusev S., Bergmann L., Rahmel T. et al. *Update of the S3 Sepsis Guideline 2025 - What's New?* // Pneumologie. — 2025. — Vol. 79, No. 12. — P. 1012-1021.
[6] Sherman M., Critical Care Continuum Taskforce. *From Resuscitation to*

Rehabilitation: The Post-Intensive Care Syndrome Continuum in Sepsis Care. // Journal of Clinical Medicine. — 2025. — Vol. 14, No. 23. — P. 8374-8389.

[7] Smith-Turchyn J., Richardson J. *Exploring the use of physical rehabilitation for sepsis survivors: a scoping review.* // BMJ Open. — 2025. — Vol. 15, No. 7. — P. e097125.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

Фізико – хімічні властивості сполук Феруму та їх аналітичне застосування

Смольський Олександр Сергійович[1],
Денисенко Діана Михайлівна[2]

[1] кандидат біологічних наук, доцент, доцент кафедри хімії, технологій та фармації;
Національний університет «Чернігівський колегіум» імені Т.Г. Шевченка; Україна

[2] студентка IV курсу;
Національний університет «Чернігівський колегіум» імені Т.Г. Шевченка; Україна

Сполуки Феруму відіграють важливу роль у хімічному аналізі завдяки своїм характерним фізико-хімічним властивостям, зокрема здатності існувати у двох основних ступенях окиснення +2 та +3, що обумовлює широке застосування його сполук в аналітичній хімії.

Іони Fe^{2+} мають відновні властивості, тоді як Fe^{3+} - окисні. Це дозволяє використовувати Ферум у численних окисно-відновних реакціях. Наприклад, сполуки Fe^{2+} можуть бути кількісно визначені шляхом перманганатометричного та біхроматометричного титрування [6]. У свою чергу, Fe^{3+} може бути визначений за допомогою тіоціанат-іонів, з утворенням інтенсивно забарвленого комплексного йону $[Fe(SCN)_3]$, або утворювати забарвлені у жовтий колір комплексні сполуки з саліциловою кислотою, що лежить в основі фотоколориметричних та спектофотометричних методів аналізу [3].

Гідроліз сполук Fe^{3+} у водному середовищі відбувається вже при слабкокислих значеннях pH, що призводить до утворення осаду гідроксиду феруму (III) $Fe(OH)_3$ – червоно-бурого кольору. Ця реакція широко використовується у гравіметричному аналізі, коли необхідно кількісно визначити Ферум за масою осаду [8].

Ферум також активно утворює координаційні сполуки з різними лігандами - органічними та неорганічними. Зокрема, відомі стійкі комплекси феруму з етилендіамінтетраацетовою кислотою (ЕДТА), фенантроліном, тіоціанатами, що забезпечує селективність аналізу на фоні інших іонів [7]. Лігандні форми сполук Ферума з ЕДТА та ОЕДФ (оксиетилідендифосфонова кислота) широко використовують у сільському господарстві для створення мікродобрив, у водопідготовці та теплоенергетиці, в аналітичній хімії для кількісного визначення шляхом трилонометричного титрування [9].

Кольорові характеристики сполук феруму також мають значення для аналізу. Наприклад, розчини Fe^{2+} мають світло-зелений або блідо-блакитний колір, тоді як Fe^{3+} - жовто-коричневий. Комплекси феруму з органічними реагентами часто мають інтенсивне забарвлення, що дозволяє застосувати фотометричні методи з високою чутливістю [2].

Сполуки Ферума є важливими складовими питної води та їх вміст регламентує якість води за фізико-хімічними показниками. Документом, що регламентує вміст сполук Феруму у питній воді є ДСанПіН 2.2.4-171-10 [4], а вибір хімічних та фізико-хімічних показників якості води грунтується на вимогах держстандарту - ДСТУ 4808:2007 [5].

Метою даного дослідження була розробка та експериментальне опрацювання аналітичної тест-системи для експрес-визначення присутності та кількісної оцінки сполук Феруму у природних водах. Воду питну культурно-побутового призначення відбирали з декількох точок централізованого водогону м. Чернігова згідно рекомендацій ДСанПіну 2.2.4-171-10 [4]. Оцінку чутливості аналітичних реакцій для виявлення сполук Fe^{2+} здійснювали із застосування реагентів калію гексаціаноферату (III) та диметилгліоксиму, а йонів Fe^{3+} - калію гексаціаноферату (II), калію тіоціанату та калію йодиду [1].

Показано, що вміст загального Феруму у досліджуваних зразках питної води в межах м. Чернігова не перевищує ГДК та становить менше 0,2 мг/дм^3, що відповідає нормативам для поверхневих водойм господарсько-побутового призначення [4].

Для кількісної експрес-оцінки вмісту загального Ферума у питній воді рекомендуємо використання методу візуальної колориметрії, концентрацію аналітичних реагентів - 1,0 моль/дм^3, а мінімальний об'єм гранично розведеного розчину - 0,5 см^3.

References:

[1] Болотов В.В., Свєчнікова О.М., Колісник С.В., Жукова Т.В. та ін. Аналітична хімія: навчальний посібник. Харків:Вид-во НВаУ; Оригінал, 2004. С.83-98.
[2] Гусєва, В. П. Кількісний аналіз металів: навчальний посібник. Одеса: ОНУ, 2019. 221 с.
[3] Дороніна І. М. Аналітична хімія: практикум. Львів: ЛНУ, 2018. 256 с.
[4] ДСанПіН 2.2.4-171-10. Наказ Міністерства охорони здоров'я України 12.05.2010 N 400 URL: https://zakon.rada.gov.ua/laws/show/z0452-

10#Text.
[5] ДСТУ 4808:2007 Джерела централізованого питного водопостачання. Гігієнічні та екологічні вимоги щодо якості води і правила вибирання. URL: https://online.budstandart.com/ua/catalog/doc-page?id_doc=53159.
[6] Дьяків, С. І. Аналітична хімія: підручник. Київ: Вища школа, 2017. 408 с.
[7] Краснова Л. А. Хімія довкілля. Харків: ХНУ, 2020. 312 с.
[8] Самойленко В.М. Гравіметричні методи аналізу: навчальний посібник. Дніпро: ДНУ, 2015. 134 с.
[9] Яцков М. В., Назарук Г. І., Мисіна О. І. Біонеорганічна та біоорганічна хімія: навчальний посібник. Рівне: НУВГП, 2014. 123 с.

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No 301

INFORMATION AND WEB TECHNOLOGIES

Evolutionary Optimization Technologies in Innovation Management: Evidence From the Transport and Logistics Industry under Modern Dynamic Systemic Risks and Uncertainty

Krasnyuk Maxim[1]

[1] Associate Professor;
Department of Computer Science,
Kyiv National Economic University named after Vadym Hetman; Ukraine

Abstract. The article considers the possibilities of using evolutionary optimization technologies in innovative management of the transport and logistics industry under conditions of uncertainty, turbulence and systemic risks. The advantages of evolutionary computing in solving multi-criteria management problems are substantiated and the prospects for their integration with artificial intelligence and digital transformation technologies are determined.
Keywords: *evolutionary optimization, evolutionary computing, innovation management, transport and logistics industry, logistics systems, multi-criteria optimization, genetic algorithms, supply chains, uncertainty, systemic risks.*

Introduction.

The current stage of the development of the world economy is characterized by a qualitative complication of the environment in which organizations operate [1], in particular: acceleration of innovative technological changes [2], and, in particular, the intensification of global digitalization processes, instability of international markets and increased competition (especially in the service sector [3], [4]), geopolitical and regional tensions (and therefore the complex transformation of supply chains), climate challenges and, in general, an increase in the frequency of crisis phenomena of various modalities = form a new managerial reality [5]. Its special features are high uncertainty, turbulence, nonlinearity and interdependence of economic processes [6]. In these conditions, traditional methods of optimizing management decisions, based mainly on deterministic mathematical models, increasingly demonstrate limited effectiveness due to the inability to quickly adapt to rapidly changing parameters of the external environment [7].

These trends are especially clearly manifested in the transport and logistics industry [8], where the efficiency of activity is determined by the need to simultaneously take into account a large number of interdependent factors: demand dynamics, transport availability, resource limitations, fluctuations in transportation costs, time constraints, the risk of supply disruption, infrastructure capacity and a variety of random influences. As a result, optimization tasks acquire a multi-criteria nature and are characterized by extremely high computational complexity [9].

In such conditions, scientific and practical interest in evolutionary optimization technologies (evolutionary computing) is growing, which is a class of intelligent metaheuristic methods for finding solutions based on modeling the mechanisms of natural evolution [10]. Due to the ability to effectively explore large search spaces, adapt to changing system operating conditions and find close to optimal solutions in high-dimensional problems, evolutionary algorithms are becoming an important tool for innovation management [11].

That is why the purpose of this article is to investigate the possibilities of applying evolutionary optimization technologies in innovative management of the transport and logistics industry, analyze their advantages in conditions of high uncertainty and systemic risks, and determine the prospects for the further development of these technologies in the context of the digital transformation of logistics systems.

Main Part.

Considering the above in the introduction, it is clear why metaheuristic optimization methods have received special development in recent decades, among which evolutionary computing technologies occupy one of the leading places [12]. Their fundamental feature is the rejection of a complete enumeration of possible solutions in favor of an intelligent search based on probabilistic mechanisms of self-organization and adaptation [13]. Unlike deterministic algorithms, evolutionary methods allow to work effectively even in the absence of an analytical description of the objective function, the presence of a set of local extrema and a high dimensionality of the search space.

Currently, evolutionary computing combines a wide range of algorithmic directions; the most common are: genetic algorithms, evolutionary strategies, evolutionary programming, genetic programming, differential evolution, memetic algorithms and methods of multi-objective evolutionary optimization. Despite the differences in the mechanisms for forming new solutions, all of the above approaches implement the general principle of adaptive search, in which the accumulated information about the quality of previous solutions is used to generate subsequent, potentially more effective alternatives.

For innovative management, the ability of evolutionary algorithms to simultaneously take into account many efficiency criteria is important. In real management tasks, achieving one goal is almost always accompanied by a deterioration in other indicators. For example, minimizing transportation costs can lead to an increase in delivery time, while maximizing the level of customer service often requires an increase in operating costs. Similar contradictions arise between the reliability of the logistics network, the speed of order processing, the level of inventory, the environmental sustainability of transportation, and the efficiency of using transport resources.

Unlike traditional methods focused on finding a single optimal solution, modern technologies of multi-objective evolutionary optimization allow you to form many Pareto-efficient alternatives, each of which is a certain compromise between conflicting criteria. This approach significantly expands the possibilities of innovative management, as it provides managers with the opportunity to choose a development strategy taking into account the current priorities of the organization, external constraints and predicted scenarios of changes in the market environment.

In addition, evolutionary algorithms have a pronounced adaptability. When external conditions change, the search process does not start anew, but continues using already accumulated information about the structure of the solution space. This ensures a significantly higher stability of the management system to unexpected changes in the environment compared to most classical optimization methods.

The modern transport and logistics industry is one of the most complex areas of application of intelligent optimization methods. Its functioning is determined by the constant interaction of a large number of participants in the logistics network, including manufacturers, suppliers, transport operators, warehouse complexes, distribution centers, terminals, information platforms and end users [14]. Each element of this system is characterized by its own development dynamics, resource limitations and significant dependence on external factors, as a result of which the process of making management decisions acquires a multidimensional character [15]. Evolutionary optimization technologies acquire particular relevance under the conditions of transformation of global supply chains [16]. In recent years, the world economy has faced a whole range of systemic challenges, including pandemic restrictions, geopolitical instability, armed conflicts, energy crises, inflationary processes, disruption of the functioning of transport corridors, changes in the structure of international trade and increased requirements for the environmental sustainability of logistics [17]. As a result, traditional planning models, focused mainly on environmental stability, are increasingly proving to be insufficiently effective.

That is why modern innovative management is gradually moving from the concept of static optimization to the concept of continuous adaptation of management decisions. If earlier the main task was to find a single optimal option for the functioning of the logistics system, today the ability of the system to quickly rebuild itself when new restrictions arise, a change in the structure of demand or the occurrence of emergency situations is becoming much more important.

One of the most common areas of application of evolutionary computing is the optimization of transport routes. Classical vehicle routing problems belong to the category of NP-hard problems, for which a complete search of options is practically impossible even for a relatively small number of service objects. Genetic algorithms allow for the effective formation of delivery routes taking into account numerous constraints, including vehicle carrying capacity, customer service time windows, traffic conditions, order priority, fuel cost, transport infrastructure utilization level and the possibility of delays. The use of population search provides the ability to study a large number of alternative solutions simultaneously, significantly increasing the possibility of finding options close to the global optimum.

An equally important area is supply chain management. Modern logistics networks operate in conditions of constant change in demand volumes, instability of raw material supplies, fluctuations in transport tariffs and a high probability of disruption of individual links in the supply chain. Evolutionary algorithms allow to simultaneously optimize the levels of safety stocks, distribution center locations, purchase volumes, delivery schedules and distribution of transport flows, minimizing the total logistics costs while maintaining the required level of service reliability.

The use of multi-objective evolutionary optimization is of particular importance, since the efficiency of modern logistics is determined not by one, but by a set of interdependent criteria. In addition to minimizing costs, it is necessary to take into account the speed of delivery, the stability of supply chains, the level of customer service, the level of transport capacity utilization, environmental indicators, energy consumption and the carbon footprint of transportation. The formation of a set of Pareto-efficient solutions allows managers to choose the most rational strategy for developing the logistics system depending on the current priorities of the enterprise and environmental changes.

An important advantage of evolutionary computing is its ability to integrate with other digital technologies. As the concept of digital transformation of enterprises develops, evolutionary algorithms are increasingly used together with technologies of artificial intelligence, machine learning, big data analysis, digital twins and Internet of Things. Such integration significantly expands the possibilities of intelligent management of logistics processes.

It should be noted that the modern external environment is increasingly described by the concepts of VUCA, BANI, SHIVA and WARMI, which reflect the growing instability, nonlinearity, fragility and unpredictability of socio-economic processes. In such conditions, the importance of not so much the search for an absolutely optimal solution as ensuring the stability of the system's functioning in the implementation of various scenarios of events increases. That is why innovation management is gradually moving from classical optimization to adaptive management, which is based on the constant revision of management decisions and the continuous search for new alternatives.

Evolutionary computing fully corresponds to this management paradigm. Due to the probabilistic nature of the search, high adaptability, the ability to work with incomplete information and take into account a large number of criteria at the same time, they provide significantly higher resistance of logistics systems to the influence of external risks. At the same time, the effectiveness of their application increases as they are integrated with modern technologies of artificial intelligence, cognitive analytics, digital platforms and intelligent decision support systems.

At the same time, the use of evolutionary optimization is not without certain limitations. The quality of the obtained solutions significantly depends on the correctness of the choice of the structure of the solution representation, the setting of population parameters, selection, mutation and crossover operators, as well as the criteria for assessing fitness. In addition, the computational complexity of individual tasks may require the use of high-performance computing platforms and parallel computing. However, the development of cloud technologies, distributed computing architectures and specialized hardware accelerators is gradually removing these limitations, expanding the possibilities of practical application of evolutionary computing in the intelligent management of complex transport and logistics systems.

Conclusions.

The conducted research allows us to conclude that evolutionary optimization technologies (evolutionary computing) are becoming one of the promising areas of development of modern innovative management under conditions of qualitative complication of the environment of functioning of socio-economic systems. Unlike traditional methods of mathematical optimization, focused mainly on solving static problems in the presence of rigidly specified parameters, evolutionary algorithms provide adaptive search for rational solutions in conditions of multi-criteria, incomplete information, high dimensionality of the search space, dynamic change of constraints and influence of numerous uncertainty factors.

Using the example of the transport and logistics industry, it is shown that the use of evolutionary computing allows to significantly increase the efficiency of management of complex logistics systems by optimizing transportation routes, changing supply chains, distributing transport and warehouse resources, managing inventories, forming sustainable logistics networks and supporting the adoption of strategic ones. These technologies are of particular importance in the context of continuous market changes, disruption of global supply chains, increased geopolitical instability, increased systemic risks and the need for operational adaptation of organizations to new business conditions.

It has been established that one of the key advantages of evolutionary optimization is the ability to simultaneously take into account many conflicting efficiency criteria. The formation of a set of "Pareto-efficient" solutions provides innovative management with a significantly higher level of flexibility compared to the use of single-criteria optimization methods, as it allows choosing management solutions taking into account the strategic goals of the enterprise, resource constraints, the level of acceptable risk and predicted scenarios for the development of the external environment.

The prospects for further development of evolutionary computing are directly related to their integration with technologies of artificial intelligence, machine learning, big data analysis, digital twins, the Internet of Things, multi-agent systems and cloud computing. The formation of intelligent hybrid decision support systems opens up opportunities for the creation of self-adaptive management mechanisms capable of continuous optimization of logistics processes in real time.

Thus, in the current conditions of the formation of a new management paradigm, caused by high uncertainty, turbulence, nonlinearity and systemic risks, evolutionary optimization technologies are transformed from a specialized computational tool into one of the basic elements of digital innovation management. Their further development and practical implementation can provide a significant increase in the stability, adaptability, efficiency and competitiveness of transport and logistics systems, as well as create a methodological basis for the formation of new generation intelligent management models focused on functioning in conditions of continuous environmental changes.

References:

[1] Maksym Naumenko (2024). Modern concepts of innovation management at enterprises. *Scientific innovations and advanced technologies* No. 6(34) (2024). DOI: https://doi.org/10.52058/2786-5274-2024-

6(34)-435-449
[2] Ostapenko T., Onopriienko D., Hrashchenko I., Palyvoda O., Krasniuk S., Danilova E. (2022) Research of impact of nanoeconomics on the national economic system development. *Innovative development of national economies*: collective monograph. – Kharkiv: PC TECHNOLOGY CENTER, 2022. – pp. 46-70. URL: https://er.knutd.edu.ua/handle/123456789/23169
[3] Hrashchenko, I. S. (2011). Problemy ta osoblyvosti prohnozuvannia na pidpryiemstvakh sfery posluh [Problems and features of forecasting at service enterprises]. *Ekonomichnyi visnyk Donbasu - Economic Bulletin of Donbass*, (3(25)), 175-179. https://www.evd-journal.org/download/2011/2011-3/Ek_visnyk_3_2011.pdf [In Ukrainian].
[4] Hrashchenko, I. S., & Pryshchepa, N. P. (2016). Formuvannia konkurentnoho potentsialu pidpryiemstv za umov zrostannia mizhnarodnoi konkurentsii [Formation of the competitive potential of enterprises in conditions of growing international competition]. *Skhidna Yevropa: ekonomika, biznes ta upravlinnia - Eastern Europe: economics, business and management,* (4), 118–122.
[5] Naumenko, M. (2024). Methodology of determining factors of activity efficiency and competitive position of the enterprise on the market in crisis conditions. *Scientific innovations and advanced technologies*, № 7(35) (2024). DOI: https://doi.org/10.52058/2786-5274-2024-7(35)-648-665 [in Ukrainian].
[6] Nevmerzhytska S. M. (2018). Formation of a strategy for the innovative development of enterprises in conditions of uncertainty. *Scientific Bulletin of the Kherson State University. Series: Economic Sciences*. 2018. Vol. 32. pp. 99-103. URL: https://ej.journal.kspu.edu/index.php/ej/article/view/422/418.
[7] Krasnyuk M.T., Naumenko M.A. (2024) Efektyvne zastosuvannia henetychnykh alhorytmiv u vyrishenni bahatoekstremumnykh optymizatsiinykh zadach v menedzhmenti konkurentnoho pidpryiemstva [Effective application of genetic algorithms in solving multi-extremum optimization problems in the management of a competitive enterprise]. *Grail of Science*, № 41, June 2024, 65-73. URL: https://archive.journal-grail.science/index.php/2710-3056/issue/view/05.07.2024/29 [in Ukrainian].
[8] Krasnyuk, M., & Kustarovskiy, O. (2017). The development of the concept and set of practical measures of anticrisis logistics management in the current Ukraine conditions. *Zarządzanie. Teoria i Praktyka*, Wyższa Szkoła Menedżerska w Warszawie, (1 (19)), pp. 31–37.
[9] Oksana Karpenko , Olena Palyvoda, & Olena Bondarenko (2018). Simulation modelling of strategic development of transport and logistics clusters in Ukraine. *Baltic Journal of Economic Studies*, 4 (2), 93-98. doi: 10.30525/2256-0742/2018-4-2-93-98
[10] Kulynych Y., Krasnyuk M., Krasniuk S. (2022). Efficiency of evolutionary algorithms in solving optimization problems on the example of the fintech industry. *Grail of Science*, № 14-15, May 2022, (pp. 63-70). DOI: https://doi.org/10.36074/grail-of-science.27.05.2022
[11] Deb, K. (2001). *Multi-objective optimization using evolutionary algorithms*. John Wiley & Sons.

[12] Michalewicz, Z., & Fogel, D. B. (2004). *How to solve it: Modern heuristics* (2nd ed.). Springer.
[13] Storn, R., & Price, K. (1997). Differential evolution-A simple and efficient heuristic for global optimization over continuous spaces. *Journal of Global Optimization, 11*(4), 341-359. https://doi.org/10.1023/A:1008202821328
[14] Simchi-Levi, D., Kaminsky, P., & Simchi-Levi, E. (2021). *Designing and managing the supply chain: Concepts, strategies, and case studies* (4th ed.). McGraw-Hill Education.
[15] Pourhejazy, P., & Kwon, O. K. (2016). The new generation of operations research methods in supply chain optimization: A review. *Sustainability, 8*(10), Article 1033. https://doi.org/10.3390/su8101033
[16] Potvin, J.-Y. (2009). State-of-the-art survey-Evolutionary algorithms for vehicle routing. *INFORMS Journal on Computing, 21*(4), 518-548. https://doi.org/10.1287/ijoc.1080.0312
[17] Skitsko, V. I., & Voinikov, M. Y. (2024). Supply chain management using evolutionary algorithms. *Problemy Ekonomiky, 3*, 240-248. https://doi.org/10.32983/2222-0712-2024-3-240-248

Proceedings of the 10th International Scientific and Practical Conference «Experimental and Theoretical Research in Modern Science»
(July 16-18, 2026).
Toronto, Canada

No
301

Национальная программа «AI-Sana» как стратегический инструмент трансформации высшего образования и формирования AI-экосистемы в Республике Казахстан

Арынова Малика Айдыновна[1], **Ауелбек Мурат Ауелбекұлы**[2], **Серіков Бағдат Берікұлы**[3], **Машрипханова Гульмарал Айдосовна**[4]

[1] Студент 4 курса Естественно - технического факультета;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

[2] Доктор PhD;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

[3] Докторант 2 курса;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

[4] преподаватель - ассистент;
НАО «Жетысуский университет им. И. Жансугурова»; Республика Казахстан

Аннотация. В статье исследована роль национальной инициативы «AI-Sana» в контексте модернизации системы высшего образования Республики Казахстан и подготовки квалифицированных кадров для цифровой экономики. Автор анализирует многоэтапную структуру программы, механизмы интеграции передового международного опыта (включая методологию экспертов Стэнфордского университета и MIT) в отечественную академическую среду. Особое внимание уделяется синергии образования, науки и технологического предпринимательства как основы для формирования динамичной национальной AI-экосистемы. Рассматриваются промежуточные результаты реализации программы, включая массовое освоение базовых AI-компетенций и реализации практического этапа на примере Жетысуского университета имени И. Жансугурова.
Ключевые слова: *искусственный интеллект, AI-Sana, цифровая экономика, высшее образование, кадровый потенциал, технологическое предпринимательство, экосистема инноваций, Казахстан.*

Введение

Актуальность исследования. На современном этапе глобального исторического развития искусственный интеллект (ИИ / AI) выступает не просто как сквозная цифровая технология, а как катализатор новой промышленной революции. Применение алгоритмов машинного обучения, нейросетевых моделей и систем обработки больших данных (Big Data) радикально трансформирует такие базовые секторы, как здравоохранение, промышленность, сельское хозяйство, государственное управление и, в первую очередь, образование и науку. В этих условиях способность государства генерировать, адаптировать и внедрять AI-технологии становится главным детерминантом его конкурентоспособности на международной арене и обеспечения цифрового суверенитета. Для Республики Казахстан формирование высококвалифицированного кадрового потенциала в области ИИ перешло в разряд стратегических государственных приоритетов. По поручению Президента РК Касым-Жомарта Токаева 2026 год объявлен Годом цифровизации и искусственного интеллекта. Это решение подчеркивает необходимость форсированного перехода от ресурсо-ориентированной экономической модели к экономике знаний, где ключевым фактором роста становится человеческий капитал, обладающий продвинутыми цифровыми компетенциями.

Центральным элементом этой государственной политики является масштабная национальная программа «AI-Sana», инициированная Главой государства в 2024 году. Программа призвана решить системный разрыв между академической теорией и требованиями реального технологического рынка, создав сквозную траекторию: от базовой цифровой грамотности студента до запуска коммерчески успешного AI-стартапа.

I. ТЕОРЕТИКО-МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ ФОРМИРОВАНИЯ AI-ЭКОСИСТЕМЫ В ВЫСШЕЙ ШКОЛЕ

Концептуальная архитектура программы «AI-Sana» опирается на современную теорию инновационных экосистем (Triple Helix Model / Модель тройной спирали Г. Ицковица), предполагающую тесное стратегическое взаимодействие трех институтов: государства (Министерство науки и высшего образования РК), академической среды (ведущие вузы страны) и бизнеса / инновационной инфраструктуры (Astana Hub, QazInnovations, международные венчурные фонды).

В рамках данной модели высшее учебное заведение перестает быть исключительно ретранслятором знаний и трансформируется в «Университет 3.0», где процессы обучения (1.0) и научных исследований (2.0) органически дополняются функцией коммерциализации технологий и создания стартапов (3.0). Программа «AI-Sana» методически структурирована таким образом, чтобы обеспечить поэтапное формирование у обучающихся трех уровней компетенций:

- Hard Skills в сфере AI: понимание архитектуры нейросетей, навыки работы с prompt-инжинирингом, базовое программирование и анализ данных.

- Soft Skills и критическое мышление: способность оценивать этические аспекты применения ИИ, риски галлюцинаций моделей и вопросы безопасности данных.
- Entrepreneurial Skills (Предпринимательские навыки): умение трансформировать технологическое решение в жизнеспособный бизнес-продукт (MVP), проводить анализ рынка (Product-Market Fit) и привлекать венчурные инвестиции.

II. АНАЛИЗ ЭТАПОВ РЕАЛИЗАЦИИ ПРОГРАММЫ «AI-SANA»

Системный подход Министерства науки и высшего образования РК к модернизации высшей школы выразился в жесткой этапности и масштабируемости проекта.

Этап 1: Массовая цифровизация и базовые компетенции

На первом (фундаментальном) этапе основной задачей являлось преодоление цифрового неравенства среди студенческого сообщества и создание широкой воронки талантов. Студентам казахстанских вузов был предоставлен доступ к ведущим международным образовательным платформам.Результаты первого этапа беспрецедентны для образовательного пространства СНГ: студентами было получено более 697 тысяч сертификатов, подтверждающих успешное освоение базовых AI-компетенций. Данный шаг позволил сформировать единый понятийный аппарат и подготовить академическую почву для более сложных проектных задач.

Этап 2: Проектно-ориентированное обучение и AI-предпринимательство

С апреля 2026 года при поддержке Общественного фонда «Қазақстан халқына» стартовал второй этап программы, характеризующийся переходом от пассивного потребления контента к активному проектированию. На данном этапе обучение проходят почти 90 тысяч студентов. Главным методологическим ядром второго этапа стала специализированная программа, разработанная выдающимся международным экспертом, членом Совета по развитию искусственного интеллекта Полом Кимом совместно с американской компанией Zemex Inc. Данный курс сфокусирован на основах AI-предпринимательства. Студенты учатся не просто кодить, а искать реальные «болевые точки» (pain points) в экономике и закрывать их с помощью ИИ-решений. Ключевым фактором обеспечения высочайшего качества образования стало привлечение беспрецедентного пула международного профессорско-преподавательского состава. К реализации привлечены 63 ведущих международных эксперта в области цифровой трансформации, ИИ и инноваций, имеющие опыт работы в топ-вузах мира: Stanford University, Massachusetts Institute of Technology (MIT), Carnegie Mellon University, UC Berkeley, Johns Hopkins SAIS, Georgetown University, Boston University. Участие менторов из Кремниевой долины и представителей глобальных венчурных фондов позволяет интегрировать в казахстанские университеты передовой опыт акселерации, принятый в лучших мировых институтах.

Этап 3: Инкубация, акселерация и выход на рынок

Логическим продолжением программы станет формирование междисциплинарных проектных команд. Студенты технологических, гуманитарных и экономических специальностей будут объединяться для создания комплексных продуктов. Разработанные технологические решения будут направляться на площадки национальных институтов развития — Astana Hub и QazInnovations. Здесь молодежные стартапы пройдут классические стадии инкубации (доработка концепта, создание MVP) и акселерации (масштабирование, первые продажи, поиск инвесторов).

Реализация практического этапа на примере Жетысуского университета имени И. Жансугурова

Ярким примером региональной имплементации (внедрения) принципов программы «AI-Sana» выступает опыт Жетысуского университета. В качестве практического кейса синергии AI-компетенций и образовательных технологий в вузе разрабатываются и внедряются такие инициативы, как проекты доктора философии (PhD) Ауелбек М.А. «AI-Pedagogue» («AI-Ұстаз») и инновационная робототехническая платформа TiR (Training in Robotics). Проект «AI-Pedagogue» ориентирован на ликвидацию цифрового разрыва среди педагогических кадров региона посредством внедрения элементов ИИ в учебный процесс средних школ. В свою очередь, платформа TiR решает проблему доступности инженерного образования, предлагая виртуальные симуляторы роботов и готовые интерактивные онлайн-курсы (от базовой схемотехники и Arduino до сложных систем). Этот пример доказывает, что в рамках «AI-Sana» студенты и молодые ученые Жетысуского университета переходят от пассивного изучения ИИ к созданию экспортоориентированных MVP-продуктов для образовательного сектора (EdTech).

Эра искусственного интеллекта в Жетысуском университете: как ИИ-инициативы меняют будущее образования и науки.

Жетысуский университет имени Ильяса Жансугурова уверенно закрепляет за собой статус одного из ведущих центров цифровой трансформации и инноваций в регионе. Ярким подтверждением этому стало масштабное проведение мероприятий в рамках государственной программы **«AI SANA»**. Искусственный интеллект здесь — это не просто теоретическая дисциплина, а реальный инструмент, с помощью которого студенты учатся, создают и меняют будущее прямо сейчас. Организаторами этого технологического праздника выступили Департамент цифровизации и технического обеспечения, а также Отдел цифровизации и автоматизации процессов университета. Мероприятия объединили творческую мысль и передовые инженерные решения в рамках двух крупных республиканских конкурсов.

1. Конкурс видеороликов и креатива «AI SANA CONTEST: WE LEARN, CREATE, CHANGE THE FUTURE» (Глазами студентов Жетысуского университета)

Цель конкурса: Популяризация творческого и технического применения инструментов ИИ, поддержка авторских студенческих проектов в формате коротких видеороликов, а также раскрытие потенциала нейросетей в создании визуального и звукового контента. Чтобы обеспечить максимальную объективность и высокий уровень оценки, в состав экспертного **жюри** вошли ведущие специалисты университета и приглашенные эксперты:

- **Шынгыс Нургожаев** — директор Талдыкорганского высшего политехнического колледжа;
- **Даулет Батырбеков** — и.о. директора Департамента цифровизации и технического обеспечения;
- **Кыдырәлі Ахмет** — заведующий Лабораторией искусственного интеллекта и виртуальной реальности;
- **Жайлау Ерасыл** — и.о. руководителя отдела цифровизации и автоматизации процессов;
- **Жалгас Ахметов** — преподаватель-лектор кафедры физики и математики;
- **Асель Оразбаева** — преподаватель-лектор кафедры информационных технологий и ИИ;
- **Арслан Бараков** — преподаватель-ассистент кафедры творческого образования.

2. Республиканский конкурс студенческих проектов «AI Sana - Digital Kazakhstan: Projects of the Future»

Этот масштабный технологический трек был направлен на глобальную цифровую трансформацию страны. В финал, преодолев жесткий отборочный этап, пробились **14 сильнейших команд** из ведущих высших учебных заведений Казахстана. Приветствуя финалистов, Председатель правления - ректор Жетысуского университета **Ермек Бурибаев** выразил твердую уверенность в том, что сегодняшние студенческие инициативы в сфере ИИ завтра трансформируются в успешные, коммерчески жизнеспособные стартапы и будут служить на благо социально-экономического развития всей страны.

Авторитетное жюри конкурса

Проекты оценивали топ-менеджеры, представители бизнеса и государственного сектора:

- **А. Хамзинова** — руководитель отдела внедрения и развития IT акимата области Жетісу;
- **Ә. Исмаил** — руководитель отдела развития человеческого капитала Палаты предпринимателей области Жетісу;
- **С. Калиев** — представитель АО «Казахтелеком»;
- **С. Чернышев** — начальник IT-отдела «ASMA Industrial»;
- **С. Осинская** — заместитель директора филиала «Евразийский банк».

Программа **«AI SANA»** в Жетысуском университете продемонстрировала, что современная молодежь готова к вызовам цифровой эпохи. Университет имени И. Жансугурова продолжает выступать мощным катализатором и диалоговой площадкой, где рождаются прорывные идеи, а искусственный интеллект становится надежным союзником на пути к технологическому суверенитету Казахстана!

III. МЕХАНИЗМЫ МОДЕРНИЗАЦИИ ВУЗОВСКОЙ СРЕДЫ ПОД ЭГИДОЙ МНВО РК

Реализация «AI-Sana» потребовала от Министерства науки и высшего образования РК проведения глубоких структурных изменений внутри самих университетов:

1. Интеграция AI-модулей в учебные планы: Элементы искусственного интеллекта внедряются не только на специализированных IT-факультетах, но и в программы подготовки педагогов, инженеров, агрономов и медиков. ИИ рассматривается как универсальная рабочая компетенция.
2. овышение квалификации профессорско-преподавательского состава (ППС): Успех программы напрямую зависит от готовности преподавателей использовать ИИ в учебном процессе. МНВО РК расширяет программы стажировок и воркшопов, позволяя локальным кадрам перенимать опыт у приглашенных зарубежных профессоров.
3. Развитие исследовательской инфраструктуры: На базе опорных вузов создаются лаборатории ИИ, центры обработки данных и студенческие хабы.
4. Укрепление международного сотрудничества: Трансфер технологий из Кремниевой долины и ведущих азиатских центров ИИ позволяет оперативно обновлять образовательный контент, избегая устаревания программ.

Заключение и выводы

Национальная программа «AI-Sana» представляет собой уникальный для Центрально-Азиатского региона опыт масштабной, системной и институциональной интеграции технологий искусственного интеллекта в высшую школу. Переход от количественных показателей первого этапа (697 тыс. базовых сертификатов) к качественному прорыву второго этапа (90 тыс. студентов, обучающихся AI-предпринимательству у мировых лидеров мысли) демонстрирует высокую динамику реализации государственной стратегии. Формирование сквозной экосистемы «Обучение – Исследования – Стартап» позволяет решать сразу несколько важнейших задач:

- Обеспечение рынка труда кадрами нового поколения, обладающими компетенциями на стыке науки, технологий и бизнеса;
- Снижение риска «утечки мозгов» за счет создания привлекательной инновационной инфраструктуры внутри страны (Astana Hub, гранты фонда «Қазақстан халқына»);
- Повышение наукоемкости и технологичности национальной экономики в рамках Года цифровизации и искусственного интеллекта.

Дальнейшее масштабирование программы «AI-Sana» и глубокая вовлеченность отечественных региональных университетов станут прочным фундаментом для превращения Казахстана в ведущий цифровой и AI-хаб на евразийском пространстве.

References:

[1] Токаев К.К. Выступление Президента РК на пленарном заседании форума Digital Bridge 2024 / Официальный сайт Президента Республики Казахстан (Акорда).
[2] Официальные материалы Министерства науки и высшего образования Республики Казахстан (МНВО РК). Пресс-релизы и отчетные данные по программе «AI-Sana», 2024-2026 гг.
[3] Ицковиц Г. Тройная спираль. Университеты - предприятия - государство. Инновации в действии. – М.: ТУСУР, 2010. – 238 с.
[4] Ким П. Методология развития предпринимательского мышления и AI-компетенций в высшей школе // Материалы Совета по развитию искусственного интеллекта. – Земекс Инк., США, 2025.
[5] Отчет Общественного фонда «Қазақстан халқына» о финансировании образовательных и инновационных программ на 2026 год.
[6] AI Sana Жетысуского университета имени Ильяса Жансугурова — AI Sana URL: https://aisana.zhetysu.edu.kz/

SCIENTIFIC EDITION

SCIENTIFIC COLLECTION «INTERCONF»

№ 301 | July 2026

The issue contains:

Proceedings of the 10th International
Scientific and Practical Conference

EXPERIMENTAL AND THEORETICAL
RESEARCH IN MODERN SCIENCE

Toronto, Canada
16-18.07.2026

All materials are reviewed.
The editorial office did not always agree with the position of authors.

Sighed for online publication: July 18, 2026.

Printed: August 16, 2026. Circulation: 200 copies. Format 60×84/8.
Batang & Courier New typefaces. Offset paper 100gsm. Digital color printing.

Contacts of the editorial office:

LLC Scientific Publishing Center «InterConf»
info@interconf.center
https://www.interconf.center

Certificate on the entry of publishing business subject in the State Register of Publishers, Manufacturers and Distributors of Publishing Products of Ukraine: ДК № 7882 of 10.07.2023.