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## Agricultural sciences

### THE DOMINANT MYCOBIONT OF BLUEBERRY IN SOUTHWESTERN GEORGIA

**Macharadze G.**

PhD,

Shota Rustaveli State University

**Shainidze O.**

Professor,

Batumi Shota Rustaveli State University

**Shakro Kanchaveli**

Department of Integrated Plant Protection Research, Scientific Research Center of the Ministry of Environmental Protection and Agriculture of Georgia

**Turmanidze M.**

PhD,

Batumi Shota Rustaveli State University

**Jashi D.**

Professor,

Batumi Shota Rustaveli State University

#### **Abstract**

In 2024 and 2025, research was conducted at the Plant Protection Laboratory and greenhouse of Batumi State University, as well as in blueberry orchards in Southwestern Georgia. The main objective of this study was to identify and determine the main pathogens of blueberry and their Control. Fungal cultures identification was based on macroscopic characteristics like colony morphology, colour, texture, shape and appearance were observed on potato dextrose agar (PDA) and microscopic characteristics like conidia shape, hyphen colour, concentric zone, and pigmentation. Results of the studies showed that among the mycobionts found on blueberry, the most common, dangerous and harmful are *B. cinerea*. Here we analyze symptoms, disease cycle and management of blueberry gray mold..

**Keywords:** Blueberry, Gray mold; *Botrytis cinerea*, Disease cycle, Symptoms, Control

#### **Introduction**

Blueberry (*Vaccinium* spp.) is esteemed globally as a valuable economic crop, primarily due to its high concentrations of antioxidants, including anthocyanins, phenolic acids, and flavonoids, which have earned it the moniker "king of berries." According to FAOSTAT, global blueberry production has reached over 1.7 million metric tons, highlighting the crop's major agricultural significance. Gray mold, caused predominantly by *Botrytis cinerea* Pers., is one of the most commonly observed and severe diseases of blueberry worldwide, particularly in the post-harvest stage where it leads to significant economic losses, and is well documented in countries such as Canada, Korea, Chile, and China (Wang et al., 2022; Neugebauer et al., 2024). Given the growing global demand for blueberries, understanding the pathogen's biology and the plant's defense responses is essential for developing sustainable control strategies. This review article addresses this problem by synthesizing current knowledge on pathogenic mechanisms, host resistance, available management practices, and potential research perspectives, thereby contributing to both scientific understanding and practical application in blueberry production systems.

Gray mold is among the most critical fungal diseases impacting blueberry after harvest (Zhou et al., 2025). Gray mold is not only prevalent in blueberries but also affects a variety of other economically significant crops, including grapes, tomatoes, tobacco, cucumbers, and strawberries (Stamelou et al., 2021; Vogel et al., 2023; Chang et al., 2025; Yuan et al., 2025). *B. cinerea* is a necrotrophic filamentous fungus with a broad host range, affecting more than 1400 plant species, thus becoming one of the main threats to the agriculture systems (Rui et al., 2023; Roca-Couso et al., 2021; Li et al., 2023). Its conidia can reach host tissues via air currents, water droplets, or mechanical damage. The fungus remains active in low temperature (0–4 °C) and humid conditions, leading to gray mold incidence levels as high as 60–100% during the post-harvest storage of blueberry (Mamode et al., 2021).

Upon infection with gray mold, blueberry exhibit characteristic symptoms on the fruit, flowers, and leaves. Initially, the fruit develops small, hard, light brown lesions that rapidly expand and become



covered with a layer of gray fungal growth. Flowers display symptoms of rot, with severe infections leading to complete wilting. Leaves may form brown to gray lesions, and under conditions of high humidity, gray mycelium and masses of conidia may form on these lesions (Kwon et al., 2011). Gray mold not only directly causes rot in blueberries but also diminishes their shelf life by accelerating water loss and nutrient degradation. *B. cinerea*, when cultured on potato dextrose agar (PDA) medium, initially forms white colonies that subsequently transition to gray or brown and produce black sclerotia. The conidiophores are slender and branched, while the conidia are oval to round in shape (Cheon et al., 2013; Li et al., 2011).

Among the registered blueberry diseases in Adjara (Shainidze, 2013) it is widespread *B. cinerea*. Therefore, our attention will be focused on this mycobiont.

### Materials and Methods

**Collection of samples:** Study was conducted from 2024 to 2025 in Laboratory Plant Protection Laboratory of Batumi State University, and field studies in subtropical and mountainous Adjara, Georgia.

**Sampling location:** The objects of research were various varieties of blueberry plants and *B. cinerea* in agroecosystems of the subtropical and mountainous Adjara, Georgia. The materials were collected and analyzed (dissemination and development of diseases) by using the well-known methods (Foster et al., 2004). The symptoms such as rot, mummification, wilting, spotting, necrosis, mold, etc., were recorded.

**Isolation of *B. cinerea*:** For isolation of fungi from blueberry plants, the agar method was used. Fungal pathogens responsible for disease were isolated from fruit. From the samples obtained, serial dilutions (1:10) were prepared in test tubes with 9 ml sterile water, adding 1 g of fruit samples until dilutions 10<sup>-5</sup>, 10<sup>-6</sup> and 10<sup>-7</sup>, of which 50 µL and shaken at 200 rpm for 3 hours. Samples collected were seeded by duplicate through diffusion technique on Petri dishes of 90 mm diameter containing one of the following artificial Potato Dextrose Agar (PDA) and Czapeck's agar medium. After incubation (23°C for 6 days) the number for conidia *B. cinerea* was calculated. *B. cinerea* were cultured using a single spore technique on PDA and Czapeck's medium. After incubation, *B. cinerea* were identified by their macroscopic and microscopic characteristics.

**Identification of *B. cinerea*:** Fungal culture identification was based on macroscopic characteristics like colony morphology, color, texture, shape and appearance were observed on potato dextrose agar (PDA) and microscopic characteristics like conidia shape, hyphae color, concentric zone, and pigmentation. Species identification was based on the morphological characteristics of single-spored isolates as described (Domsch, 1993; Navi et al., 1999; Watanabe, 2000). Collections of the *B. cinerea* have been examined by standard light microscopy (Pereval, Carl Zeiss, Jena and Olympus, BX50, Hamburg, Germany). The SEM micrographs have been prepared by means of a JSM-35 (Japan) SEM microscope. The specimens examined are deposited at HAL, KW and TGM (Holmgren et al., 1990).

### Data collected

Disease severity was recorded by using 0-5 visual diseases scoring scale stated by (Sharma, 1986). Where; 0 = no symptoms (healthy), 1 = slight, less than 5% of leaves affected, 2 = moderate, 5-20% of leaves affected, some yellowing, little or no defoliation, 3 = extensive, 20-50% of leaves affected, significant defoliation, 4 = heavy, 50-80% of leaves affected, severe defoliation and 5 = extreme, 80-100% leaves affected, complete or near complete defoliation.

Damage/severity of fruits were rated by 0-3 scale and average percentage respectively for each were; 0 = no symptom (healthy), 1 = slight (less than 5% of fruits affected), 2 = moderate (5-20% of fruits affected, some yellowing, little or no defoliation), 3 = extensive damage (20-50% of fruits affected) (Fetena and Lemma, 2014).

$$\text{Disease Severity (\%)} = \frac{\text{Area of Diseased Tissue}}{\text{Total Tissue Area}} \times 100$$

The severity grades were converted into percentage severity index (PSI).

$$\text{PSI} = \frac{\text{Sum of numerical ratings}}{\text{No. of plants scored} \times \text{maximum disease score on scale}} \times 100$$

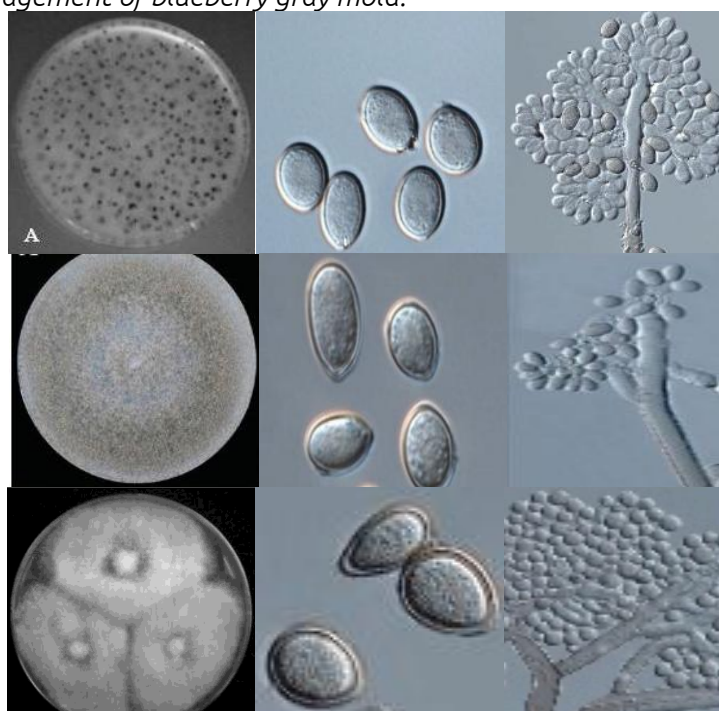
The relative disease severity reduction on untreated and treated plots of the treatment combination was calculated as follows. Relative disease severity reduction (%) =  $\frac{\text{untreated} - \text{treated}}{\text{untreated}} \times 100$

**Data Analysis:** Data were analyzed following a procedure appropriate to the design of the experiment as described by Gomez and Gomez (1984) and logistic model and, general linear model (GLM) of SAS version 9.2 (SAS, 2009). The treatment means were separated using the least significant difference (LSD) test at 5% probability level. Correlation and regression analysis was used to determine the relationships between growth, yield and yield related traits, and disease severity and AUDPC across the

treatments. It was performed to determine the association of disease parameters with yield obtained from the different fungicide schedules.

### Results

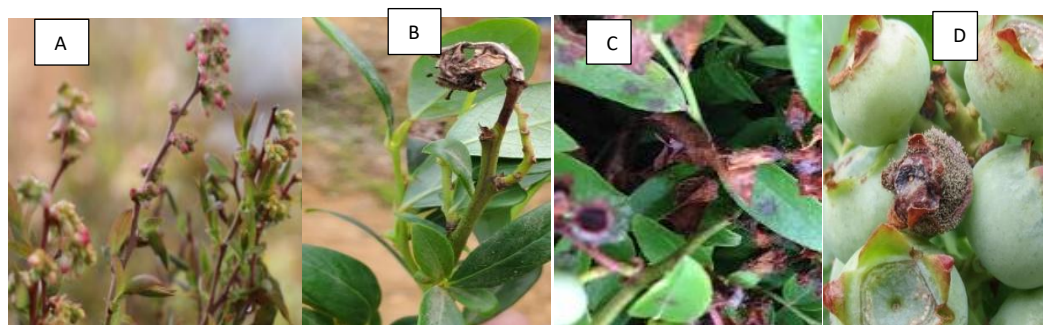
Results of the studies showed that among the mycobionts found on blueberry (*Alternaria* leaf spot and fruit rot-*Alternaria tenuissima* (Nees & T. Nees:Fr.) Wiltshire; Anthracnose fruit rot-*Colletotrichum acutatum* J. H. Simmonds (syn. *Glomerella acutata* Guerber & J. C. Correll) and *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. (syn. *Glomerella cingulata* (Stoneman) Spauld. & H. Schrenk); *Armillaria* root rot-*Armillaria mellea* (Vahl:Fr.) P. Kumm.; *Botryosphaeria* stem canker-*Botryosphaeria corticis* (Demaree & M. S. Wilcox) Arx & E. Müll. (syn. *Physalospora corticis* Demaree & M. S. Wilcox); *Botrytis* blight and fruit rot/*Botrytis* blossom blight-*Botrytis cinerea* Pers.:Fr. (syn. *Botryotinia fuckeliana* (de Bary) Whetzel); *Fusicoccum* canker/*Godronia* canker-*Godronia cassandrae* Peck (syn. *Fusicoccum putrefaciens* Shear); *Gloeosporium* leaf spot and stem canker/*Gloeosporium* stem and leaf spot-*Gloeosporium minus* Shear; Mummy berry-*Monilinia vaccinii-corymbosi* (J. M. Reade) Honey (syn. *Monilia vaccinii-corymbosi* J. M. Reade); *Penicillium* fruit rot-*Penicillium* spp.; *Pestalotia* fruit rot- *Pestalotia vaccinii* (Shear) Guba; *Phomopsis* canker/*Phomopsis* twig blight and fruit rot-*Diaporthe vaccinii* Shear (syn. *Phomopsis vaccinii* Shear), the most common, dangerous and harmful are *B. cinerea*. Here we analyze symptoms, disease cycle and management of blueberry gray mold.



**Fig. 2 .** Characteristics of colonies, conidia, and conidiophores for three categories of colony type: **A.** sclerotial type (upper); **B.** conidial type (middle); and **C.** mycelial type (bottom).

### SYMPTOMS

In the spring, *Botrytis* blight often begins on blossoms after pollination but before flower drop. As the flowers are colonized and killed by the pathogen, they turn a brown color instead of their typical white (Figure 2 A). Infections may move through the blossom to the entire floral structure. Infected blossoms tend to stick on longer to the calyx (Figure 2 B). The disease also can move from flower clusters at the tip into the succulent stem at the base (Fig. 2 B), which can cause twig blight or diebacks and kill all flowers above the infection site. Blackish-brown watery spots appear on the affected leaves (Fig. 2 C). On green fruit, symptoms appear a brown water-soaked discoloration near the calyx end of the fruit (Fig. 2 D). Infected berries may rot and drop from the cluster when they are ripening. Infected berries may not show any visible symptoms in the garden or field until post-harvest when it becomes favorable for disease development. Woody stems are less susceptible to the disease. Under a high relative humidity condition, grayish fungal spores develop on diseased tissues including flowers, leaves, fruits, and stems, which give the tissues a dense gray fuzzy appearance



**Fig. 2.** Symptoms of diseases Blueberry: A-flowers, B-leaves, C-shoots and D-fruit damaged by *Botrytis* Disease Cycle

The pathogen of *Botrytis* blight of blueberry, *B. cinerea*, has a wide host range. Dormant mycelia of the fungus survive in dead twigs on the plant and in plant debris on the ground. Resting structures (sclerotia) of the fungus are resistant to unfavorable environment conditions and persist in the soil for a long period without host plant tissues. In the spring, the pathogen forms spores on overwintered inoculum sources and attack faded flower petals and senescent plant tissues. During the season, the fungus produces a dense gray spore mass on infected tissues. Fungal spores are dispersed by air currents or water splash and cause new infections in fields. Spore germination and infections require at least 6 hours of continuous wetness on the surface of plant tissues or high relative humidity (>90%). The optimum temperature range for spore germination and infection is 19-23°C. So, periods of rainy cool weather and extended periods of high relative humidity conditions are favorable for the disease development. Frequent overhead irrigation and poor air circulation can prolong leaf wetness and relative humidity conditions, which favor fungal sporulation, spore germination, and infection. Frost damage and other physical injuries on tender new growth make it more vulnerable to the disease. Dead tissues on bushes may offer opportunities for the fungal colonization and spore production during the season.

#### Management

##### Cultural Practices

Annual pruning, wide row spacing, and controlling weeds can help improve airflow and prevent moisture development in the canopies and rows. As *Botrytis* spp. are excellent necrotrophs (decomposers), removing dead material like leaves, twigs, and canes in the off-season can be helpful for control. Avoiding low areas in the field can help prevent frost damage, which can contribute to infection levels. Overusing nitrogen fertilizer in springtime leads to new succulent twigs that are susceptible to infection and should be avoided. Timely harvest and removing all ripe fruit are important to prevent potential post-harvest losses to *Botrytis* and other fruit rots. Quickly cooling harvested berries to ~35°C will slow down development of post-harvest rots, as well. However, since *Botrytis* spp. are able to grow at temperatures slightly above freezing, management in the field is most effective.

##### Chemical and biological control

Fungicide treatments are preventative to protect healthy tissues from the disease. If *Botrytis* blight is detected on flowers and wet weather is forecast, a fungicide spray program may be required from pre-bloom through the end of bloom. Fungicide applications need to be repeated at label-recommended intervals. If weather conditions are conducive to infection when berries are ripening, a preharvest application may be needed later in the season to prevent post-harvest berry rot and losses. Fungicides that are registered for *Botrytis* blight include captan, iprodione, fenhexamid, boscalid, and thiophanate-methyl.

Organic options include Serenade (*Bacillus subtilis* strain QST 713). Fungicide resistance to site-specific fungicides is a real concern with this pathogen. These fungicides should not be applied consecutively or be alternated with other fungicides from different FRAC groups to avoid fungicide resistance development in the fungal population.

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## *Biological sciences*

### *EFFECT OF MICROCLONAL PROPAGATION ON FIELD SURVIVAL OF ARTEMISIA ABSINTHIUM L. SEED-LINGS*

**Azamat Ergashev**

*Denov Institute of Entrepreneurship and Pedagogy,  
Surkhandarya, Uzbekistan*

**Begali Alikulov,**

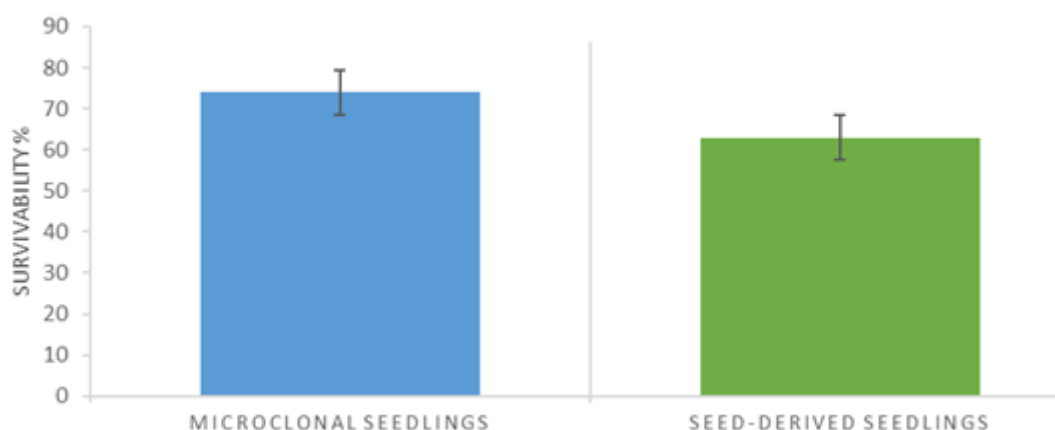
*Institute of Biochemistry, Samarkand State University  
named after Sharof Rashidov, Samarkand, Uzbekistan,*

*At present, the conservation, propagation, and establishment of a sustainable raw material base for medicinal plants that are sources of biologically active compounds are of significant scientific and practical importance. [1]. In this respect, Artemisia absinthium L. (bitter wormwood) is distinguished by its wide application in the pharmaceutical industry, medicine, and traditional folk remedies [4]. However, the natural populations of this plant are gradually declining as a result of anthropogenic factors and improper harvesting practices [6]*

*Conventional vegetative and generative propagation methods are characterized by uneven seedling development, low resistance to diseases, and limited capacity to produce a sufficient number of healthy seedlings within a short period of time. Therefore, the modern biotechnological approach of microclonal propagation is recognized as an effective method for obtaining high-quality plant material that is genetically uniform and free from phytopathogens [2].*

*The aim of this study was to evaluate the practical effectiveness of microclonal propagation by investigating the field survival, adaptability, and growth characteristics of Artemisia absinthium L. seedlings produced through this method. The obtained results demonstrate the advantages of the microclonal method in seedling production. This method is particularly significant for regions with arid climates and gypsum-rich or saline soils. The preparation of high-quality, uniform, and adaptable seedling material for new plantings ensures higher yields and improved survival rates for agricultural enterprises. At the same time, the genetic diversity of natural seedlings enhances ecological stability in the long term [5]. Therefore, developing appropriate systems for the integrated use and management of both types of seedlings would also be beneficial. In this study, the field survival rates of microclonal and naturally propagated seedlings were investigated. Figure 1 presents the survival rates of the seedlings expressed as percentages. The obtained results indicate that the survival rate of microclonal seedlings is approximately 73–75%, which is higher than that of naturally propagated seedlings. In naturally propagated seedlings, this indicator accounts for 62–64%. This difference can be explained by the fact that the microclonal seedlings were produced under laboratory conditions, developed in a physiologically uniform manner, and exhibit enhanced mechanisms of adaptation to field conditions.*

*The survival of seedlings under field conditions reflects their ability to adapt to natural ecological factors such as temperature, moisture, soil conditions, and other environmental influences [3]. In the study, seedlings produced using the microclonal method were comparatively analyzed alongside seedlings grown under natural conditions used as the control.*



**Figure 1. Survival rate of seedlings produced by the microclonal method and those grown under natural conditions under field conditions**

A comparison of seedling survival rates under field conditions showed that seedlings produced by the microclonal method achieved higher results than those grown under natural conditions. This indicates that seedlings produced by the microclonal method exhibit stronger adaptability to ecological factors under field conditions.

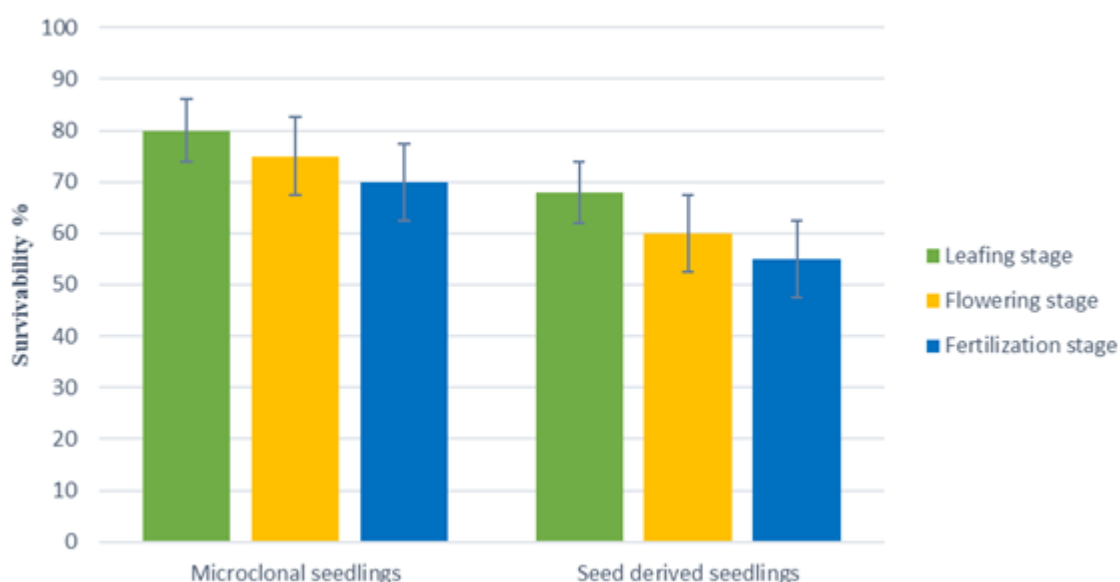
The results indicate that microclonal seedlings established well under field conditions and ensured a high survival rate. In contrast, naturally grown seedlings showed a lower survival rate, indicating greater sensitivity to transplantation and external environmental conditions.

Microclonal seedlings are typically derived from a uniform genotype, resulting in more stable growth rates, leaf surface area, and root system development. Therefore, their establishment and survival under field conditions are higher. In addition, microclonal seedlings are relatively free from pathogens, as they are cultivated under sterile conditions. This factor also enhances their adaptation during the first year of establishment. The survival of seedlings is strongly influenced not only by their genetic background but also by the field conditions themselves. For example, soil moisture, nutrient availability, salinity level, air temperature, wind speed, and the quality of irrigation and management practices determine the first-year growth rate and survival of seedlings. While microclonal seedlings are able to cope with these factors more easily to some extent, naturally grown seedlings tend to suffer greater losses under such conditions.

Overall, these data scientifically confirm that seedlings obtained through microclonal propagation technology possess stable survival under field conditions.

Observations conducted under field conditions during the vegetation periods indicate that seedling survival differs significantly not only overall, but also across different stages of the growing season. Microclonal and naturally grown seedlings exhibit distinct characteristics in terms of adaptability, growth rates, and survival.

At the leaf development stage, microclonal seedlings showed a survival rate of 80%, whereas naturally grown seedlings exhibited a survival rate of 68%. At the flowering stage, the respective values of this parameter were 75% and 60%, whereas at the fertilization stage they accounted for 70% and 55%. These results indicate that microclonal seedlings maintain a consistent advantage throughout the entire vegetation period (Figure 2).



**Figure 2. Average survival rates of *Artemisia absinthium* L. seedlings under field conditions during the vegetation period**

The studies indicate that, in order to enhance survival rates, it is necessary to expand microclonal seedling production technologies, improve cultivation and irrigation systems, and optimize growing conditions for conventionally propagated seedlings as well. Throughout the vegetation period, microclonal seedlings exhibited higher survival rates than conventionally propagated seedlings at all developmental stages. This demonstrates that microclonal seedlings are effective not only under laboratory conditions but also in field environments.

In conclusion, the cultivation of *Artemisia absinthium* L. using the microclonal propagation method is distinguished by its effectiveness in enhancing seedling survival and adaptability under field conditions. This method enables the production of healthy, uniformly developed, and stress-tolerant seedlings, and therefore represents a promising biotechnological approach for the sustainable propagation and large-scale cultivation of medicinal plants.

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# TROPHIC FEATURES OF ALIEN FISH SPECIES IN THE STRUCTURE OF COMMERCIAL FISH FAUNA OF THE ILE-BALKHASH BASIN

Satbek Angsar Talgatuly

Doctoral Student, Al-Farabi Kazakh National University

ORCID: 0009-0000-5259-4945

## ТРОФИЧЕСКИЕ ОСОБЕННОСТИ ЧУЖЕРОДНЫХ ВИДОВ РЫБ В СТРУКТУРЕ ПРОМЫСЛОВОЙ ИХТИОФАУНЫ ИЛЕ-БАЛКАШСКОГО БАСЕЙНА

Сатбек Ансар Талгатұлы

Докторант, Казахский национальный университет имени аль-Фараби

ORCID: 0009-0000-5259-4945

### Abstract

The article examines the current state of the commercial ichthyofauna of the Ile-Balkhash Basin with a focus on the origin and ecological role of alien fish species. It is shown that most dominant species in scientific catches were introduced during the 20th century as part of fisheries management practices. Both positive effects of introductions, such as increased fishery productivity, and negative ecological consequences, including alterations of trophic relationships and displacement of native species, are analyzed. The study highlights the ambivalent role of alien species in the basin's aquatic ecosystems.

### Аннотация

В статье рассматривается современное состояние промысловой ихтиофауны Иле-Балкашского бассейна с акцентом на происхождение и роль чужеродных видов рыб. Показано, что большинство доминирующих в уловах видов были интродуцированы в XX веке в результате рыбохозяйственных мероприятий. Проанализированы потенциальные положительные эффекты интродукций, связанные с увеличением промысловой продуктивности, а также экологические риски, выражающиеся в трансформации трофических связей и вытеснении аборигенных видов. Сделан вывод о двойственной роли чужеродных рыб в экосистеме бассейна.

**Keywords:** Ile-Balkhash Basin, trophology, ichthyofauna, alien species, introduced fish, commercial fish, aquatic ecosystem, biodiversity.

**Ключевые слова:** Иле-Балкашский бассейн, трофология, ихтиофауна, интродуценты, чужеродные виды, промысловые рыбы, экосистема, биоразнообразие.

Исследования. Материалом для анализа послужили сборы за 2023-2024 года по 7 видам рыб проведенные в 9 точках западной части озера (заливы Терсаккан, Тасарал, Каракамыс, Жилымды, Аккерме, Майтан, Бозарал, возле островов Лесные и Аякарал) и 7 из восточной (заливы Шомышколь, Кумарал, Тыкшок, Байкадамарал, Майкамыс, устья рек Лепсы и Каратал). Основу питания молоди сазана из залива Караузяк размером 3,0-4,0 см составляют зоопланктон - 23,5% по массе, ракообразные - 47,9% (мизиды - 15,7%, корофииды - 27,9%, гаммариды - 4,3%) и личинки хирономид - 24,4%. На Востоке сазан размером 2,5-5,0 см из Байкадамарала питается также зоопланктоном - 29,0% по массе. Из-за отсутствия или малого количества ракообразных (мизид) на крайнем востоке в питании сазанчиков возрастает роль личинок хирономид - 42,5% и личинок других насекомых - 18,3%. Индексы наполнения кишечника молоди в размере 3,0-5,0 см. по озеру в целом немного выше (170,4-177,1‰О), чем у подросших сазанчиков - 81,1‰О - на Западе, 47,1‰О - на Востоке. Наличие в пищевом комке детрита и песка до 15,0 % по массе у сазанчиков из устья р.Лепсы, говорит о недостаточности животного корма для них. Пищевой комок леща пойманного возле острова Аякарал в единственном экземпляре длиной 12,0 см, весом 31,980 г., состоял исключительно из ракообразных - 100% и его индекс наполнения был очень высокий - 234,5‰О. В восточной части озера (заливы Тыкшок, Кумарал) из-за недостаточности бентосных кормов лещ в размере 2,5-5,0 см продолжает питаться зоопланктоном - 63,3% по массе. За ним идут мизиды - 21,3%. Ввиду того на Востоке в обрастаниях преимущественно обитают представители крупных видов личинок хирономид, трудно доступные для молоди леща - роль их питания незначительна - 2,0%. Соответственно этому индекс наполнения кишечника у Восточного леща довольно низкий - 94,8‰О.

В западной части озера вобла длиной 3,0-4,0 питается зоопланктоном - 58,8% по массе, водорослями - 23,8%. Роль ракообразных в этом возрасте (мизиды - 6,2%, корофииды - 6,9%) незначительна. Вобла длиной 4,6-11,0 см больше предпочитает ракообразных и их величина в сумме колеблется в пределах от 43,3 до 75% по массе. Кроме них у подросшей молоди обнаружены молодь монодакны до 10,0%. Индекс наполнения кишечника у молоди воблы на Западе довольно высокий – 150,8-314,5‰О. В восточной части озера вобла в основном питается водорослями - 16,7 – 38,1% и мизидами 25,0 - 26,6% по массе. Из-за нехватки пищи в частности корофиид возрастает роль детрита, песка и соответственно индекс наполнения 114,3 – 174,9‰О несколько ниже, чем на Западе. Молодь карася из залива Караузек (материалы за 2024 г.) длиной 2,5-4,2 см в основном питается личинками хирономид – 86% по массе. Роль остальных кормовых организмов незначительна. Больше половины (52,5%) пищевого комка у карасей из залива Чемышколь (материалы нынешнего года) состоял из детрита. Интенсивность питания молоди карася в общих частях озера довольно высокая. Отсутствие животного корма на Востоке восполняется детритом, богатым минеральными и органическими веществами. Индекс наполнения кишечника в западной части озера - 480‰О, в восточной - 286,0‰О. В начале 80-х годов молодь судака и жереха питалась до 80-90% по массе мизидами. В настоящее время из-за сокращения численности мизид по сравнению с теми годами, молодь судака длиной 4,5 - 6,0 см вынуждена питаться зоопланктоном - 20,3% по массе. Значение мизид - 16,7% и корофиид - 20,0% в питании молоди судака на уровне низших ракообразных. Подросшая молодь (длиной более 6,0 см) предпочитает хищничать - 73,4% по массе и с возрастом (8,0-11,5 см.) это значение возрастает - 93,3%. Интенсивность питания молоди судака можно считать довольно высокой и индекс наполнения желудков составил - 111,7‰О на Западе, а на Востоке он колебался в пределах от 116,4 до 336,0‰О. Жерех длиной 4,5-6,0 см питается ракообразными. При длине более 5,0 см начинает хищничать. У жереха длиной 8,1-10,0 см пищевой комок состоял из рыб - 81,6% по массе, и по частоте встречаемости наибольшее значение имеет вобла. Интенсивность питания молоди жереха намного ниже, чем у судаков. Анализ питания молоди рыб показал, что несмотря на неодинаковые значения отдельных пищевых групп в пище рыб все корма используются довольно полно. Наибольшая острая конкуренция наблюдается из-за мизид, корофиид и личинок хирономид. Состав пищи молоди сазана на западной части, откармливающихся в одних и тех же местах в большой степени совпадает с составом пищи молоди леща - 55,3%, воблы - 53,9%, судака - 60,1%, жереха - 40,2% в основном по ракообразным. В восточной части озера у молоди сазана наблюдается также сходство с лещом - 34,8% (в основном по зоопланктону) и с окунем - 43,7% из-за хирономид. В восточной части озера также очень велико сходство пищи молоди судака и жереха - 82,3%. Из-за небольшого количества собранных материалов не смогли дать полного анализа сравнения темпа линейно-вещного роста молоди всех видов рыб из Западного и Восточного Балкаша, но с уверенностью можем сказать различия имеются не только между Западным и Восточным Балкашом, оно имеет место даже между заливами самой Западной части озера, также и Восточной.

В 2024 г. был проведен анализ питания трех взрослых видов рыб – сазана, леща, воблы. Анализу подвергнуты 60 экз. сазана размерами 25-52 см, 40 экз. леща длиной 22-32 см и 20 экз. воблы, длиной тела 15-20 см. Сазан по типу питания бентофаг, но при недостатке бентосного корма переходит на питание растительностью. Расселен по всему Балкашу и состав его пищи по отдельным районам озера не одинаков. Это связано с неравномерным распределением бентонтов. В Западном Балкаше материал на питание сазана отобраны из шести точек три точки расположены на юго-западном побережье и три на северо-восточном. В заливах юго-западного побережья сильно заросших водяной сосенкой и разнообразными рдестами, сазан питается как чисто бентическими формами бентоса, так и организмами обитающими на макрофитах, поэтому доля растительности в питание сазана в среднем составляет 44%, в то время как на бентосные организмы приходится 43% от массы пищевого комка. Черви (олигохеты и полихеты) как бы не участвуют в питании, однако следует оговориться, что фрагменты червей присутствуют в пробах питания, но в результате их сильной перевариваемости установить процентное значение их практически не возможно. Из бентосных организмов наибольшее значение имеют моллюски, корофииды, гаммарусы и личинки хирономид. Значение мизид не значительно. В заливах вдоль северо-восточного побережья, где основу бентофауны составляет моллюск *H. colarata* сазан питается последним (90% от пищевого комка). В восточной части Балкаша основным кормом сазана всегда являлось растительность, в августе 2024 г. растительность составляла 70%, содержание животных

кормов – а именно личинки хирономид в 30% по весу. В озерах нижней дельты р. Или в силу их сильной зарастаемости макрофитами основу макрозообентоса составляют организмы обитающие на растениях – это брюхоногие моллюски, корофииды и гаммарусы, минирующие формы личинок хирономид и личинки поденок (отнесенные к прочим личинкам насекомых). 33% по массе от пищевого комка составляют макрофиты. Сазан практически поедает всех представителей бентоса, и их содержание в пищевом комке находится в прямой зависимости от количественного развития того или иного представителя бентофауны. Такое разнообразие пищи сазана по отдельным районам озера обуславливается попищевой пластичностью, которая составляет 71,2%. Это имеет большое значение, так как кормовые участки сазана совпадают с пастбищами других рыб и в частности леща. Накормленность сазана в бухтах юго-западного побережья колеблется от 52 до 304‰О, в среднем – 133‰О; в заливах северо-восточного берега составляет 250 – 480‰О, в среднем – 320‰О. Одним из показателей обеспеченности рыб пищей является показатель соотношения основных и второстепенных кормов. В питании сазана периодически происходит колебания соотношения значений бентосных организмов и растительности, которое зависит от водности озера, чистоты воды, а также от численности промыслового стада данного вида рыбы. В восточной части озера на кормленность сазана ниже, чем в западной половине и равна 116‰О, а соотношение основных и второстепенных кормов (равно 1:2) говорит о недостатке в этой части озера бентосных кормов. В озерах нижней дельты реки Или, как уже говорилось, сазан питается бентосными организмами обитающими на растениях в силу сильной зарастаемости озер и наличия толстого покрова растительных остатков на дне кормленность сазана в озерах 127‰О, соотношение основных и второстепенных кормов составляет 1,3:1, что свидетельствует о необеспеченности сазана животными кормами на нагульных площадях. Лещ, как и сазан, бентофаг и также широко расселен по водоему. Питается в основном животными кормами. В вегетационный период 2024 года бентосные организмы в питании леща составляет от 32 до 60%. Наибольшее значение в питании леща в Западном Балкаше играют высшие ракообразные, преимущественно корофииды и гаммарусы, меньше – мизиды, независимо от места расположения нагульных площадей. Содержание личинок хирономид в пищевом комке леща колеблется от 0 до 15%. В восточной части озера при отсутствии в составе бентоса корофиид и гаммарусов лещ поедает мизид и личинок хирономид. Такое варьирование содержания организмов бентоса в пищевом комке леща говорит о его пластичности в питании и составляет около 72,9%. Накормленность леща по Балкашу колебалась от 5 до 215‰О, в среднем 74‰О. Соотношение основных и второстепенных кормов как в Западной части озера, так и Восточной составляет 1:1,1, что говорит о недостаточной кормовой базе половозрелого леща. Вобла в озере имеет смешанное питание, состав пищевого комка зависит от места пастбища, а также линейного размера рыбы. Так, в Западном Балкаше, плотва, кормящаяся вдоль юго-западного побережья, в основном поедает растительность. Бентос обычно представлен фитофильными формами личинок хирономид или других бентонтов. В заливах северо-восточного побережья, где биомасса двустворчатых моллюсков порой превышает 50-100 грамм, плотва начинает питаться последними по достижении длины тела 17 см. У рыб 17 см и выше моллюск гипангия составляет 40-60%, а у рыбы размерами 15-16 см пищевой комок почти на 100% состоял из нитчатых сине-зеленых водорослей. Накормленность плотвы в этом случае невысокая, составляет 37-70‰О. При питании плотвы моллюсками на кормленность 120-180‰О, т.е. более взрослые особи накормлены лучше. В восточной части озера вобла питается на 90-95% водяной сосенкой и рдестами. Накормленность плотвы на востоке озера 130-150‰О. Макрозообентос озера Балкаш состоит из высококалорийных и легкодоступных кормов и потребляется всеми рыбами, как мирными так и хищными. Сазан – высокопластичная бентосоядная рыба. Основой питания сазанов в озере Балкаш размерами 17-35 см. является двустворчатый моллюск гипанис, высшие ракообразные – корофииды и гаммарусы, а также личинки хирономид. Растительность составляющая до 16% представлена преимущественно листьями рдестов, которые поедаются сазанами во время соскабливания с них гаммарусов и личинок хирономид. У сазана из дельтовых водоемов содержание растительных кормов возрастает до 40%, но все же основу в питании играют высшие ракообразные и личинки хирономид. Индекс наполнения кишечника 140-190‰О. Основой пищевого рациона леща (L-17-25) как в самом озере так и водоемах дельты являются высшие ракообразные (мизиды, корофииды, гаммарусы). Содержание детрита в кишечниках леща колеблется от 10 в самом озере до 55% в дельтовых водоемах. Индексы наполнения у леща составляют 98-130‰О. Как и



два предыдущие виды вобла бентофаг, но содержание растительности у нее гораздо выше и составляют от 20 до 30%. Из бентосных организмов вобла поедает моллюсков высших ракообразных и личинок хирономид. Индексы наполнения кишечника 115-145‰О. Карась - всеядная рыба. Основой питания как в самом озере так и водоемах дельты являются растительные корма - водяная сосенка, рдесты. Бентосные корма представлены высшими ракообразными и личинками насекомых. Индекс наполнения 110-150‰О. Из хищных рыб анализу были подвергнуты половозрелые особи судака, берша, жереха линейными размерами от 19 до 40 см и молодь сома, линейными размерами от 33 до 91 см. Половозрелый судак (L-26-40 см) – хищник. Основу питания составляет вобла - от 37 до 50%, содержание леща колеблется от 5 до 30%. Наличие в питании судака молоди берша (13%) объясняется тем, что большая доля материала на питание рыб Западного Балкаша собрана из южной части озера, где численность берша более высокая, чем в других частях озера. В дельтовых водоемах и восточной половине озера в питании судака встречается карась - до 10%. Берш (L-19-26 см) - факультативный хищник. Наряду с рыбой поедает крупных донных беспозвоночных. Так у берша собранного в районе Мынаральских островов, заливе Ажибекарал высшие ракообразные составляют 26%, в том числе креветки 12% и молодь речного узкопалого рака 10%. Подобный состав кормовых организмов: раки - рыба наблюдается и у жереха. Жерех (L-25-40 см) как в самом озере, так и дельтовых водоемах на 30-55% питается крупными ракообразными. В питании молоди сома в предыдущие годы по мимо рыбы отмечались крупные личинки насекомых, сами насекомые и мизиды. Летом этого года в южной части Западного Балкаша и заливе Шубаркунан в желудках сома найдены раки. В основном уже полупереваренные остатки, в одном экземпляре длиной 51 см обнаружены помимо переваренной массы два экземпляра целых - 8 и 12 см длиной. Анализируя полученные данные можно заключить, что макрозообентос используется всеми промысловыми рыбами. Рацион питания мирных промысловых рыб тесно связан с местами нагула. Так, у сазанов длиной 18-32 см, отловленных в Западном Балкаше в районах Каракамыс, Тасарал, Лесные острова, основу составляет моллюск монодакна и личинки хирономид. По мере продвижения к юго-восточному побережью роль моллюсков снижается и возрастает значение корофиид и растительности. У леща спектр питания значительно шире, он более полно использует бентосные корма как в западной, так и в восточной половине озера. У воблы, как и у леща, спектр питания довольно широк. Расширение ареала монодакны в восточном направлении улучшило условия откорма рыб, нагуливающих в северо- восточной части западной половины озера. Кишечники как молоди сазана (L-19-25 см) и воблы (L-15-21 см), так и старшевозрастных особей, отловленных в районах Ортадересина, бухт Томар и Узунарал, наполнены моллюсками. Обеспеченность рыбы пищей определяется количеством и доступностью пищи в водоеме, а также зависит от продолжительности сезона нагула качественного состава кормящейся популяции рыб и в связи с тем, что в озере Балкаш отсутствуют фито и зоопланктофаги. нами рассчитана потенциальная рыбопродуктивность за счет макрозообентоса.

**Заключение.** Проведённый анализ свидетельствует о том, что современная промысловая ихтиофауна Иле-Балкашского бассейна в значительной степени сформирована за счёт чужеродных видов, отсутствовавших в природных сообществах региона ранее. Их интродукция позволила повысить рыбохозяйственное значение водоёмов и обеспечить устойчивые промысловые уловы. Вместе с тем широкое распространение интродуцентов привело к изменению структуры сообществ, перераспределению трофических ниш и снижению роли аборигенных видов. В этой связи дальнейшее использование чужеродных рыб требует научно обоснованного контроля с учётом экосистемных ограничений и приоритетов сохранения биологического разнообразия.

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## AGE STRUCTURE AND GROWTH OF PRUSSIAN CARP (*CARASSIUS GIBELIO*) IN LAKE DENGIZKUL (UZBEKISTAN)

**Namozov S.M.**

Junior Researcher

Institute of Zoology of the Academy of Sciences of Uzbekistan  
st. Bogishamol-232b, Tashkent, Uzbekistan

**Sobirov J.J.**

Doctor of Philosophy in Biological Sciences (PhD), Senior Researcher  
Institute of Zoology of the Academy of Sciences of Uzbekistan  
st. Bogishamol-232b, Tashkent, Uzbekistan

### Abstract

Lake Dengizkul (Bukhara Region, Uzbekistan) is an endorheic water body characterized by variable hydrological and hydrochemical conditions, which can substantially influence fish population structure and growth. This study aimed to determine age–size characteristics of Prussian carp (*Carassius gibelio*) in Lake Dengizkul, assess age-related variation in growth performance, and provide baseline information for fisheries management. Sampling was conducted in March 2025 using set gillnets (mesh sizes 16, 20, 24, 32, 36, 40, and 50 mm). In total, 63 specimens were analyzed. Total length (TL) and standard length (SL) were measured to the nearest 1 mm, and body mass (W) to the nearest 1 g. Age was determined from cycloid scales collected above the lateral line beneath the dorsal-fin base; sex-related differences in the length–weight relationship were not significant, and pooled analyses were applied. The sample comprised age classes 0+ to 5+ and was dominated by younger fish (0+–1+). Mean SL and W increased consistently with age, from  $8.26 \pm 0.11$  cm and  $8.92 \pm 0.36$  g (0+) to  $28.60 \pm 0.30$  cm and  $361.40 \pm 19.57$  g (5+). Variability in W was especially pronounced in older age groups, indicating heterogeneity in individual condition and/or resource availability. The results provide an initial age–size and age–weight baseline for *C. gibelio* in Lake Dengizkul and can support preliminary stock assessment and gear-selectivity decisions; further seasonal sampling is recommended to refine estimates for older cohorts.

**Keywords.** Lake Dengizkul; *Carassius gibelio*; Prussian carp; age structure; growth; scale ageing; fisheries management; Uzbekistan

In the Republic, a key priority of sustainable water-resources governance is the rational and scientifically grounded use of natural and artificial water bodies. However, the growing anthropogenic pressure—hydraulic engineering and dam construction, flow regulation, water abstraction, agricultural and industrial effluents, and recreational impacts—drives profound transformations of aquatic ecosystems. These drivers alter hydrological regimes and hydrochemical conditions, reorganize the trophic and spatial structure of communities, and ultimately affect the status of hydrobiont populations, including fish.

Against this background, a comprehensive assessment of rheophilic ichthyopopulations and their ecology is required, including spatial structuring, trophic relationships, reproductive strategies, and seasonal to interannual dynamics. The resulting evidence base is essential for biodiversity conservation, sustainable use of fish resources, and the implementation of adaptive management of aquatic ecosystems under increasing anthropogenic pressure and climate change.

Lake Dengizkul is located in the Alat District of Bukhara Region (southern Uzbekistan), within a tectonic depression at an elevation of approximately 181.5 m a.s.l., near the border with Turkmenistan; according to several descriptions, it lies about 75 km south–southwest of Bukhara. The lake is endorheic (closed-basin) and lacks a stable shoreline: its outline and surface area vary markedly depending on in-flow and evaporation. Recharge is provided primarily by collector–drainage discharge waters and seepage/return flows from irrigated lands; during high-water periods, the lake may also receive water from the Taykyr branch of the Zeravshan River.

Based on late 20th-century descriptions, Dengizkul had an approximate length of ~43.3 km, a maximum width of up to 9 km, a surface area of about 267 km<sup>2</sup>, and a volume of roughly 2.7 km<sup>3</sup> (these values correspond to a specific hydrological period and may differ in other years due to water-level fluctuations). To stabilize the water regime, a dike was constructed in 2017 (separating the main water area from the northwestern part), after which a relative stabilization of the water balance has been reported since 2018.

The Prussian carp (*Carassius gibelio* (Bloch, 1782)) is widely distributed across freshwater ecosystems of Europe and Asia. This species is characterized by pronounced ecological plasticity and high adaptive capacity, enabling it to maintain stable populations under fluctuations in hydrological conditions and water quality. It also typically exhibits relatively rapid growth rates and early sexual maturation, which enhance its competitive performance within fish assemblages. In the water bodies of Uzbekistan, *C. gibelio* forms abundant populations and, in many economically important aquatic systems, represents one of the key targets of commercial and recreational fisheries.

The aim of this study was to determine the age–size characteristics of the Prussian carp (*Carassius gibelio*) in Lake Dengizkul, to evaluate annual growth rates, and to identify key features of the population structure for subsequent application in fisheries management.

**Materials and methods.** Samples were collected in March 2025 from Lake Dengizkul (Bukhara Region) using set gillnets with mesh sizes of 16, 20, 24, 32, 36, 40, and 50 mm.

For each captured specimen, total length (TL) and standard length (SL) were measured to the nearest 1 mm, and body mass (W) to the nearest 1 g. Because standard length (the distance from the snout tip to the end of the scaled caudal peduncle) is frequently used as the principal linear metric in ichthyological studies, SL was recorded for all individuals with the same precision [2].

Age was determined from scales [4] collected from the mid-body region above the lateral line beneath the base of the dorsal fin. Scale readings were also used to perform retrospective growth reconstruction and to estimate annual increments using the Lea–Fraser method [2].

The analyzed material comprised 63 specimens of Prussian carp (*Carassius gibelio*). Scales were of the cycloid type with rounded margins. Annual growth zones were identified based on the alternation of areas with widely spaced versus closely spaced circuli; however, under rapid growth, annuli may be weakly expressed, which can reduce the accuracy of age determination.

**Length–weight relationship.** No statistically significant sex-related differences were found in the length–weight relationship; therefore, further analyses were performed using a pooled sample (males + females) (Table 1).

Table 1.

**Age–size and weight characteristics of Prussian carp in Lake Dengizkul (males and females pooled)**

| Age | SL, cm (mean ± SE; min–max)    | W, g (mean ± SE; min–max)      | N  |
|-----|--------------------------------|--------------------------------|----|
| 0+  | <u>7,5–8,6</u><br>8,26±0,11    | <u>6–10</u><br>8,92±0,36       | 17 |
| 1+  | <u>9,0–11,5</u><br>9,92±0,16   | <u>9–27</u><br>14,96±1,09      | 19 |
| 2+  | <u>18,3–20,0</u><br>18,93±0,54 | <u>95–122</u><br>109,67±7,88   | 3  |
| 3+  | <u>21,0–24,2</u><br>22,88±0,32 | <u>126–268</u><br>211,92±12,14 | 13 |
| 4+  | <u>26,0–27,4</u><br>26,88±0,22 | <u>189–346</u><br>294,00±24,54 | 6  |
| 5+  | <u>27,5–29,2</u><br>28,60±0,30 | <u>317–410</u><br>361,40±19,57 | 5  |

Table 1 summarizes age-related variation in standard length (SL) and body mass (W) of Prussian carp (*Carassius gibelio*) from Lake Dengizkul. A clear ontogenetic increase in both traits is evident: juveniles of age 0+ show SL of 7.5–8.6 cm and W of 6–10 g, whereas the oldest group (5+) reaches 27.5–29.2 cm in SL and 317–410 g in W. Mean SL increases consistently from 8.26 ± 0.11 cm (0+) and 9.92 ± 0.16 cm (1+) to 28.60 ± 0.30 cm (5+), accompanied by a strong rise in mean body mass from 8.92 ± 0.36 g (0+) to 361.40 ± 19.57 g (5+).

Within-age min–max ranges reflect individual variability, which becomes particularly pronounced for body mass in older fish (e.g., 4+: 189–346 g; 5+: 317–410 g), likely due to differences in feeding conditions, habitat use, and physiological status. It should also be noted that sample sizes for older age classes are smaller (4+: n = 6; 5+: n = 5); therefore, estimates for these groups should be interpreted with caution owing to limited representativeness. Overall, the data indicate a structured population with age-dependent increases in size and weight typical of the species.

**Discussion.** The age-specific size and weight data indicate a well-defined ontogenetic pattern for Prussian carp (*Carassius gibelio*) in Lake Dengizkul. Both standard length (SL) and body mass (W) increase monotonically with age, with a particularly pronounced shift from juvenile to adult stages. While SL increases relatively steadily across age classes, W rises disproportionately in older fish, reflecting the expected allometric nature of somatic growth (i.e., weight increases faster than length as body volume and tissue reserves accumulate).

The age structure of the sample is dominated by younger fish (0+–1+), whereas older age classes (4+–5+) are represented by fewer individuals. This distribution can be interpreted in several non-exclusive ways: (i) strong recruitment and high juvenile abundance, (ii) progressive natural mortality reducing cohort size with age, and/or (iii) size- and age-selectivity of the sampling gear. In addition, the very small sample size for age 2+ ( $n = 3$ ) suggests that estimates for this group may be sensitive to individual outliers and should be treated as preliminary.

Within-age variability (min–max ranges) becomes especially evident for body mass in older fish (e.g., 4+ and 5+), which is typical for cyprinids in heterogeneous environments. Such dispersion can reflect differences in feeding opportunities, habitat use, and individual condition, as well as seasonal physiological factors. Because sampling was conducted in March, variation in gonadal development and pre-spawning energy allocation may also contribute to increased scatter in  $W$  among mature individuals, even when  $SL$  ranges remain relatively narrow.

From an ecological perspective, Dengizkul is characterized by fluctuating hydrological and hydro-chemical conditions in a closed-basin setting, which can strongly influence trophic resources and growth performance. Under such variability, cohorts may experience different growth conditions during early life, and adult condition may respond rapidly to changes in food availability and environmental stressors. Consequently, the observed age-related trends in  $SL$  and  $W$  likely integrate both intrinsic life-history traits of *C. gibelio* and the environmental dynamics of the lake.

Overall, the presented age–size and age–weight patterns provide a useful baseline for population assessment and fisheries planning in Lake Dengizkul. However, more robust inference—especially for older age classes—would benefit from larger sample sizes, repeated seasonal sampling, and explicit evaluation of gear selectivity to separate biological signals from sampling effects.

**Conclusions.** Prussian carp (*Carassius gibelio*) in Lake Dengizkul exhibits a clear age-dependent increase in standard length ( $SL$ ) and body mass ( $W$ ). Mean  $SL$  rises from  $8.26 \pm 0.11$  cm in age 0+ to  $28.60 \pm 0.30$  cm in age 5+, while mean body mass increases from  $8.92 \pm 0.36$  g to  $361.40 \pm 19.57$  g over the same age range, indicating strong ontogenetic growth and pronounced weight gain in older fish.

The sample was dominated by younger age classes (0+–1+), whereas older fish (4+–5+) were less frequent, which may reflect cohort decline with age due to natural mortality and/or the selectivity of sampling gear. Within-age variability, particularly in body mass among older individuals, suggests heterogeneity in feeding conditions, habitat use, and physiological status.

These results provide baseline age–size and age–weight characteristics for *C. gibelio* in Lake Dengizkul and can support preliminary fisheries assessment and management decisions. Nevertheless, estimates for older age classes should be interpreted cautiously because of smaller sample sizes, and future studies should expand sampling across seasons and increase representation of older cohorts to improve precision and interpretability.

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## *Cultural sciences*

### SAFEVID DEVOTION IN ANATOLIAN OZAN-ASHIQ LITERATURE

Laman Osmanova

Doctoral Student, Nakhchivan State University

#### **Abstract**

*The ozan–ashiq tradition, an inseparable and significant component of the Turkish language and Turkish spirituality, has preserved its spiritual–mystical leadership for centuries. Both before and after Islam, Turkish peoples regarded the institution of ozan as a fundamental cultural necessity, maintaining it throughout nomadic, semi-nomadic, and later settled urban periods. The Turkish ozan tradition is rooted in ancient epic-telling practices and possesses a complex and multifaceted system. At the same time, the ozan tradition represents Turkish folk Sufism. It is natural that the wisdom of the people survives in the vernacular language, as well as in folklore and ethnographic traditions. From this perspective, the Safavid–Qizilbash ideology was a quintessential example of Turkish folk Sufism. Particularly in Anatolia and Azerbaijan, the ozan–ashiq tradition was shaped from the medieval period onward on precisely this ideological foundation. In both regions, it is impossible to encounter an example of ashik art or ashik poetry that does not embody elements of Safavid thought and the Alevi worldview.*

**Keywords:** *Anatolia, Azerbaijan, ozan, ashik, Sufism, Qizilbash, Safavidism, irfan, saz, poetry, etc.*

*For centuries, the Anatolian plateau has been home to multiethnic and multicultural communities. Each person and nation living here has formed its own regional yet tolerant civic values. Among these peoples, the Turks—who long ago made Anatolia their homeland—have always held a leading position. After antiquity, Turkish identity and Turkish dominance shaped the present and guaranteed the future of this geography in every era of history. The Turks consistently ruled these lands; thus, Anatolia came to be governed under the authority of the Turkish language and Turkish culture.*

*When we say “Anatolia,” the first things that should come to mind are not the Byzantine, Seljuk, or Ottoman empires, but Turkish folk literature, Turkish folk music, Turkish folklore, and Turkish ethnography. Popular and national values have blended with universal values on these lands in a remarkably fluid and harmonious way, producing a unique model of civilization. The cultural–spiritual harmony that emerged both from congruences and contradictions turned Anatolia—using the Anatolian Turks’ own expression—into the “heart of the world.”*

*No matter how much Anatolian Turkish culture has intertwined with other cultures, one element has remained unchanged and modernized in its own distinctive way: the ozan–ashiq tradition. “Considered a continuation of the ozan tradition initiated by the Turks even before the advent of Islam, Alevi ashiks became the creators of works regarded as unique in many respects. In Anatolia, Alevi literature—which is considered the bearer of Turkish culture against the dominance of Persian and Arab cultures—chose to remain Turkish while embracing Islam.” [1, p. 32].*

*Throughout nearly every period of Turkish history, this cultural phenomenon—which creates and records the history of a people and a society—has retained its strength, significance, and relevance in modern Anatolia. In fact, the need for ozan–ashiq creativity has grown even stronger over time. This is because the existence and preservation of Turkish identity in Anatolian Turkey depend greatly on the ozan–ashiq tradition. The purity of the mother language, the distinctiveness of popular psychology, and the need to resist assimilation into other cultures have been safeguarded by the ozans, ashiks, dedes, pirs, and abdals—a process that continues today. The Turkish researcher İ. Doğan expresses this idea as: “When Turkish tribes embraced Islam over a certain period, they could not abandon their saz. It was with the saz that they would praise Islam. They would perform the semah as a divine dance accompanied by the saz, uniting with the God whose presence they believed manifested within them. Men and women would worship together.” [2, pp. 27–28].*

*In Anatolia—a geography that serves as a mosaic of cultures—there exists nothing stronger or more authentic than the ozan–ashiq tradition to ensure the preservation of Turkic identity, Turkism, folk spirit, and ultimately the national core. Whether through literary art and its epic-telling background, the centripetal simplicity of its musical material, or the genre’s generally closed and conservative nature with respect to external elements such as musical modes, rhythmic structures, poetic forms, and other*

components, the ozan–ashiq tradition has safeguarded the purity and originality of Turkish culture in Anatolia.

For example, the saz (or bağlama), the principal attribute of the ozan–ashiq art, is a musical instrument with its own distinct repertoire, performance tradition, and tonal structure. It is practically impossible to adapt musical pieces from other genres—such as arabesque, pop, or Turkish classical music—to the saz in a way that would align with the structural ethos of ozan–ashiq art. The issue of repertoire is crucial here. With the exception of certain virtuoso solo performances, the Anatolian ozan tradition cannot exist without words—without poetry. Unlike songs and türkü that have evolved into artistic, staged, or concert-driven forms, genuine ozan art manifests itself most authentically in Alevi–Qizilbash deyiş and semah traditions of Anatolia.

In this context, the primacy of the word is decisive. The saz semahs and saz zikrs—also known as lodge and cemevi music—are characterized by the fact that words take precedence over music; music merely functions as a transmitter and intensifier. It is therefore no coincidence that many renowned performers who serve as zakir in cemevi ceremonies cannot reproduce in the lodge the artistic style they display on stage or on television. The poetry and music performed in cemevi are not artistic products but expressions of worship. For this reason, many well-known performers are transformed into ordinary dervishes as soon as they enter a cemevi: indistinguishable from others, seated humbly in a corner, joining the community in zikr and semah, and following the commands and guidance of the cem dede.

It should also be noted that this phenomenon is not exclusive to Anatolian Alevism. Many celebrated artists in Turkey and Iran, who belong to different Sufi orders, serve within their respective traditions as mürid, zakir, or guyende (a person who performs poetry and music to guide dervishes into zikr). Among them are Ahmet Özhan, a disciple (mürid) of the Khalwati–Cerrahi order in Turkey, and Shahram Nazeri, one of the Ahl-e Haqq dervishes in Iran. Despite their fame, both artists remain deeply loyal to their orders, their pir, their mürşid, and the rules and etiquette of their lodges. This fact demonstrates once more that Sufi philosophy is far from being a simple belief system or ritualism; it represents an ongoing cultural renaissance of the Near and Middle East, including the Islamic world.

Like other Sufi traditions, Alevism–Bektashism has played a significant role in shaping this renaissance. “Haji Bektash Veli formed a belief system based on the principle of controlling one’s hand, tongue, and loins, and on the four gates—Sharia, Tariqa, Ma’rifa, and the Secret of Haqiqa—which constituted the essential doctrine of the Sufi school initiated by Ahmad Yasawi and later expanded across the Khorasan region. This belief system came to be known as Alevism–Bektashism.” [3, p. 83]

As demonstrated by the foregoing explanations, despite the rich mystical–Sufi diversity across Anatolia and the socio-cultural—even class-based—differences among various orders, they all, in essence, share a unified structural framework. The worship practices, zikr ceremonies, semah rituals, recited poetic compositions, venerated saints, and the overall lodge (khānaqāh and tekke) structure exhibit remarkable similarities. Among these orders are the Mevleviyya, Qadiriyya, Khalwatiyya, ‘Ushshaqiyya, Cerrahiyya, and others. The central axis of this shared framework is formed by key concepts of Sufi metaphysics such as divine love (‘ishq-i ilahi), wahdat al-wujūd, wahdat al-mawjud, and fanā’ fi’LLāh.

Although many of these orders have gradually distanced themselves from foundational Sufi principles and merged with various religious-sectarian currents, Anatolian Alevism remains one of the rare contemporary traditions that has preserved a highly active intellectual and spiritual vitality. Millions of Anatolian Alevis, living across tens of thousands of villages and small towns, have managed to protect their esoteric heritage through the wisdom of experienced dedes and pirs in modest, old, and what may be called “kharābat-style” cemevis. Most of these dedes are themselves ozans: they play the saz, perform semah, and recite nefes and deyiş. They have never appeared on stage, in concerts, or on television. For many of them, identifying the saz, the bağlama, the deyiş, or the semah with artistic performance—meaning with “art”—is unacceptable.

This characteristic tendency is even more pronounced among the Ahl-e Haqq communities of Iran and Southern Azerbaijan. Members of the Ahl-e Haqq do not touch their sacred instrument without prayer or ablution; they do not perform it outside the jamkhāna; nor do they play the tanbur or recite kalām for anyone who does not belong to the order. This atmosphere of secrecy and conservatism shared by both Anatolian Alevis and the Ahl-e Haqq is rooted in two principal reasons. The first is the desire to protect the esoteric secrets of the order from the nā-mahram, as they call outsiders; they believe that not everyone should gain access to these semah, deyiş, kalām, or zikr practices or turn them into popular cultural products. The second reason is historical: in both regions, Alevis and the Ahl-e Haqq have long been subjected to persecution by local authorities and by religious-sectarian forces that those authorities empowered.

However, it must be remembered that both Anatolian Alevism and the Ahl-e Haqq tradition of Iran and Southern Azerbaijan, despite being highly specific and closed in terms of their doctrinal structures, are at the same time profoundly widespread. This is because these ideological currents encompass extremely large populations. Naturally, this broad social base has contributed to the development of ozan-ship, ashiq performance, poetry, and artistic creativity within the framework of these orders.

For example, among the Anatolian Alevis—especially in villages and small towns—it is almost impossible to find a household that does not possess a saz, bağlama, or cüre. Even if no one in the household can play it, one of these instruments is invariably hung on the wall. The presence of the saz is one of the principal markers of Alevi–Qizilbash identity. The same phenomenon can be observed in both Southern and Northern Azerbaijan. In this regard, it is enough to mention just two regions—Borçalı and Qaradağ. In these historical Azerbaijani territories—one in the north, the other in the south—it is truly difficult to find a home where the saz is not played or where affection and reverence for ozan and ashiq culture do not exist.

The development and mutual interaction of Azerbaijani ashiq art in these two geographically distant regions have become even more visible today. Due to easier travel possibilities and the opportunities provided by television and internet platforms, we are once again witnessing the depth and strength of the historical and genetic bond that Azerbaijani Turks maintain with the ozan–ashiq tradition. Particularly in the Borçalı region, the ashiq tradition preserved to this day includes a remarkable practice: when an ashiq, dede, or ozan passes away, the funeral begins with Quranic recitation and continues with the saz. In contemporary Borçalı, it is customary to perform the famous and ancient saz melody “Mənsuri” during the burial ceremony of an esteemed ashiq.

A rare example of this ritual can be found widely in Anatolia today as well. The funeral rite commonly known in Turkish as cenaze namazı (funeral prayer) is distinguished by its unique and characteristic form:

**“Türkçe cenaze namazı**  
*Bismi şah, Allah Allah*  
*Sağ el kalp üzeri*  
*Her canlı ölümü tadacaktır*  
*Her şey aslına dönecektir*  
*Haktan geldik, Hakka dönecektir*  
*Yüce Allahın selamı ve rahmeti*  
*Muhammet Mustafaya*  
*Aliyel-Murtazaya ve onların evlatlarına selam olsun... [4. s. 26].*  
**“The Turkish Funeral Prayer**  
*Bismi Shah, Allah Allah*  
*With the right hand placed over the heart*  
*Every living being shall taste death*  
*Everything shall return to its origin*  
*We came from Haqq, and to Haqq we shall return*  
*May the peace and mercy of Almighty God*  
*Be upon Muhammad Mustafa,*  
*Upon Ali al-Murtaza, and upon their descendants...”*  
 [4, p. 26].

Another noteworthy point is that, as a consequence of the Soviet period and the earlier policies of occupation, unlike the Ashiq art of Borchali and, in general, Northern Azerbaijan, the ideology of Sufism—both covertly and overtly—has been preserved within the Ashiq schools and environments of Southern Azerbaijan, particularly in Tabriz and Qaradağ. In Southern Azerbaijan, the vast majority of the Qaradağ Ashiqs are Ahl-e Haqq Alevis. However, unlike the Alevi–Qizilbash ozans of Anatolia, these Ashiqs do not reveal this identity and tend to conceal their beliefs among the people. As is well known, the tekkes of the Ahl-e Haqq in Iran and Southern Azerbaijan are generally secretive and closed communities. The Ahl-e Haqq can be recognized only through a few outward signs (for example, their never-trimmed mustaches, their avoidance of smoking, etc.). Apart from such signs, no member of the Ahl-e Haqq openly displays their creed; on the contrary, they strive to conceal it.

Anatolian Alevi ozan tradition not only preserves its ideological foundation but also goes a step further by attempting to introduce it into the cultural sphere of the world—and in many instances, they succeed in doing so. “Indeed, Alevism is a great humanism. For them, to love human beings is to love God. Serving humanity is the highest form of worship. The human being is the representative and follower of

*God on earth. This idea and behavior constitute the rebellion of reason against religious dogmatism that seeks God only in the heart.” [5, p. 6].*

*The universal ideological foundation characteristic of the ozan tradition—particularly of Sufi ozanism—namely its ability to transcend the boundaries of its associated religion, nation, and geography in order to express more global and humanistic ideas, is one of the essential qualities of contemporary Anatolian ozan culture.*

*Modern Anatolian Alevism, aside from a few newly emerged extremist leftist or radically anti-Islamic tendencies (such as the absurd notion of “Alevism Without Ali”), continues to preserve its vitality, freshness, and productivity like a tree that has grown and flourished upon its own deep roots. In fact, it may be that Anatolia needs Alevism now more than ever. This is because Sufi traditions such as Alevism and Bektashism, as systems of thought and philosophy—and at the same time as ways of life and forms of socio-cultural engagement—play an irreplaceable role in bridging the ever-widening and deepening chasm between belief and unbelief. Ultimately, it is precisely this spiritual elevation and sublimity that lie at the core of Irfan and Sufism.*

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## *Economic sciences*

### *CIRCULAR ECONOMY AND SUSTAINABLE DEVELOPMENT*

**Maia Chechelashvili**

Doctor of Economics (Ph. D.)

Associate Professor, Georgian Technical University

**Badri Gechbaia**

Doctor of Business Administration (Ph. D.)

Professor at Batumi Shota Rustaveli State University

#### **Abstract**

*The article explores the development of the circular economy. It highlights its aim to minimize the use of new materials and energy while reducing environmental impacts associated with resource extraction, harmful emissions, and waste. It seeks to establish a zero-waste hierarchy, which, according to the authors, serves as a guiding principle for waste reduction in a circular economy. This economy emphasizes actions to reduce, reuse, and recycle waste. Waste prevention ranks highest in the hierarchy, while waste disposal ranks lowest. The authors argue that priority should be given to measures at the top of the hierarchy, such as waste prevention, preparation for recycling and recovery, recycling, and energy and resource conservation.*

**Keywords:** *Circular economy, sustainable development, waste and pollution, restoration of natural systems.*

#### **Introduction**

*The circular economy is based on three principles:*

- *Reducing waste and pollution (ideally to zero).*
- *Making efficient use of equipment and resources.*
- *Restoring natural systems.*

*In other words, products, equipment, and infrastructure should remain in use for as long as possible, and waste from one process should be converted into raw materials for another.*

*This approach also includes the use of renewable energy sources and the recycling of secondary raw materials. The result should be a simultaneous increase in economic, natural, and social capital.*

*The Ellen MacArthur Foundation (EMF) notes that "the goal of a circular economy is to restore capital, whether financial, industrial, human, social, or natural. This ensures an increase in the flow of goods and services."*

*According to the Ellen MacArthur Foundation (EMF), a circular economy is "an economy that is regenerative in nature and aims to maintain the usefulness of products, components and materials and preserve their value." (1)*

*The development of a circular economy focuses on minimizing the need for new materials and energy and on reducing the environmental impacts associated with resource extraction, emissions, and waste.*

*The zero-waste hierarchy is a guiding principle for waste minimization in a circular economy, prioritizing reduction, reuse, and recycling. Waste prevention is at the top of the hierarchy, while waste disposal is at the bottom. Priority should be given to measures at higher levels of the hierarchy, such as waste prevention, preparation for recycling and recovery, and energy and resource conservation.*

#### **1. Circular Economy and the Sustainable Development Goals**

*The circular economy offers a unique perspective for achieving several Sustainable Development Goals (SDGs) and their associated targets, including SDG 3 on healthy lives and well-being, SDG 6 on energy, SDG 8 on economic growth, SDG 11 on sustainable cities, SDG 12 on sustainable consumption and production, SDG 13 on climate, SDG 14 on oceans and SDG 15 on life on land. (2)*

*A circular economy promotes the efficient use of natural resources. It reduces the need for primary materials and reduces waste, thereby reducing negative impacts on ecosystems. It can also encourage responsible and sustainable production and consumption, including reducing the use of chemicals in the processing of raw materials and products. A circular economy promotes the gradual elimination of high-risk chemicals from material flows to ensure safe reuse and recycling and to reduce emissions. In addition, the circular economy supports job creation, thereby improving human well-being. It recognizes the need*

for skilled workers to transform waste into new resources and to collect and recycle secondary materials, thereby promoting education, gender equality, and women's empowerment across all countries and regions. New jobs can be created in sectors such as agriculture, renewable energy, construction, and manufacturing. The International Labor Organization projects the creation of 18 million "green" jobs by 2030, including 4 million in manufacturing and 9 million in the renewable energy and construction sectors. Across these sectors, a shift to circular thinking will support growth.

The circular economy is a tool for creating zero-waste businesses that maximize the value of resources by recycling, repairing, reusing, repurposing, or upgrading products and materials. By adopting a circular economy, communities, businesses, and individuals reimagine the potential value of materials and products, helping them transition from waste to greener, more sustainable options.

The circular economy fosters innovation across sectors to achieve a cleaner and more competitive economy, thereby contributing to the Sustainable Development Goals and their associated targets.

The following Sustainable Development Goals are clearly linked to the circular economy:

Goal 3:9 ("By 2030, significantly reduce the number of deaths and illnesses caused by hazardous chemicals and air, water, and soil pollution").

Goal 6:3 ("By 2030, improve water quality by reducing pollution, eliminating waste and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and significantly increasing recycled water and safe water recycling globally.")

Goal 8:3 ("Promote development-oriented policies that support productive activities, decent work, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro, small and medium-sized enterprises, including through access to financial services.")

Goal 8:4 ("By 2030, progressively improve global resource efficiency in consumption and production, while striving to achieve economic growth without environmental degradation...")

Goal 11:6 ("By 2030, reduce the per capita negative environmental impact of cities, "...with a special focus on air quality and municipal and other waste management.")

Goal 11:6 ("By 2030, reduce the per capita negative environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.")

Goal 8:3 ("Promote development-oriented policies that support productive activities, decent work, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro, small and medium-sized enterprises, including through access to financial services.")

Goal 8:4 ("By 2030, progressively improve global resource efficiency in consumption and production, while striving to achieve economic growth without environmental degradation...")

Goal 11:6 ("By 2030, reduce the per capita negative environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.") Addressing air quality and municipal and other waste management... waste.

Target 12:4 ("By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their releases to air, water and land, to minimize their adverse impacts on human health and the environment.")

Target 12:5 ("By 2030, significantly reduce the generation of waste through prevention, reduction, recycling and reuse.")

Target 14:1 ("By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine litter and nutrient pollution.

Target 15:5 ("Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of endangered species.")

## **2. Plastics as a key target material for the circular economy**

In January 2016, the World Economic Forum (WEF) and the Ellen MacArthur Foundation published a report, "The New Plastics Economy – Reimagining the Future of Plastics." (3)

The report notes that:

Plastic packaging is typically used only once; 95% of the value of plastic packaging, which is worth US\$80-120 billion, is lost to the economy each year.

Plastic packaging creates negative economic externalities, conservatively estimated by UNEP at US\$40 billion.

Given the projected growth in consumption under a "business as usual" scenario, by 2050, the oceans are expected to contain more plastic (by weight) than fish, and the polymer industry will consume 20% of total oil production and 15% of the global annual carbon budget.

*While countries are investing heavily in advancing toward a circular economy, little or no attention is paid to the toxic chemicals present in new products made from recycled materials.*

*The circular economy is indirectly linked to the sound management of chemicals and waste. It plays a vital role in achieving the SAICM goal of minimizing the negative impacts of chemicals on human health and the environment.*

### **3. Circular Economy and Toxic Chemicals**

*However, there is growing evidence that the circular economy is failing to address toxic chemicals in products, particularly those intended for children.*

*According to the #breakfreefromplastic movement, "Recycling is not as safe as we might think. Flame retardants and other toxic substances are added to many plastics, and these compounds are re-used when the plastics are recycled into new products, including children's toys." (4)*

*The updated technical guidelines prepared for the Open-ended Working Group of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal list toxic additives in plastics. It states that "highly toxic additives used in plastics can have negative impacts on human health and the environment. In addition, hazardous additives persist in the environment, can be degraded, and can be released from landfills or other waste sources. Recent studies have shown that plastic found on beaches in England contains high levels of chemical additives that have been banned in Europe for some time. In addition, burning plastic waste can lead to the release of hazardous substances, such as accidentally formed persistent organic pollutants, such as dioxins."*

*Most of these substances have been phased out, but they remain present in recycled products.*

*According to the report "Key Facts for Designing Plastic Packaging for Recyclability," most additives in virgin plastic waste "are not consumed, replaced or broken down by melting or mechanical recycling (unlike glass or metal recycling), so they are retained and found in granules." (6) The report also notes that "the industry has voluntarily removed some of these substances and exist as legacy substances but are not reintroduced into the virgin plastic production cycle." The report, titled "Toxic Additives in Plastics: The Hidden Health Hazards of Common Plastic Products," cites extensive data from recognized scientific articles and journals on the most dangerous groups of chemicals used in plastics. (7)*

*The report defines "hazardous substances" in plastics as those that pose a risk to human health and the environment, including flame retardants, perfluorinated chemicals, phthalates, bisphenols, and nonylphenols.*

*These chemicals, many of which are classified as endocrine disruptors, are toxic additives in plastics that are commonly used in everyday products, including children's toys, food packaging, electronics, textiles, upholstery, and furniture. Even small amounts of these chemical additives in plastics can cause cancer, damage to the immune and reproductive systems, impaired intellectual function, and/or developmental delays. The report also notes that "the presence of toxic additives represents a potentially significant barrier to plastic recycling and the transition to a circular economy." According to the report, "recycled plastic" – that is, plastic from various sources that has been melted down and recycled – is used to make children's toys and has been found to contain several banned, restricted or otherwise hazardous chemicals." This practice continues "due to a lack of transparency from manufacturers, insufficient recycling regulations and mislabeling that allows this practice to continue."*

*There is evidence that the industry is focusing on recycling its products to reduce waste. However, in practice, this results in the recycling of materials hazardous to human health and the environment, including those already banned worldwide. The report notes that, for example, polymeric materials such as foam, plastic food packaging, paper, rubber, and textiles can contain flame retardants, plasticizers, softeners, coatings, modifiers, catalysts, other additives that improve performance, and traces of different substances. When these are recycled into new products, the resulting materials are often heavily contaminated, heterogeneous, and unsanitary, even for toys and food-contact materials.*

### **4. Circular challenges in the textile industry**

*A report by the Ellen MacArthur Foundation shows that the clothing sector is far from circular: 97% of fibers come from virgin raw materials, while only 1% comes from recycled materials (closed loop) and 2% from recycled materials obtained from other industries.*

*It is well known that "textiles made from natural fibers such as cotton, hemp, or wool are renewable resources and therefore much less harmful to the environment. Meanwhile, polyester fabrics and other artificial fiber fabrics are made from non-renewable petroleum products and are much more difficult to produce and recycle."*

*Although global consumption of recycled polyester fibers increased by 58% in one year (2015-2016), 73% of used clothing ends up in landfills or is incinerated, while only 12% of textiles are recycled.*

*To facilitate large-scale recycling, fibers should be unmixed whenever possible, as separating fiber mixtures during the recycling process is very expensive. "It is generally difficult to recycle textiles containing mixed fibers into quality materials, and some fiber blends are particularly problematic, such as those containing spandex or elastane. Therefore, discarded jeans containing spandex or elastane are often converted into insulation or industrial cleaning materials."*

*In addition, the toxic chemicals present in textiles represent another obstacle to safe and effective recycling. It is sometimes assumed that all textile waste can be recycled, but in reality, if textiles contain toxic chemicals, the possibilities for safe recycling and circular use are at best limited and at worst impossible.*

*If contaminated textile waste is recycled, hazardous chemicals will be released into new products. They cannot be disposed of in landfills or incinerated, as toxic emissions and waste pollute the environment and the food chain and ultimately enter humans.*

*To address this problem, toxic chemicals must be removed entirely from the textile production process and replaced with safe alternatives that produce non-toxic end products and associated waste, thereby strengthening the circular economy and enhancing safety. However, this is hampered by the large-scale production of toxic chemicals, the absence of uniform global binding regulations, the lack of mandatory disclosure requirements for toxic content in textiles, and manufacturers' desire to produce large quantities of cheap goods to meet mass production requirements. A hazard classification of chemical products based on hazardous properties is necessary.*

*To facilitate large-scale recycling, fibers should be unmixed whenever possible, as separating fiber mixtures during recycling is very expensive. "Textiles containing mixed fibers are typically difficult to recycle into quality materials, and some fiber blends are particularly problematic, such as those containing spandex or elastane. Therefore, discarded denim jeans containing spandex or elastane are often converted into insulation or industrial cleaning materials."*

*In addition, toxic chemicals in textiles create another barrier to safe and effective recycling.*

#### **5. Pathways to a Safe Circular Economy**

*Toxic additives should be replaced with non-chemical alternatives or non-toxic substances. This will facilitate recycling and help prevent contamination of recycled materials with toxic chemicals, including those banned by existing chemical treaties.*

*Recyclers need to know the chemical composition of the plastic waste they process to ensure that the recycled materials they produce can be used in toys, food packaging, and other consumer products.*

*There are often barriers to sharing information within the industry due to business confidentiality requirements.*

#### **6. Recommendations**

*Waste management and recycling are essential to a safe approach to the circular economy, but the transition extends beyond these two. The concept of the circular economy also encompasses many other aspects, such as ecodesign, the development of new business models, product service systems, product life extension, life guarantees, reuse, repair and refurbishment strategies, repair regulations, and the transition to full producer responsibility (with high performance targets and outcomes supported by strict enforcement).*

*Industry must develop safe materials and systems, infrastructure, and technologies to ensure the replacement of toxic chemicals with safer alternatives. Chemicals should be assessed against a comprehensive set of human and environmental health criteria to enable the selection of less hazardous chemicals or alternatives. Circular economy strategies should focus on proactive assessment and verification of material chemical composition to prevent unsuccessful substitutions and reduce the toxicity of materials entering commercial circulation.*

*The wider adoption and further development of exposure-based testing approaches can also inform substitution efforts and ensure the toxicological safety of plastics within a circular economy.*

#### **7. A global minimum transparency standard as a way forward**

*Knowing which chemicals enter products throughout their life cycle is crucial for a safe and non-toxic circular economy. Here, we emphasize that transparency and traceability, which help prevent hazardous chemicals from entering material flows, are at the heart of a circular economy that is safe for human health and the environment. One way forward is to agree on a global minimum transparency standard for the disclosure of chemicals in products.*

*There are several possible options for developing a transparency standard. For example, a transparency standard could initially focus on a "negative" list of chemicals that are internationally recognized as posing risks to human health and the environment. Such chemicals are already regulated globally, for*



example, under the Stockholm Convention, or regionally, under the list of substances proposed by the European Union.

However, the global transparency standard should be further expanded to include other hazardous chemicals once the criteria for chemicals of international concern are developed. It is sometimes assumed that all textile waste is suitable for recycling; however, if textiles contain toxic chemicals, the possibilities for safe recycling and circulation are limited at best and impossible at worst.

If contaminated textile waste is recycled, hazardous chemicals may be present in the resulting products. They cannot be disposed of in landfills or incinerated, as toxic emissions from these processes pollute the environment and the food chain and ultimately reach humans.

To address this problem, toxic chemicals should be removed entirely from the textile production process and replaced with safer alternatives that yield non-toxic end products and associated waste, thereby strengthening the circular economy and enhancing safety. However, the large-scale production of toxic chemicals hinders this, as do the lack of uniform global binding regulations, the lack of mandatory disclosure requirements for toxic content in textiles, and manufacturers' desire to produce large quantities of cheap goods to meet mass production requirements.

#### **9. What hinders recycling in the textile sector?**

Low quality and fragility. Product quality is a vital factor for recycling, selling, repairing, and renting second-hand clothing. Very cheap clothing is often produced, with quality not guaranteed; therefore, it cannot be reused. Low-quality fast-fashion products are usually discarded. Fast-fashion products are discarded approximately twice as quickly as conventional goods. In addition, consumers associate low-quality fast-fashion garments with disposability, thereby increasing the likelihood that they will be discarded with household waste. This, in turn, increases the volume of waste sent to landfills and incinerators.

Second-hand clothing is not always a win-win solution. The conversion of low-quality clothes into second-hand clothing is also problematic. The situation is similar to the case of e-waste shipped from developed countries to developing countries and labeled as "second-hand goods". In reality, this waste is recycled in the informal sector, polluting the environment and ending up in landfills. Similarly, low-quality clothing sold as second-hand cannot be reused and contributes to the growth of waste piles that end up in landfills, incinerators, or open burning, leading to emissions and the release of toxic chemicals from textile waste into the environment.

#### **10. Hazardous chemicals contaminating value chains.**

A wide range of hazardous substances are found in textiles throughout a product's life cycle. For example, dyeing processes alone typically use more than 1,600 different chemicals, including formaldehyde, chlorine, lead, and mercury. Per- and polyfluorinated compounds (PFOS) are used in certain textiles due to their chemical stability, water-repellent properties, and oil resistance. Some of these substances are persistent organic pollutants that persist in the environment and are associated with serious health problems.

While the risks posed by many chemicals are well known, the potential issues of their presence in manufactured fabrics have not been widely studied, and the available information for consumers is limited. Little is known about how toxic chemicals from processed textiles are recycled. Further research is needed to clarify whether the textile recycling process contributes to poisonous contamination in new products made from recycled materials. Recycling is only a small part of the solution.

Worldwide, only 12% of the materials used to produce clothing are recycled. The problem partly stems from fabric composition, as fabrics often combine different types of fibers, including natural, synthetic, plastic, and metallic fibers. Recycling such mixed fibers is very challenging because separating the desirable fibers from the mixture is difficult. As a result, recycling often leads to the destruction of fabrics, where "value is lost as the fabrics are converted into industrial cleaning materials, insulation, carpets, etc."

A large volume of used textiles is sent to developing countries, where recycled fiber yarns are spun into low-quality products. To promote broader recycling, the textile industry should invest in recycling equipment at production sites.

The GIZ (German Agency for International Cooperation) report "Promoting Sustainability in the Textile and Clothing Industry" notes that potential solutions exist, but none have yet reached market maturity.

There are insufficient collection systems. Many countries lack established systems to supply the market with secondary raw materials for recycling. Some companies are implementing take-back

programs in their stores, but the fate of the collected clothing remains unclear. Additionally, the absence of collection standards prevents collectors from relying on high-quality secondary raw materials.

*Circular solutions in the textile industry.* Currently, France has two mandatory EPR schemes for textiles, requiring companies to either establish their own reuse and recycling programs or contribute financially to Eco TLC. This nationally mandated organization provides a collective system for the industry. In addition to these mandatory schemes, various brands, such as H&M and Puma, are also taking voluntary measures.

### **11. Tax solutions**

Sweden has recently implemented a tax on textiles containing substances of very high concern (SVHC), as defined by the EU REACH regulation, as well as on chemicals that meet similar criteria. All clothing is subject to the tax, but the taxpayer may reduce it by up to 95% if they can demonstrate that their products do not contain such chemicals. These measures provide real incentives for manufacturers and brands. As long as hazardous chemicals are used at various stages of textile and clothing processing and throughout the entire life cycle of clothing, it will not be possible to achieve safe and clean recycling. A comprehensive list of restricted substances in the supply chain, along with strict monitoring and enforcement of national regulations, will help eliminate hazardous chemicals from the textile life cycle.

### **Conclusion**

As long as hazardous chemicals are used at different stages of textile and clothing processing and throughout the garment's life cycle, safe and clean circularity will not be possible. An ambitious list of restricted substances in the supply chain, strict monitoring, and enforcement of national regulations will ultimately help eliminate hazardous chemicals from the textile life cycle. Transparency in the supply chain and for consumers

Knowledge about the chemicals used in the textile and clothing supply chain is a key step towards a safe, circular economy. A lack of information about chemicals throughout a product's life cycle undermines recycling and deprives consumers of the opportunity to make informed choices when purchasing and disposing of products. Some companies already provide consumers with information on the environmental impact of their products, for example, through specific eco-labels for textiles and clothing. Mandatory, standardized labeling of environmentally friendly, non-toxic, and socially responsible products is a clear path to achieving sustainability and ensuring the right to information in the textile and clothing industry.

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## DEVELOPMENT OF RECOMMENDATIONS FOR OPTIMIZING INTERNAL CONTROL OF FIXED ASSETS IN PRIVATE EDUCATIONAL INSTITUTIONS

**Hu Teng**

*Al Farabi Kazakh National university, Al Farabi business school,  
1<sup>st</sup> year Doctoral Student*

**Nurmagambetova Azhar**

*Candidate of Economic Sciences, doctor PhD, Associate Professor,  
Al-Farabi Kazakh National University*

**Niyetalina Gaukhar**

*c.e.s., associate professor, Turan University*

### **Introduction**

*Effective management is a crucial responsibility for any educational institution[1]. In today's educational landscape, this issue is particularly pressing, as the success of these institutions hinges on the prudent utilization of their physical assets and financial resources.*

*Fixed assets encompass buildings, equipment, technical materials, and other tangible assets that require meticulous monitoring and accounting to ensure the smooth and effective functioning of an educational organization.*

*The urgency of this study is underscored by the fact that in the current era of digital transformation, with heightened competition in the educational services market and the imperative to enhance the transparency of financial and administrative operations, the optimization of internal control over funding has become paramount. Inadequate oversight can result in the inefficient allocation of resources, cost-cutting measures, and a decline in the quality of the educational experience.*

*The objective of this research is to devise strategies for enhancing internal control to guarantee the proper management of funds in contemporary educational establishments.*

*To attain this objective, the following objectives are being pursued:*

*To scrutinize the current state of management and take into account the key advancements in contemporary educational institutions.*

*To pinpoint the issues and hazards associated with the breach of the control framework for the control mechanism.*

*The paper explores exemplary practices and methodological approaches to the establishment of internal control in educational institutions.*

*To formulate practical suggestions for enhancing the efficiency of internal control through alternative means.*

*The novelty of the study is the comprehensive approach to enhancing internal control, which takes into account the unique characteristics of contemporary educational institutions, cutting-edge digital accounting and monitoring tools, and the integration of planning, diptychs, and analysis of fixed asset utilization.*

*The practical significance of the work is the potential for implementing the proposed recommendations to enhance the effectiveness of asset utilization, improve financial management, and foster the growth of modern educational institutions.*

### **Literature review**

*Investigations into the efficacy of fund management and the implementation of internal control in educational institutions have garnered significant attention. Barker R. et al. highlights the primary issue as the lack of transparency in the accounting for tangible assets, which results in the inefficient utilization of resources and substantial losses[2]. The author emphasizes that the growing importance of this topic has prompted the expansion of modern educational institutions and the necessity for enhanced financial discipline.*

*El Bechychy I., Alloui A. underscores the fact that in the context of these changes, internal control often remains superficial and fails to encompass all aspects of the utilization of fixed assets[3]. This, according to the author, poses risks of underestimation or damage, as well as a decline in the quality of the educational experience.*

*Odonkor B. et al. highlights the contemporary methods for automating accounting and monitoring alternative assets[4]. He argues that the implementation of digital systems can reduce human error, enhance data precision, and promptly detect discrepancies in asset utilization. However, he*

*acknowledges that many private educational institutions have yet to fully embrace these tools, which hinders their management effectiveness.*

*Nunticha P., Kajornatthapol P., Siyaphat S. examines the international best practices for organizing internal control in the educational sector and emphasizes the necessity for a comprehensive approach, encompassing planning, monitoring, and oversight of material resources[5]. They posit that by adapting these practices to global trends, institutions can enhance the transparency and efficiency of their financial and economic operations.*

*To sum up, it is clear that the importance of enhancing internal control over methods in contemporary education is contingent upon a variety of factors, including the expansion of educational institutions, the need for efficient utilization of resources, and the integration of cutting-edge digital tools.*

*Based on the review of scholarly sources, it becomes evident that an effective internal control framework should be multifaceted, encompassing the automation of surveillance, monitoring, and regular assessments, thereby fostering enhanced management practices and accounting for the evolving landscape of educational institutions.*

### **Research methodology**

*To achieve the objectives of the study on optimizing internal control, a combination of several complementary methods was used as alternative methods in educational institutions. Firstly, the analytical method allows for a systematic analysis of the current state, accounting and control of basic measures, identification of problems and shortcomings of existing procedures, as well as assessment of the effectiveness of the tools used. This method provides a theoretical framework for understanding the key factors affecting asset management matters.*

*Secondly, the comparative method was used for the parliamentary practice of internal control in various educational organizations. Comparing objects allows us to identify the best approaches, identify differences in the level of accounting automation, the degree of transparency and completeness of control, and formulate recommendations aimed at improving the efficiency of financial management.*

*Thirdly, the sociological method, which includes surveys and interviews with managers and employees of educational institutions, allows us to obtain empirical data on problems with organizational difficulties in accounting and controlling fixed assets, as well as to identify the opinions and suggestions of practitioners within the framework of existing procedures. This method is applied to the practical study of innovation and allows integrating the opinions of participants in the educational process into the development of strategies. Educational institutions of Kazakhstan and China were used as an object.*

### **Results and discussion**

*Based on the results (analytical, comparative and sociological methods) that I described earlier, it follows that the analysis was conducted on the basis of educational institutions in several countries where the private education sector is actively developing and faces problems of internal control over possible methods.*

*Private educational institutions in the following countries were used as examples for the analysis:*

*Kazakhstan is the main research country where market reforms and digitalization of education determine the need to optimize internal control.*

*Russia is growing due to its presence in scientific schools and colleges using traditional and digital accounting tools.*

*China is a country with a rapid pace of digitalization and a developed system of private education, which allows us to identify the best practices for implementing internal control.*

*Poland is a European example demonstrating a high level of standardization and the application of international approaches to accounting for basic measures.*

*The results of the analytical study demonstrate that the degree of automation, particularly in relation to fixed assets, differs significantly across different countries. In Kazakhstan and Russia, traditional or hybrid accounting methods are still prevalent, which increases the risk of errors and reduces the visibility of controls. In contrast, China and Poland have embraced digital platforms, which guarantee the precision of data and ensure regular updates. Nevertheless, it is important to consider the intricacies involved, such as the requirement for skilled personnel and the management of digital systems(in table 1).*



Table 1 – Analytical analysis by country's

| Country    | Type of Accounting                             | Key Identified Problems                             | Consequences                        |
|------------|------------------------------------------------|-----------------------------------------------------|-------------------------------------|
| Kazakhstan | Mixed, often manual                            | Irregular inventory checks, lack of systematization | Accounting errors, asset loss risks |
| Russia     | Mostly manual with partial automation          | Low digitalization, outdated accounting forms       | Insufficient data accuracy          |
| China      | Fully digitalized accounting                   | Complexity of platform integration                  | High maintenance costs              |
| Poland     | Automated accounting aligned with EU standards | Shortage of trained personnel                       | Delays in data updates              |

The source was compiled based on the data [6-9]

The table shows big differences in how schools count and check their assets in Kazakhstan, Russia, China, and Poland. The differences are because of how digitalized the schools are, how old their systems are, and how many people know how to do the work.

In Kazakhstan, schools use a mix of old and new ways to count things. They don't check things often enough, and they don't have good rules. This makes it easy to make mistakes and lose things. The schools need to make their systems better and use more digital ways to be more accurate and honest.

Russia has some digital things, but it uses old ways too. This can make the information not be true. The schools have problems like Kazakhstan, like not knowing where things are and who is responsible for them.

In China, digital accounting is better. It helps to be more accurate and see assets in real time. But it is hard to use different programs together. It needs a lot of people to work with them. So digitalization is good, but it can be hard to manage.

In Poland, there is automated accounting. It is good for EU standards. But if there are not enough people, it can be slow and not so good. So even in good countries, not enough people can be a problem.

In general, table 1 shows that there is a connection between digitalization, how good people are at their jobs, and how well the controls work. The table shows that countries like Kazakhstan and Russia need to use more automated systems and train more people. Countries like China and Poland have good systems but they need to make them better by making them work together better and making sure people are always learning.

Based on analytical data, the comparative method allowed for a more in-depth comparison of the level of development of internal control systems in four countries. The comparison revealed that digitalization is a crucial factor for efficiency: China and Poland have a high level of automation and transparency, whereas Kazakhstan and Russia are still in the process of establishing modern systems.

The data in Table 2 further supports the conclusions drawn from the analytical approach, illustrating how specific control parameters vary between countries.

Table 2. Comparative results by country

| Control Criterion              | Kazakhstan | Russia      | China   | Poland  |
|--------------------------------|------------|-------------|---------|---------|
| Level of digitalization        | Medium     | Low-medium  | High    | High    |
| Transparency of accounting     | Medium     | Medium      | High    | High    |
| Regularity of inventory checks | Irregular  | Irregular   | Regular | Regular |
| Staff qualifications           | Medium     | Medium      | High    | Medium  |
| Risk level of asset loss       | High       | Medium-high | Low     | Low     |

The source was compiled based on the data [6-9]

Table 2 expands the examination by assessing the internal control mechanisms within operational procedures.

In Kazakhstan and Russia, there is a limited use of risk-based monitoring and preventive measures[10]. Their internal control frameworks primarily rely on basic compliance checks rather than continuous monitoring, which hinders their ability to detect misuse of assets.

China, on the other hand, has a highly structured internal control environment, supported by digital audit trails, automated verification tools, and integrated asset monitoring systems[11]. However, the complexity of multiple platforms may lead to inefficiencies if not properly coordinated.

Poland follows a balanced approach, combining EU-standard audit procedures with a moderate level of automation[12]. This approach ensures regular monitoring, but it may still experience delays due to administrative workloads.

*These findings underscore the strong correlation between the sophistication of internal control frameworks and the regulatory landscape. The regulations in the European Union and the ongoing institutional reforms in China have fostered the development of more advanced control systems compared to those typically employed in Kazakhstan and Russia.*

*The sociological method has become a logical continuation of comparative analysis, making it possible to evaluate the opinion of employees of private educational institutions in these countries and their practical observations. The respondents' responses emphasized that despite technological differences, there is a need in all countries to improve the skills of employees and improve organizational procedures (in table 3).*

*Thus, Table 3 complements the previous analytical and comparative conclusions, providing a practical assessment of the effectiveness of existing control systems.*

*Table 3. Results of the sociological research*

| Country    | Main Respondent Feedback                             | Summary Conclusion                                   |
|------------|------------------------------------------------------|------------------------------------------------------|
| Kazakhstan | High labor intensity, medium automation              | Need for digitalization and staff training           |
| Russia     | Overload caused by manual accounting, time shortages | Need for standardization and reduced manual workload |
| China      | High automation but complex platforms                | Need for stronger technical support                  |
| Poland     | Efficient systems but gaps in staff training         | Need for professional development programs           |

*The source was compiled by the author*

*Table 3 assesses the skills of employees, the training systems in place, and the level of managerial involvement. The capacity of human resources appears to be a key factor in determining the effectiveness of internal control in all countries.*

*In Kazakhstan and Russia, there is a lack of consistent training programs, and employees often have limited digital skills, which can impact the accuracy of asset accounting.*

*In contrast, China has a highly specialized workforce, with mandatory training systems in place and strong managerial oversight. The high level of employee expertise enhances the performance of digital control systems and reduces operational risks.*

*Poland also has a strong focus on HR development, but due to staff shortages, training may not be conducted as frequently as necessary, leading to procedural delays.*

*The analysis demonstrates that even sophisticated digital systems cannot operate efficiently without a competent workforce. Nations that prioritize ongoing professional growth, such as China and to some extent Poland, exhibit more robust and transparent internal control mechanisms.*

*The results from all three tables collectively demonstrate a clear relationship between digitalization, internal processes, and human capital. The success of internal control over fixed assets is not determined by a single factor, but rather by the interplay of three key elements:*

*Technological infrastructure (Table 1) — This aspect influences the accuracy and speed of asset management.*

*Procedural maturity (Table 2) — This ensures the presence of systematic monitoring and preventive measures.*

*Personnel competence (Table 3) — This aspect determines the actual effectiveness of systems and procedures.*

*The Chinese model exemplifies how a strong synergy between these three elements results in highly effective internal control. In contrast, the models of Kazakhstan and Russia demonstrate how weaknesses in any of these components can diminish the overall system's performance. Poland represents a model that is in between, with advanced systems in place but limited personnel capabilities that hinder performance.*

*These findings underscore the importance of concurrent progress in digital tools, regulatory frameworks, and staff training programs to enhance the effectiveness of internal control systems in private educational institutions. Only through comprehensive development can reduce risks, increase transparency, and achieve sustainable asset management.*

### **Conclusion**

*The conducted allows us to draw the conclusion that the efficacy of internal control over fixed assets in private educational establishments is directly contingent upon the harmonious development of three fundamental elements: the degree of digitalization in accounting practices, the sophistication of internal control mechanisms, and the expertise of personnel.*

A comparative analysis of the approaches adopted in Kazakhstan, Russia, China, and Poland reveals significant disparities in the implementation of digital solutions, the implementation of systematic monitoring systems, and the availability of skilled personnel. These disparities give rise to diverse models for managing assets.

In Kazakhstan and Russia, the internal control system is characterized by a certain level of automation and a fragmented approach to procedures, which significantly increases the risk of errors, breaches, and asset loss. The main challenges in this regard are insufficient digital infrastructure, inconsistent inventory management, and a shortage of skilled professionals.

China, on the other hand, demonstrates a more effective model, built upon comprehensive digitalization, standardized processes, and continuous employee training. This approach ensures high levels of transparency and swift control. Poland, having integrated itself into the European regulatory framework, maintains a balanced model characterized by a high degree of regulation. However, it faces personnel shortages that may compromise the efficiency of certain processes.

In essence, the findings suggest that focusing solely on one aspect of oversight does not significantly enhance the quality of asset management. The key to optimization lies in an integrated approach that encompasses the modernization of information systems, implementation of regular risk-based surveillance, and professional development for employees.

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## THE IMPACT OF DIGITAL TECHNOLOGIES ON THE COMPETITIVENESS AND SUSTAINABILITY OF TOURIST SITES

**Shang Peipei**

Al Farabi Kazakh National university, Al Farabi business school,  
1<sup>st</sup> year Doctoral Student

Scientific advisor: **Alma Karshalova**

PhD, associate Professor, Kazakh-British Technical University

Scientific advisor: **Olga Koshkina**

PhD, associate professor, University of International Business

### Introduction

In an era of rapid development of digital technologies and changes in the global tourism market, it is particularly important to study how digital innovations affect the competitiveness and long-term development of tourist sites.

In today's world, digital platforms, online booking systems, big data analysis, virtual and augmented reality, mobile applications and intelligent services are becoming key tools that determine the quality of the tourist experience and the effectiveness of tourist sites management.

The need to adapt the tourism industry to new technological and socio-economic conditions, increase tourists' expectations of the level of service and increase competition between tourist destinations and attractions make this topic relevant.. The use of digital technologies allows not only to optimize internal processes, but also to create sustainable development models, reduce negative environmental impacts, increase safety and ensure the long-term attractiveness of tourist sites.

The purpose of the study is to identify and substantiate the role of digital technologies in increasing competitiveness and ensuring the sustainability of tourist sites in modern conditions.

To achieve this goal, the following tasks were set:

1. To analyze theoretical approaches to understanding the competitiveness and sustainable development of tourist sites.
2. Identify the main types of digital technologies used in the tourism sector and evaluate their functionality.
3. To investigate the impact of digital tools on improving the management of tourist sites and attracting tourists.
4. Identify the obstacles and features of the introduction of digital solutions in the tourism industry. Create guidelines on the optimal use of digital tools to improve the competitiveness and stability of tourist sites.

The scientific value of the study lies in the fact that it comprehensively examines the relationship between digital technologies and the sustainable development of tourist sites. The paper also systematizes modern digital tools in terms of their impact on the competitiveness of tourist destinations.

The study proposes an author's model for assessing the contribution of digital technologies to improving the sustainability and efficiency of tourist sites. This allows us to better understand the features of the digital transformation of the tourism industry and substantiate new vectors of its development.

### Literature review

Within the framework of this study, a literature review of various projects has been conducted, and the author emphasizes the importance of digital technologies in increasing the sustainability of tourism sites. Special attention has been paid to the challenges of integrating digital solutions with traditional management models.

Omwole B. M. et al. highlights that many facilities face difficulties in terms of staff digital competencies and limited investment resources, which hinders the pace of digital transformation[1]. He raises the issue of fragmented digital initiatives and a lack of a comprehensive approach to digitalization in the tourism industry.

Xin G. et al. explores the impact of digital communication platforms on the competitiveness of tourism sites[2]. They argues that the active use of social media, online reputation management systems, and big data analytics allows tourism sites to better understand their audience's needs and create personalized offerings. However, they identifies a key challenge: the reliance on the speed at which digital content is updated and online reputation managed. This can lead to decreased marketing effectiveness if there are not enough analytical tools available.



Shukla V., Rana S., Prashar S. on the other hand, focuses on virtual and augmented reality (VR/AR) technologies as a means to enhance the tourist experience[3]. They argue that these technologies have the potential to significantly increase the appeal of tourism sites, particularly for cultural and historical attractions. However, the authors identify several challenges: the high cost of implementation, the difficulty in adapting infrastructure, and the need for constant software updates. Shukla V., Rana S., Prashar S. also brings up the lack of methodologies for assessing the effectiveness of digital innovations.

Digitalization is seen as a factor in creating sustainable tourism sites in the context of environmental management, according to the researcher. Patrichi I. C. points out that modern digital tools can optimize tourist flows, reduce pressure on natural sites, and improve monitoring of ecological conditions[4]. The main issue highlighted by the author is the poor integration of digital technology with environmental strategies and the absence of a unified digital monitoring system for the tourism industry.

An analysis of the work of modern researchers has shown that digital technologies hold significant potential for increasing the competitiveness and sustainability of tourism facilities. However, common problems identified by authors include:

- Lack of digital skills and qualified personnel
- High cost of implementing innovative solutions and lack of investment
- Lack of a systematic approach to digital transformation
- Weak integration of digital technology with environmental and management strategies
- Lack of analytical methods and tools to evaluate the effectiveness of digitalization

Overall, researchers agree that further development of tourism sites is impossible without comprehensive digital transformation. This transformation should be based on strategic planning, development of digital skills, and integration of digital technology into all elements of the tourism system.

#### **Research methodology**

Within the framework of this topic, this study was investigated using two methods. The analytical method was used to systematically study the theoretical foundations of competitiveness and sustainable development of tourist sites, as well as to analyze the types of digital technologies used in the tourism industry. This method is used to study the content of scientific publications, regulatory documents, digital development strategies and international reports in the field of tourism. The analytical approach makes it possible to identify key areas of digitalization, identify problems and barriers to technology adoption, and assess the impact of digital tools on the quality of management and the formation of the tourist experience. It helps to solve problems related to literature reviews, technology classification and substantiation of theoretical conclusions.

And the comparative method this method made it possible to compare the effectiveness of the use of digital technologies in different tourist sites or destinations. The study compares models of digital transformation, the level of implementation of innovative solutions, the quality of digital services, as well as their impact on the competitiveness and sustainability of sites. Using the comparative method helps to identify differences in management strategies, identify best digitalization practices, and assess how different types of technologies affect tourism attraction, operational efficiency, and environmental sustainability. This method is directly related to the tasks of identifying the specifics of implementing digital tools and developing recommendations.

#### **Results and discussion**

Within the framework of the analytical method, a systematic analysis of the theoretical foundations of competitiveness and sustainable development of tourist sites has been carried out, as well as the types of digital technologies used in the tourism sector (in table 1).

Table 1 – Results of the analytical method

| Task                                                         | Analysis Results                                                                                                                                                                                                                               |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Theoretical approaches to competitiveness and sustainability | Key factors of competitiveness were identified: service quality, attractiveness of the object, marketing, and innovation. Sustainability is considered from economic, environmental, and social perspectives.                                  |
| Identification of key digital technologies                   | Main technologies include VR/AR, mobile applications, online booking systems, big data systems, digital marketing, environmental monitoring, and CRM systems. Each technology impacts different aspects of competitiveness and sustainability. |
| Identification of implementation challenges                  | Main challenges: lack of qualified personnel, high implementation costs, fragmented digital initiatives, and weak integration of technologies with existing processes and environmental strategies.                                            |
| Recommendations for digital transformation                   | A comprehensive technology implementation strategy is required, including staff training, integration of digital tools into object management, continuous monitoring of effectiveness, and adaptation to new technological trends.             |

The source was compiled based on the data [5-10]

In the initial phase of the analysis, the theoretical frameworks for comprehending the competitiveness and resilience of tourist destinations were examined. Competitiveness is defined as the capacity of a destination to attract visitors, deliver top-notch services, foster a positive image, and adapt to market fluctuations.

Resilience, on the other hand, is viewed from three primary perspectives:

Economic resilience: the capacity to generate consistent revenue, optimize expenses, and maintain investment appeal.

Environmental resilience: minimizing the impact on the natural environment, judicious use of resources, and monitoring the ecological state of the area.

Social resilience: ensuring the satisfaction of both tourists and local residents, preserving cultural and historical heritage, and developing infrastructure.

In the course of the literature review, the key factors that contribute to the success and sustainability of tourism businesses: innovative technologies, the quality of services, marketing and management of tourist flows, and the use of digital tools for monitoring and planning.

In the subsequent phase of our research, we focused on the main digital technologies employed in the tourism industry and their influence on various aspects of facility operations.

Virtual and augmented reality technologies (VR/AR) enable the creation of interactive tours, enhancing tourist engagement and accessibility to sites remotely.

Mobile applications and online booking platforms simplify the process of accessing services, improving the convenience for tourists and reducing waiting times, thereby enhancing competitiveness.

Big data and customer relationship management systems analyze the behavior of tourists, helping to create personalized offers and optimize the management of tourist flows.

Digital marketing and social media platforms are instrumental in promoting products, enhancing brand awareness, and shaping the perception of a destination.

Environmental monitoring systems enable the tracking of natural area usage, minimizing negative environmental effects, and enhancing the environmental sustainability of sites.

Each technology contributes to a multifaceted impact: it elevates service quality, fosters an innovative image, reduces resource consumption, and enhances facility management.

### 3. The primary challenges in implementing digital technologies

A review of practical examples and literature has identified key obstacles and difficulties in implementing digital solutions:

Insufficient skilled personnel — employees often lack the necessary expertise to work with modern digital tools.

High financial investment — the acquisition of equipment, the development of applications, and the implementation of big data analysis systems require substantial financial outlay.

The lack of cohesion in digital initiatives results in a piecemeal approach to digital solutions, which diminishes their impact.

The failure to integrate technology with existing processes and strategies — digital tools are not aligned with management and environmental strategies, hindering their full implementation.

The constant need for technology updates — technologies rapidly become obsolete, and facilities must frequently update their tools to remain competitive.

### 4. Recommendations for digital transformation of tourist sites

Based on the identified issues and the examination of best practices, recommendations for successful digital transformation were formulated:

Creation of a comprehensive technology implementation strategy that considers the economic, environmental, and social aspects of the facility.

Training and professional development for staff to ensure effective use of digital tools.

Incorporating digital technologies into existing management practices, encompassing marketing, tourist services, resource tracking, and environmental monitoring.

Ongoing assessment of the performance of digital solutions, data analysis, and process improvements based on the insights gained.

Employing industry-leading practices and cutting-edge technologies, such as virtual and augmented reality, big data analytics, and mobile applications, to elevate the tourist experience and foster sustainable growth of sites.

Within the framework of the study, a comparative analysis was conducted to evaluate the effectiveness of implementing digital technologies in different types of tourist facilities. The goal was to identify the impact of digitalization on the competitiveness and sustainability of these establishments. This method allowed us to compare real-world digitalization practices across various types of facilities, including historical museums, eco-tourist parks, resort complexes, and cultural attractions.

The analysis focused on several key aspects relevant to the study's objectives. Firstly, we identified the main digital technologies employed in the tourism industry, such as virtual and augmented reality (VR/AR), mobile applications, online booking systems, big data analytics, digital marketing, and environmental monitoring solutions. Secondly, we examined how these tools influenced the management of the facilities and their ability to attract tourists. We considered factors such as increased visitor numbers, improved service quality, and the creation of a positive brand image.

The third aspect of the method's application was to identify barriers and specific challenges in implementing digital solutions. Through a comparison, it was found that most facilities faced high financial costs, lack of qualified personnel, and the need for continuous technology updates. Based on the data collected, recommendations were then formulated for effective use of digital technologies. These recommendations included integrating tools into management processes, providing staff training, and utilizing modern analytical and marketing solutions (in table 2).

Table 2 – Comparative analysis of the use of digital technologies in tourist sites

| <b>Tourist Sites / Destination</b> | <b>Applied Digital Technologies</b>                                                     | <b>Impact on Competitiveness</b>                   | <b>Impact on Sustainability</b>                               | <b>Main Implementation Challenges</b>                                      |
|------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------|
| Historical Museum, Almaty          | VR/AR tours, mobile application, online booking                                         | 30% increase in visitors, improved reputation      | Optimization of tourist flows, reduced load on exhibits       | High implementation cost, lack of personnel with digital skills            |
| Ecotourism Park, Kolsai            | Online reputation management, digital environmental monitoring, visitor control systems | 20% increase in tourists, higher platform ratings  | Reduced environmental impact, improved ecological monitoring  | Limited investment, weak integration with local infrastructure             |
| Resort Complex, Shymbulak          | Big Data systems for personalized offers, mobile services, CRM                          | 25% increase in revenue, improved client retention | Improved service quality, reduced management costs            | Complexity of big data analysis, shortage of digital analytics specialists |
| Cultural Destination, Astana       | Social media, online marketing, virtual tours                                           | Attraction of youth audience, improved image       | Minimization of physical impact on sites, increased awareness | Need for constant content updates, information security risks              |

The source was compiled based on the data [11-14]

A comparative analysis has shown that digital technologies significantly increase the competitiveness of tourist sites by increasing attendance, improving reputation and personalizing services. At the same time, digitalization contributes to sustainable development by reducing the burden on facilities and improving environmental control. The main problems of implementation include high financial costs, lack of qualified personnel and the need for constant technology updates. Based on the analysis, best practices have been identified that can be recommended for integrating digital solutions into the management of tourist facilities.

The analysis of the outcomes of applying analytical and comparative methods has revealed that digital technologies are instrumental in enhancing the competitiveness and sustainability of tourist attractions. The utilization of virtual reality, augmented reality, mobile applications, big data systems, digital marketing, and environmental monitoring enables the improvement of service quality, personalization of the tourist experience, optimization of tourist flow management, and reduction of facility load. However, the implementation of technology is not without its challenges, including high

financial investments, a shortage of skilled personnel, the fragmentation of digital initiatives, and the need for continuous updates. A comparative analysis has confirmed the practical efficacy of these tools, identifying best practices for various types of attractions, including museums, parks, resorts, and cultural destinations.. The findings demonstrate that the process of digitalization not only enhances the appeal of tourist attractions, but also fosters their sustainable growth by enhancing environmental and administrative oversight.

### Conclusion

Based on the goals and objectives of the research, it can be inferred that the integrated application of digital technologies is a potent instrument for enhancing the competitiveness and sustainability of tourist attractions.

The analytical method allowed:

- Examining theoretical perspectives on competitiveness and sustainable development in the tourism sector.

- Identifying the key digital technologies employed in the tourism industry and their functionalities.

- Recognizing the primary challenges in implementing digital solutions.

- Substantiating recommendations for a comprehensive digital transformation.

The comparative method confirmed the practical relevance of these technologies and demonstrated their impact on specific attractions, including increased visitor numbers, improved service quality, enhanced reputation, and optimized tourist flows, as well as reduced strain on natural and cultural resources.

Thus, the achievement of all the objectives of the research demonstrated that in order to enhance the competitiveness and resilience of tourist sites, it is imperative to:

- devise a comprehensive digital transformation plan;

- provide training and professional development for personnel;

- incorporate digital tools into management procedures;

- regularly assess the efficacy of the implemented technologies and adapt them to the current market demands.

The implementation of these measures enables the realization of strategic objectives, such as enhancing the tourist experience, optimizing resources, and ensuring the sustainable growth of tourist destinations, in line with both the theoretical and practical aspects of the research[15].

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**A STUDY OF THE IMPACT OF PROFESSIONAL TRAINING ON THE COMPETENCE OF MANAGERS****Zhang Yina***Al Farabi Kazakh National university, Al Farabi business school,  
1<sup>st</sup> year Doctoral Student***Mynzhanova Gulzhakan***PhD, Associate Professor,**Kazakh Ablaihan University of international relations and world languages***Niyetalina Gaukhar***c.e.s., Professor, Turan University***Introduction**

*In the modern world, organizations are facing a high rate of change in the external environment, digital transformation and increased competition at the global level[1]. In such conditions, the quality of the work of the management staff becomes a key factor for the stable development of the company. Managers must be able to adapt quickly to changes, make strategically sound decisions, and effectively organize work processes.*

*Professional training of managers plays an important role in the formation and development of managerial skills necessary for the successful functioning of the company. However, despite the large number of training programs, the question remains as to how much they really affect the competence of managers and their behavior in the organization.*

*In the context of the digitalization of the economy, the introduction of new formats of distance and modular learning, the growing demands on the competencies of managers, as well as the needs of organizations to create effective systems for continuous staff development, the study is becoming particularly relevant.*

*However, there is a gap between the theoretical models of manager training and their practical application in management, which underlines the need for a comprehensive study of this problem.*

*The purpose of the study is to determine how professional training affects the level of managerial competencies of managers, and to identify mechanisms that can improve the effectiveness of training in modern organizations.*

*To achieve this goal, the following tasks were set:*

*To analyze theoretical approaches to the concept of professional training and competence of managers.*

*Identify the key skills that are formed during the training of management personnel.*

*To analyze the existing methods and training programs for managers in modern organizations.*

*To investigate how professional training affects the level of managerial skills based on real data.*

*Identify the factors that influence the success of management training programs.*

*Develop recommendations for improving the management training system.*

*The scientific significance of the study lies in clarifying the mechanism of the impact of professional training on the development of managerial skills. We also offer a comprehensive model for evaluating the effectiveness of training managers, which takes into account both formal indicators (knowledge and skills) and behavioral characteristics (management style, communication skills, adaptability).*

*The scientific novelty of the research lies in the development of new methods for analyzing the professional training of managers and determining its importance in shaping the competencies of a modern manager.*

*The results of the study expand the theoretical knowledge about how training, development and experience affect the effectiveness of a manager in his work.*

*The practical significance of the research lies in the fact that its results can be used to improve corporate training programs, create systems for assessing the competence of managers and improve the effectiveness of companies' HR policies.*

*The research materials can be useful for HR departments, executive training centers, and educational institutions in developing professional development programs.*

**Literature review**

*Mustafa B., Lleshi S. posited that education and vocational training are investments that enhance employee productivity and generate economic advantages for both individuals and organizations[2]. Theben A., Plamenova N., Freire A. distinguished between general and specific skills, highlighting that the efficacy of training investments is contingent upon the nature of skills and the structure of the labor*

market[3]. These insights shed light on why companies opt for particular forms of management training and how this impacts their proficiency and adaptability.

Gordon S. P. developed the theory of experiential learning and a cyclical learning model, which consists of four stages: concrete experience, reflection, abstract conceptualization, and active experimentation[4]. His main idea for managerial training is that the most effective way to acquire managerial skills is through a combination of practice, reflection, and application. Therefore, management training programs should include practical assignments, case studies, internships, and reflection mechanisms, rather than relying solely on lecture-based knowledge delivery.

Richard Boyatzis is a leading figure in the field of management, having developed a model of managerial competencies based on empirical research[5]. He argues that a manager's success is not solely determined by their academic knowledge, but rather by their behavioral patterns. This means that for effective training, it is crucial to focus on developing specific behavioral competencies, such as leadership, communication, and decision-making, and integrating them into the selection, evaluation, and training processes.

Donald Kirkpatrick developed a well-known framework for assessing the success of training programs, which consists of four stages: reaction, learning, behavior, and results[6]. The key practical implication of his work is that the evaluation of management training programs should go beyond a simple assessment of satisfaction and should instead measure tangible changes in knowledge and skills, the transfer of learned behaviors into the workplace, and the economic and organizational impact (ROI). This framework is a valuable tool for demonstrating the effectiveness of training programs and for improving their effectiveness.

Peter Senge demonstrated in his theory of the «learning organization» that the long-term development of managerial skills is not solely achieved through individual training programs, but rather through the establishment of an organizational environment that fosters continuous learning, systematic thinking, personal development, and shared vision[7].

Therefore, the most effective approach to managerial training is a systematic one, where training is integrated into the organization's operations, supported by management, and complemented by organizational mechanisms for knowledge sharing.

The synthesis of the findings of the five authors offers a practical framework: Bojatis' competence models, Kirkpatrick's assessment model, and Senge's systems approach. Taken together, these approaches provide a comprehensive strategy for enhancing managers' skills through targeted training investments, well-structured programs with practical elements, a robust evaluation system, and organizational support.

### **Research methodology**

To achieve the purpose of the study — to identify the impact of professional training on the level of managerial competencies of managers — and to solve the tasks set, two key methods are used: comparative analysis and the sociological method (questionnaires and expert interviews). Each of them complements each other and provides a comprehensive study of both theoretical aspects and practical manifestations of the phenomenon under consideration.

The comparative analysis method is used to compare existing approaches, models and training programs for managers, which corresponds to the tasks of studying the theoretical foundations, identifying key competencies and analyzing various educational formats.

Within the framework of this method:

The comparison of traditional and modern models of professional training is carried out.;

The differences between corporate and academic programs are analyzed.;

The patterns and common elements influencing the development of managerial competencies are identified.;

The results obtained are compared with theoretical models of competence, experiential learning, and performance evaluation.

The use of comparative analysis makes it possible to determine which formats and methods of training demonstrate the greatest effectiveness, and thus provides a scientific justification for the relationship between professional training and the development of managers' competencies.

The sociological method (questionnaires and expert interviews)

The sociological method includes conducting a survey of managers and interviewing experts (HR specialists, heads of departments). This method directly ensures the fulfillment of tasks related to the study of the real impact of training on the competence of managers, the identification of efficiency factors and the collection of empirical data.

*During the research:*

*The survey allows us to identify the self-assessment of managers' competencies before and after professional training;*

*changes in managerial behavior, level of knowledge and practical skills are recorded.;*

*expert interviews identify organizational factors that enhance or reduce the effect of professional training;*

*Data is collected on the actual effectiveness of specific executive development programs.*

*This method provides reliable and practice-oriented information that makes it possible to assess the impact of training on managerial competencies in the real conditions of an organization.*

*Logical connection of methods with the purpose of research*

*Comparative analysis is responsible for the theoretical justification and comparison of training models (tasks 1-3).*

*The sociological method provides empirical verification of the findings and measurement of the actual impact of learning (tasks 4-6).*

*Together, both methods allow for a comprehensive study of the impact of professional training on the competence of managers, combining theoretical conceptualization and practical analysis.*

### **Results and discussion**

*A comparative analysis was conducted to evaluate existing management training models and programs. Data was collected on academic and corporate training programs in various industries, including banking, information technology, and manufacturing. The aim was to identify which programs and approaches are most effective for developing managerial competencies (in table).*

*Table 1. Comparative analysis of management training programs in different industries*

| <b>Industry</b> | <b>Training Program Type</b>           | <b>Key Competencies Developed</b>                             | <b>Observed Effectiveness</b>                              | <b>Notes</b>                                         |
|-----------------|----------------------------------------|---------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------|
| Banking         | Corporate Leadership Programs          | Strategic thinking, decision-making, communication            | High – measurable improvement in KPI achievement           | Strong mentoring component; interactive workshops    |
| IT              | Technical & Managerial Hybrid Training | Problem-solving, team leadership, adaptability                | Medium – good technical skills, moderate leadership growth | Online modules effective but less behavioral impact  |
| Manufacturing   | Practical On-site Training             | Operational management, process optimization, team management | High – significant improvement in operational efficiency   | Focus on real case simulations and rotation programs |

*The source was compiled on the data [8-10]*

*The results of the comparative analysis are presented in Table 1. A comparative analysis of management training programs in different industries. As can be seen from the table, corporate programs that include practical training and mentoring are the most effective in improving both hard and soft management skills. In contrast, online or theoretical programs tend to expand knowledge, but have limited impact on behavioral competencies. Among the competencies studied, leadership, decision-making, and strategic thinking show the most tangible improvements, especially when curricula include elements of practical learning such as case studies, modeling, and practical projects.*

*The sociological method included manager surveys (n=50) and interviews with HR specialists and department heads across the banking, IT, and manufacturing sectors. The aim was to assess perceived competency improvements and identify factors influencing training effectiveness (in table 2).*

*Table 2. Survey results*

| <b>Competency</b>  | <b>Before Training (Average Score 1–5)</b> | <b>After Training (Average Score 1–5)</b> | <b>Improvement</b> |
|--------------------|--------------------------------------------|-------------------------------------------|--------------------|
| Leadership         | 3.2                                        | 4.1                                       | +0.9               |
| Strategic Thinking | 3.0                                        | 4.0                                       | +1.0               |
| Communication      | 3.5                                        | 4.3                                       | +0.8               |
| Decision-making    | 3.1                                        | 4.0                                       | +0.9               |
| Adaptability       | 3.3                                        | 4.2                                       | +0.9               |

*The source was compiled by author*

*The main conclusions of the expert interviews are that programs that include practical projects and mentoring provide the greatest growth in managerial competencies. The lack of follow-up and organizational support reduces the transfer of acquired skills to the workplace. And Managers from the*



banking sector demonstrate faster growth in strategic competencies, while managers from the IT sector are more noticeably improving their adaptability and problem-solving skills.

The comparative analysis revealed effective training program structures and key competencies, confirming the theoretical significance of this study.

The survey and interviews showed a real improvement in managers' competence, which corresponds to levels 2-3 of the Kirkpatrick Training Effectiveness assessment model (learning and behavior).

Taken together, both methods demonstrate that professional training has a positive impact on the competence of managers, provided organizational support and adaptation of programs to the specifics of the industry.

### **Conclusion**

To achieve the research goal and solve the tasks set, an integrated approach was applied, combining theoretical and empirical levels of analysis, which made it possible to comprehensively study the impact of professional training on managerial competencies and ensure consistency between theoretical models and practical results. At the theoretical level, a comparative analysis of existing management training programs and models was used, covering corporate and academic programs in various industries such as banking, IT, and manufacturing. The comparison made it possible to analyze existing theoretical approaches to the concept of professional training and competence of managers, identify key competencies formed during training, and identify the most effective training methods, including practice-oriented assignments, cases, internships, and mentoring elements, based on the models of Boyatzis' competencies, Kolb's experiential learning, and the principles of evaluating Kirkpatrick's trainings. The empirical part of the study included a sociological method combining a questionnaire of managers (n=50) and expert interviews with HR specialists and heads of departments, which made it possible to investigate the relationship between professional training and the level of managerial competencies, identify factors affecting the effectiveness of training programs, and compare the results of training with the requirements of organizations for managers' competencies. The analysis of the collected data showed that the greatest effect is achieved with a combination of practical exercises, case studies and mentoring, as well as with the support of the organizational environment and a systematic approach to learning. Based on the results obtained, recommendations were developed to improve the system of professional training of managerial personnel: the introduction of practice-oriented programs with elements of mentoring, regular evaluation of the effectiveness of training through indicators of competence change, integration of training with the real tasks of the organization and the creation of conditions for continuous professional development of managers. In general, the combination of comparative analysis and the sociological method provides a systematic study of the impact of professional training on the competence of managers, combining a theoretical basis and practical application, and allows us to form sound recommendations for optimizing training programs and improving the managerial effectiveness of organizations.

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**HUMANIZING AI RECRUITMENT: BALANCING EFFICIENCY AND EMPATHY IN ACADEMIC HIRING****Zhao Yancheng***Al Farabi Kazakh National university, Al Farabi business school,  
1<sup>st</sup> year Doctoral Student***Indira Zhunusbay***EMBA, SPHRi, HRCI Global Leader  
Professional, Certified Expert in Emotional  
Intelligence***M. Yermekbayeva***PhD, Chief People Officer, Kazakhstan Stock Exchange, business coach***Introduction**

*In the era of rapid digital transformation and the increasing use of artificial intelligence in HR processes, the organization faces the task of determining the balance between technological efficiency and humanistic values. This challenge is particularly acute in the field of personnel selection, where decisions made by AI algorithms directly impact the professional futures of candidates and shape organizational culture.*

*The importance of this issue lies in the fact that modern algorithms can significantly expedite the hiring process, enhance the objectivity of assessments, and reduce administrative expenses. However, there are also risks associated with the potential loss of empathy, individuality, and ethical considerations, as well as the erosion of traditional HR practices.*

*To ensure candidates' trust, maintain a positive company reputation, and improve the quality of decisions, it is crucial to humanize the choice of digital tools. This approach is essential for the success of organizations in the modern era.*

*The objective of this study is to explore the potential and limitations of incorporating artificial intelligence into the hiring process, with a focus on enhancing efficiency, objectivity, and empathy, while also exploring ways to humanize algorithmic solutions in HR practices.*

*To accomplish this, we must address the following objectives:*

*Identify the fundamental principles of AI-driven recruitment and determine the key performance indicators for algorithms.*

*Assess the risks associated with algorithmic systems, such as potential biases, reduced empathy, and the loss of human involvement in the hiring process.*

*Examine contemporary approaches to humanizing digital HR tools, including ethical design, algorithmic transparency, and the development of digital empathy.*

*Propose potential models and recommendations for striking a balance between technological effectiveness and humanistic interaction with candidates.*

*To evaluate the potential for the advancement of human-centered transformations in future AI-based recruitment systems.*

*The innovative aspect of this study lies in its comprehensive examination of the concept of humanizing artificial intelligence in the context of human resources, going beyond the conventional debates about algorithmic effectiveness and ethical considerations. The novelty has underscored the necessity for incorporating an empathetic perspective into digital recruiting tools and developing a conceptual framework that strikes a balance between automation and human interaction. The research opens up new possibilities for HR professionals in the era of digital transformation and outlines the paths for the development of AI-driven platforms that prioritize human-centered recruitment.*

**Literature review**

*The problem of humanizing the use of artificial intelligence in the hiring process is being actively researched by contemporary international and domestic scholars. Their work centers on examining the potential for algorithmic bias, diminished empathy in hiring, the outcomes of automation, and the capacity to provide human-centered access in digital HR systems.*

*In his article, Sarwar E., Zafar H., Siddiqui F. A. delves into the principles of value-driven design for digital systems, emphasizing that recruitment algorithms can only improve if they adhere to traditional values and ethical standards during their development[1]. The author identifies the main issue as the lack of transparency in algorithms and the high risk of candidate rejection. The key takeaway is the necessity to prioritize value-driven design as the foundation for humanizing AI-driven hiring.*

Nazer L. H. et al. highlights the dangers of algorithms that are trained on data that may contain biases[2]. He argues that these algorithms can perpetuate discriminatory practices that are embedded in the data, while remaining invisible to users. The key issue is the lack of transparency in algorithmic decision-making, and the solution lies in implementing rigorous auditing and data quality control measures for AI systems.

Magliocca P. et al. also emphasize the necessity to adapt to technological advancements and foster emotional engagement[3]. They view the digital transformation of HR as a process that can deprive managers of a sense of genuine support, which could harm the employer's reputation. The authors highlight the issue of the absence of emotional connection and the danger of dehumanization, emphasizing the significance of fostering digital empathy and creating hybrid AI + human models to ensure a positive experience for applicants.

Kyriakidou O., in his examination of the influence of algorithms on corporate culture, highlights that an overemphasis on rationality in hiring can undermine the principles of equity, autonomy, and confidence[4]. The author addresses the issue of distorted perceptions of fairness among applicants when relying solely on a fully automated selection process. In his final remarks, Gupta R. underscores the importance of selecting AI algorithms with transparency, comprehensibility, and the active participation of HR professionals to mitigate reputational and ethical hazards[5].

A review of the literature reveals that the primary obstacle to the use of artificial intelligence in personnel selection is the potential for dehumanization and ethical violations. Researchers argue that, while algorithms can be highly effective, they also pose risks such as algorithmic bias, diminished empathy, the promotion of static personality traits, and eroding trust in candidates. Nevertheless, all authors agree that the risks associated with data can be mitigated through a human-centered approach, the use of design techniques, algorithmic transparency, data auditing, and the validation of automated decisions by HR professionals. Consequently, the humanization of AI recruiting is becoming a cornerstone of modern HR technology development, ensuring fair and effective hiring practices.

### **Research methodology**

To achieve the purpose of the study — the possibilities of analysis and limitations of the use of artificial intelligence in personnel selection in terms of balance, efficiency, objectivity and empathy — two complementary research methods were applied: analytical and comparative evaluation.

The analytical method allows for a systematic and in-depth study of the essence of digital tools used in the recruitment process, as well as the main factors influencing the humanization of AI systems. It provides a detailed theoretical analysis of scientific literature, international studies, conceptual planning of algorithms, and artificial intelligence practices in the field of personnel management. This method provides a structuring of existing approaches to efficiency, transparency, and empathy in algorithmic HR models. In the framework of the study using the analytical method of economic development II, including algorithmic bias, insufficient ability to assess soft skills and risks of reducing the quality of interpersonal communications. The analysis makes it possible to identify the basic conceptual provisions on which the concept of humanizing digital hiring systems should be based, as well as to take into account the criteria by which a person and an algorithm interact in the decision-making process.

The comparative evaluation method is used to examine various models and practices of using artificial intelligence in recruitment in order to identify differences between efficiency-oriented approaches and approaches focused on humanizing recruiting. Using this method, modern AI tools are compared according to a number of the following indicators: the level of objectivity, empathy of interaction with a candidate, transparency and clarity of algorithms, the degree of human participation in the decision-making process, the impact on organizational culture and the trust of applicants. The method provides an opportunity to evaluate the strengths and weaknesses of various approaches, examples of practices, promotion of fairness and respect for candidates, as well as to determine which recruiting models determine the balance between technology policy and the human factor. The results of the comparative evaluation analysis allow us to make recommendations on the implementation of human-centered algorithmic solutions and adaptation of AI systems in such a way that they do not replace, but increase the role of an HR specialist.

### **Results and discussion**

The analytical research method allowed for a systematic study of scientific literature, international experience and existing solutions in the field of artificial intelligence used in personnel selection. As it turned out, modern algorithms are highly efficient[6]. They can significantly speed up the recruitment process, reduce administrative costs, and provide a more objective assessment of candidates using



*standardized selection criteria. Such systems successfully cope with processing large amounts of data, sorting resumes and primary filtering of candidates, which allows HR specialists to focus on strategic aspects of recruitment.*

*However, along with the advantages, as it turned out, there are significant limitations. Artificial intelligence algorithms are not able to fully take into account candidates' soft skills, emotional reactions, and interpersonal qualities, which play a crucial role in staff selection, especially in the academic environment. This leads to a decrease in the level of empathy in the process of interacting with candidates and creates the risk of formal, mechanistic selection, which may ignore individual characteristics of a person.*

*The analysis also revealed significant risks associated with algorithmic bias. As it turned out, since artificial intelligence systems are trained on historical data, they can reproduce existing stereotypes and discriminatory practices, and the opacity of the algorithms limits the possibilities of control by HR specialists. Such factors can negatively affect the trust of applicants and give them a sense of injustice, which undermines the reputation of the organization and reduces the effectiveness of long-term interaction with talented employees.*

*At the same time, the study identified promising areas for humanizing digital recruitment systems. As it turned out, the integration of ethical design principles, the introduction of digital empathy functions, the transparency of algorithms and data quality control systems allow us to create human-oriented artificial intelligence tools that not only increase the efficiency of processes, but also maintain respect for candidates, support interpersonal interaction and strengthen trust in the company.*

*Thus, the analytical research method allowed, as it turned out, to lay the foundation for assessing the balance between technological efficiency and a sensitive approach to personnel selection. The results obtained directly correspond to the objectives of the study, as they allow us to identify the limitations of existing systems, identify key risks, and identify areas for integrating human-centered solutions into the recruitment process.*

*One of the most well-known examples of the introduction of artificial intelligence (AI) into the recruitment process is Amazon's experience. In the mid-2010s, the company tried to automate recruiting by implementing a machine learning-based system designed to process resumes and rank candidates for technical and engineering positions. This system was intended to perform the initial selection task: analyzing hundreds and thousands of resumes, identifying key skills, and automatically identifying the most suitable candidates, thus significantly speeding up the selection process[7].*

*Initially, the AI engine rated candidates whose resumes met predefined criteria. This allowed HR specialists to focus on final interviews and strategic decisions, as the AI system did the majority of the initial screening work.*

*As it turned out, the system demonstrated high efficiency in terms of performance. The algorithm processed a large number of resumes within a short time frame, reducing the workload on recruiters and accelerating the candidate filtering process. Learning from historical data allowed us to identify patterns among "successful" candidates, making the selection process more standardized and objective.*

*However, during the operation of the system, some serious issues have emerged. As it turns out, the algorithm has a systemic bias. Because the model was trained on resumes from previous years, many of which were submitted by men, the system has begun to favor them over women. As a result, women's resumes, even those with excellent qualifications, have received lower marks. The system has "demoted" resumes that include the word "women's", such as "captain of the women's team", as well as those submitted by women who attended women's colleges, despite their impressive achievements[7]. Additionally, the algorithm rates soft skills, such as interpersonal skills, teamwork, and emotional intelligence, poorly, which are essential for academic and communications-intensive roles[8].*

*As a result, automation has increased in speed and objectivity, but it has also led to a loss of empathy and a decrease in fairness and inclusivity. In the years 2015-2017, Amazon realized that the system was not meeting the requirements for honest and high-quality recruitment, and they decided to curtail the project[9].*

*This example illustrates how the introduction of AI into recruiting without considering values, ethics, and empathy can lead to discrimination and negative consequences for a company's reputation. It confirms that while automation and efficiency are important, without proper control, transparency, and human involvement, there are significant risks of dehumanizing the recruiting process. To create AI systems that are human-centered, ethical design principles, algorithm audits, and the integration of human input at critical stages of selection are essential.*

Thus, Amazon's experience provides an empirical illustration of the relevance of the research topic "Humanizing recruitment using AI: balancing efficiency and empathy in hiring". The case demonstrates the need for a combination of technological optimization and a human-centered approach, which is directly related to the goals, objectives, and novelty of the research.

The comparative evaluation analysis made it possible to compare different approaches to the use of AI in personnel selection, to identify the strengths and weaknesses of efficiency-oriented systems and those that integrate the principles of humanization of the process. Two types of tools were considered: AI system A, focused on maximum speed and efficiency, and AI system B, integrating human-centered functions and empathy when interacting with candidates (in table 1).

Table 1. Comparative evaluation of ai recruitment systems: efficiency vs. humanization

| Evaluation Criterion                  | AI System A (Efficiency) | AI System B (Humanization) | Conclusion                                                                                                    |
|---------------------------------------|--------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------|
| Candidate Processing Speed            | Very High                | Medium                     | AI accelerates recruitment, but humanized systems operate slower due to the integration of empathy functions. |
| Objectivity of Selection              | High                     | Medium                     | Efficient systems minimize subjectivity but may overlook individual candidate characteristics.                |
| Empathy and Interpersonal Interaction | Low                      | High                       | Humanized systems provide a sense of care for candidates, improving the overall experience.                   |
| Algorithm Transparency                | Medium                   | High                       | Transparent models increase trust and perceived fairness in hiring.                                           |
| Human Involvement in the Process      | Minimal                  | Significant                | Humanized systems combine automation with the HR specialist's role in evaluating soft skills.                 |

The source was compiled based on the following data

The rate at which candidates are processed is a crucial metric for assessing the effectiveness of AI systems. It has been discovered that AI system A excels in this area, swiftly processing hundreds and thousands of applications, thereby relieving the workload of HR professionals and expediting the selection process. In contrast, AI system B, which prioritizes humanization, is slower. This is due to the inclusion of additional features, such as the analysis of soft skills, consideration of interpersonal traits, and the promotion of transparent communication with candidates. Consequently, AI systems that prioritize empathy may be slower in terms of speed, but they make up for this with the quality of their interactions with applicants.

The selection process is also subject to different levels of objectivity across systems. AI system A minimizes subjectivity by adhering strictly to predefined selection criteria, which standardizes the process and reduces the influence of personal biases of HR professionals. However, as it turns out, this rigidity can sometimes result in overlooking the unique qualities of candidates, such as non-traditional experience or unconventional career paths.

On the other hand, AI system B, while reducing the level of formal objectivity through the inclusion of human input and evaluation of soft skills, allows for the consideration of applicants' unique qualities, thereby enhancing the fairness and quality of the interaction.

Compassion and interpersonal communication are essential for making the process more human. System A lacks the ability to empathize with candidates, as it cannot evaluate their emotional intelligence, drive, or communication abilities. In contrast, System B incorporates elements of digital empathy, allowing candidates to receive feedback and engage in a transparent process. This, in turn, enhances the applicants' trust and enhances their experience with the organization.

The clarity of algorithms is also a crucial factor. System A offers limited details about the decision-making process, which can lead to a feeling of secrecy and mistrust among applicants. System B, on the other hand, incorporates transparency and algorithmic explainability from the outset, allowing applicants to comprehend the criteria used for evaluation. This approach has been found to enhance the perception of fairness and confidence in the hiring process.

Human involvement in the process is a crucial factor. In AI system A, human involvement is limited: the recruiter only receives the final selection outcomes, which restricts their ability to assess candidates' soft skills and personal traits. In AI system B, the involvement of an HR professional is substantial: they review the algorithm's recommendations, conduct interviews, and evaluate emotional and interpersonal qualities, ensuring a harmonious blend of automation and a human-centric approach.

The overall findings of the comparative analysis demonstrate that the optimal utilization of AI technology is achieved by sacrificing empathy and human interaction. Conversely, systems that prioritize humanization provide a superior candidate experience and foster trust in the process, albeit at the

expense of slower performance and increased reliance on HR professionals. To strike a balance between efficiency and empathy, a hybrid approach is recommended: automating routine processes with AI system A while incorporating human-centered elements from AI system B. This approach ensures swift and unbiased selection while maintaining respect for candidates and fostering interpersonal engagement, fully aligning with the objectives and goals of the study.

### Conclusion

Following the analysis and comparison, it was discovered that the implementation of AI in the process of selecting candidates for employment brings about substantial benefits, particularly in terms of the speed with which resumes are processed, the impartiality of the selection process, and the standardization of the procedure. The automation of this process enables HR professionals to concentrate on the strategic aspects of recruitment, thereby reducing administrative burdens and expediting the screening of applicants[10].

Simultaneously, studies have demonstrated that AI is incapable of fully considering emotional intelligence, interpersonal skills, and other crucial qualities when assessing candidates for academic and communication-intensive positions.

A comparative analysis has shown that systems that prioritize efficiency expedite procedures and minimize bias, but they also diminish the level of empathy and trust in applicants. Conversely, the incorporation of human-centric features and transparent algorithms enhances candidate satisfaction, fosters trust, and ensures a more equitable and compassionate process, albeit with the need for increased involvement from HR professionals and a slight delay in data processing.

A review of the renowned Amazon case demonstrated the practical relevance of these findings: an effort to fully automate the hiring process without considering the emotional intelligence and transparency of algorithms resulted in biased treatment of applicants and the system's rejection. This instance underscores the importance of finding a harmonious equilibrium between technological effectiveness and a human-centric approach.

Therefore, the overall finding of the research is that the most effective implementation of AI in personnel selection necessitates a hybrid approach that combines the automation of routine tasks with the active involvement of an HR professional and the integration of human-centric functions. This approach enables us to simultaneously achieve the objectives of enhancing the efficiency, impartiality, and swiftness of the selection process, while also ensuring the empathy, fairness, and trust of candidates. The findings obtained are in full alignment with the objectives of the study: they highlight the limitations of contemporary AI systems, propose methods for integrating human-centered solutions, and validate the importance of implementing ethical and transparent algorithms in academic settings.

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# Journalism

## THE HISTORY AND DEVELOPMENT TRENDS OF INTERNET JOURNALISM IN AZERBAIJAN

Sura Seyid

Doctor of philosophy in philology, Associate professor  
Nakhchivan State University  
<https://orcid.org/0000-0002-5628-0959>

### Abstract

*This article examines the historical development and contemporary trends of internet journalism in Azerbaijan from the first internet connections in the mid-1990s to the present. It situates technological and market developments alongside legal and political changes, and analyzes how legislation (notably the 2000 Mass Media Law and the 2021 Law on Media) and state practice have shaped online news production, distribution, and press freedom. The study synthesizes archival sources, agency histories, international monitoring reports, legal texts, and recent news accounts to map periodization, institutionalization, digital practices, and emerging trends.*

**Keywords:** Azerbaijan, internet journalism, digital media, media law, press freedom, online news

### Introduction

Internet journalism in Azerbaijan developed quickly after the country gained internet connectivity in the mid-1990s. Early adopters experimented with online editions of established outlets and a new generation of digital-only portals emerged in the 2000s. Over time, legislative updates and regulatory practice sought to incorporate digital media into formal media governance frameworks; at the same time, international monitors and domestic critics have documented growing pressures on independent media, especially since the late 2010s (Freedom House, 2021; Reporters Without Borders, 2025). This article traces the field's evolution, outlines principal development trends, and analyzes how the legal environment and political dynamics interact with technological change.

### Methods

**Research design.** This paper uses a qualitative, document-centered historical approach. Sources were gathered from (1) official legal texts and government publications; (2) major Azerbaijani media organizations' historical statements and archive pages; (3) international monitoring and legal-analysis reports (OSCE, Venice Commission, Freedom House, Reporters Without Borders); and (4) contemporary news reporting documenting recent events affecting media actors. The approach combines periodization (identifying chronological phases), legislative impact analysis (examining how statutes and regulations affected online media), and trend synthesis (technology, professionalization, and repression/ resilience dynamics).

**Data collection and selection.** Primary legal sources included the Law on Mass Media (2000, with later amendments) and the Law on Media (adopted 30 December 2021, published in the official gazette in early 2022). International assessments and legal reviews by OSCE and the Venice Commission were used to interpret the laws' implications for freedom of expression. Empirical examples (e.g., founding dates and functions of major online outlets such as Azerbaijani Press Agency/APA) were corroborated with agency webpages and archival materials (Azeri-Press Agency, 2004/2025; Caspiana/Harvard exhibition materials).

**Analytical limits.** This is a documentary synthesis relying on publicly available sources. Field interviews and large-scale audience surveys were outside the scope; therefore, conclusions about audience behavior and business models draw on secondary literature and monitoring reports rather than primary survey data.

### Historical development: periodization and key milestones

#### 1. Initial emergence (mid-1990s — 2000)

Azerbaijan's first internet connectivity opened opportunities for online dissemination by both legacy publications and nascent outlets. During this early phase, internet use was limited by infrastructure, cost, and low penetration; nevertheless, several outlets experimented with web editions and early news portals (Caspiana/Harvard, n.d.). The 2000 Law on Mass Media established a statutory baseline for media activity but did not explicitly cover online publications (Article 19 memorandum on the Law on Mass Media, 2000).

## **2. Portal growth and consolidation (2000 — c. 2008)**

In the early 2000s a number of major news portals and agencies expanded their online presence. For example, Trend (originating in the 1990s as an information provider) and the Azeri-Press Agency (APA) (registered in 2004) became important providers of round-the-clock online news and multilingual content (Azeri-Press Agency, 2004/2025; Caspiana/Harvard, n.d.). This period featured the technical and organizational steps required to make digital publishing a central part of journalistic work: web content management, multimedia content (photos, some video), and faster news cycles.

## **3. Recognition and regulatory attention (c. 2009 — 2015)**

Growing internet penetration and the popularization of social networks drove both diversified online reporting and increased state attention. The 2009 amendments to the 2000 Mass Media Law clarified that provisions applied to information disseminated electronically, formally bringing online outlets into the regulatory perimeter (Article 19, 2000; CIS legislation records). This legal recognition granted benefits such as clearer legal status for online publishers but also meant enhanced oversight and enforcement potential.

## **4. Institutionalization and increasing control (2015 — present)**

From the mid-2010s onward, online journalism became embedded in institutional media practice: outlets professionalized multimedia production, adopted mobile apps, and integrated social media as distribution channels. At the same time, the state revised its regulatory architecture. In December 2021 Azerbaijan adopted a new **Law on Media** (published in the official gazette in early 2022), which created mechanisms such as a Media Register, accreditation regimes, and expanded rules for online platforms (Azerbaijan, 2021). International legal analyses and human-rights organizations raised concerns that elements of the new law — and the practical enforcement environment — could restrict pluralism and independent journalism (Venice Commission, 2022; Centre for Law and Democracy analysis, 2022; OSCE, 2022).

Most recently, international media organizations and news agencies have reported increased arrests, suspensions of foreign outlets, and court sentences against journalists, indicating a further constriction of the space for critical reporting (Reuters, 2024; AP, 2025; Reporters Without Borders, 2025).

### **Key development trends**

#### **A. Legal formalization of online media**

The legal trajectory shows a shift from omission (early laws written with print/ broadcast in mind) to explicit inclusion and formalization. The 2009 amendments recognized online information resources as media; the 2021 Law on Media created a formal regulatory structure for online actors (Azerbaijan, 2021; Article 19, 2000). International legal reviews pointed out both clarifications and problematic provisions, recommending revisions to better protect freedom of expression (Venice Commission, 2022; OSCE, 2022).

**Implication:** Formal inclusion brings clarity but also means that regulations developed for traditional media may be applied to online practices in ways that restrict agility, anonymity for sources, or new forms of citizen journalism.

#### **B. Technological and business professionalization**

Digital newsrooms adopted multimedia workflows, social media distribution, and mobile-first strategies. Major agencies (e.g., APA, Trend) provide multilingual services and real-time updates, moving toward integrated online-broadcast models (Azeri-Press Agency, 2004/2025). However, sustainable independent business models remain limited; many independent outlets face funding constraints and reliance on donor support or advertising that may be insufficient to sustain investigative journalism.

**Implication:** Professionalization improved production quality and reach, but economic fragility limits long-term editorial independence for independent outlets.

#### **C. Audience fragmentation and social media dynamics**

Platforms such as Facebook, Twitter/X, Telegram, and YouTube became important distribution channels and spaces for debate. Social media expanded audiences but also accelerated disinformation risks and introduced platform moderation dynamics that interact with national regulation (Freedom House, 2021).

**Implication:** Social platforms create new distribution opportunities for diverse voices but also expose journalists and sources to surveillance, takedowns, and platform-driven visibility shifts.

### **Illustrative legal excerpts and interpretation**

The foundational 2000 law stated the principle of press freedom: “Mass media in the Republic of Azerbaijan shall be free. Censorship in any form shall not be permitted” (Memorandum on the Law on Mass Media, 2000). Later legal development clarified that media provisions apply to electronic

dissemination, but the 2021 Law on Media introduced registration and accreditation mechanisms that international bodies say need safeguards to prevent overbroad restrictions (Azerbaijan, 2021; Venice Commission, 2022). OSCE legal analysis recommended that reforms ensure proportionality and protect independent journalism (OSCE, 2022).

Case examples

1. **Azeri-Press Agency (APA).** Registered in 2004 and since developed a broad online presence with multilingual services and real-time news distribution—typical of agency professionalization in the 2000s (Azeri-Press Agency, 2004/2025).

2. **Closure and suspension of foreign and independent outlets.** Reporting through 2024–2025 documents suspensions and arrests affecting independent and foreign outlets’ operations, illustrating the practical impact of legal enforcement on internet journalism (Reuters, 2024; AP, 2025; Reporters Without Borders, 2025).

Discussion

Internet journalism in Azerbaijan demonstrates a paradox: technological and institutional professionalization increased the reach and sophistication of online news, yet the legal and political environment created vulnerabilities for editorial independence. The formal inclusion of online media into law has made it easier to regulate and, in some cases, to curtail critical reporting under administrative or criminal statutes. International legal analyses insist on clearer protections for freedom of expression, more narrowly tailored restrictions, and stronger procedural safeguards (Venice Commission, 2022; Centre for Law and Democracy, 2022; OSCE, 2022).

At the same time, digital tools—social media distribution, low-cost publishing platforms, and cross-border content sharing—have sustained alternative public information channels. Independent journalists and outlets continue to adapt strategies for resilience, including diaspora platforms and encrypted communication with sources. The sustainability of these strategies depends on economic models, legal protections, and international advocacy.

Conclusion and future research directions

The history and recent trajectory of internet journalism in Azerbaijan highlight how technology can expand public communication while legal and political frameworks decisively shape who benefits from that expansion. Critical areas for future research include (1) audience behavior and digital news consumption patterns in Azerbaijan, (2) the sustainability of independent online outlets’ business models, (3) quantitative studies of censorship/blocking incidents and their effects on information flows, and (4) comparative research on media-law reforms in the South Caucasus.

Table 1 — Timeline (select milestones)

| Year                  | Milestone                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------|
| Mid-1990s             | First internet connectivity and early online experiments by established outlets (archival phase).           |
| 2000                  | Law on Mass Media adopted (initial statutory framework).                                                    |
| 2004                  | Azeri-Press Agency (APA) registered and begins operations (agency professionalization).                     |
| 2009                  | Amendments clarify that electronic/online media are covered by media law.                                   |
| 2021 (published 2022) | Law on Media adopted; Media Register and new regulation mechanisms introduced.                              |
| 2024–2025             | Reported arrests and suspensions affecting journalists and foreign outlets; raised international criticism. |

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## *Jurisprudence*

### *THE ROLE OF LOCAL DEMOCRACY AND LOCAL SELF-GOVERNMENT IN THE CONDITIONS OF DEMOCRATIC RULE OF LAW: TOWARDS UNDERSTANDING THE CONTENT LOAD AND DEFINITION*

**Baimuratov Mykhailo Oleksandrovych**

Doctor Habilitat of Law, Professor,  
Professor of the Department of Political Sciences and Law  
South Ukrainian National  
Pedagogical University named after K.D. Ushynsky,  
Honored Worker of Science and Technology of Ukraine,  
Academician of the Ukrainian Academy of Sciences,  
Ukraine

ORCID: 0000-0002-4131-1070

**Kofman Borys Yakovych,**

Doctor Habilitat of Law, Professor,  
Associate Professor of the Department of Political Sciences and Law  
South Ukrainian National  
Pedagogical University named after K.D. Ushynsky,  
Honored Lawyer of Ukraine,  
Ukraine

ORCID: 0000-0001-8121-5190

**Bobrovnyk Denys Oleksandrovych,**

Candidate of Economic Sciences, Doctoral Student  
of the National Aviation University,  
Ukraine

ORCID: 0000-0002-1142-6926

### *РОЛЬ ЛОКАЛЬНОЇ ДЕМОКРАТІЇ ТА МІСЦЕВОГО САМОВРЯДУВАННЯ В УМОВАХ ДЕМОКРАТИЧНОЇ ПРАВОВОЇ ДЕРЖАВНОСТІ: ДО РОЗУМІННЯ ЗМІСТОВНОЇ НАВАНТАЖЕНОСТІ ТА РОЗМЕЖУВАННЯ*

**Баймуратов Михайло Олександрович**

доктор юридичних наук, професор,  
професор кафедри політичних наук та права  
Південноукраїнського національного  
педагогічного університету ім. К.Д. Ушинського,  
Заслужений діяч науки і техніки України, академік Української академії наук,  
Україна

ORCID: 0000-0002-4131-1070

**Кофман Борис Якович**

доктор юридичних наук, старший дослідник,  
доцент кафедри політичних наук та права  
Південноукраїнського національного педагогічного  
університету ім. К.Д. Ушинського,  
Заслужений юрист України,  
Україна

ORCID: 0000-0001-8121-5190

**Бобровник Денис Олександрович**

кандидат економічних наук, докторант  
Національного авіаційного університету,  
Україна

ORCID: 0000-0002-1142-6926

#### **Abstract**

The article is devoted to the study of the role of local democracy and local self-government in the conditions of democratic legal statehood in the contextualization of understanding the content load and delimitation of these phenomenologies. It is proved that the formation, manifestation, development and

*improvement of the phenomenology of democratic legal statehood is accompanied by powerful processes of decentralization of public power and municipalization of all aspects of the existence and functioning of a person, his groups and associations in the conditions of strategic trends of democratization of social and state life. The above state-building and law-making processes are often characterized through the application and use of the lexical and terminological systems "local democracy" and "local self-government", because they reflect the essence of self-government processes that arise in the conditions of the existence and functioning of territorial local human communities (in the sense of Ukrainian historiography and modern national constitutional and municipal law of Ukraine – territorial communities) and the logic of recognition by the state at the constitutional (Articles 5, 7, 92, Section XI of the Constitution of Ukraine) and legislative levels of such communities in all the variety of definitions and recognition of their socio-political, socio-economic, socio-cultural, socio-social role and significance. It is stated that in the doctrine of municipal law, no unified approaches to understanding the terminological systems under study have yet been found, although such attempts are regular in nature - but they do not end in success, due to the presence of different, sometimes diametrically opposed, authorial positions based on different methodological approaches, which rely on different theories of the origin of the institutions-phenomenologies of local democracy and local self-government. It is argued that it is in this aspect that the question of the relationship between democracy and local self-government is relevant and contextual - therefore, in the contextualization and understanding of the management and cooperation potential, it can be divided into several approaches, namely: a) an alternative-antagonistic approach, which is based on the fact that self-government is a traditional institution that does not agree with the basic principles of democracy. Hence, it exists and functions according to its internal laws, relying on the will of either the majority of the population or the public authority that governs it - and this does not always coincide with the guidelines of democracy; b) a priority-democratic approach, which is based on the fact that the foundations of democracy, such as majority rule, cannot be applied to self-government, as a phenomenon of limited, narrowly focused on solving only issues of local importance and creating general conditions for organizing the life of the population; c) an identifying approach, according to which local democracy is the same as local self-government - this is a very simplified approach that violates the unity of awareness and understanding of profile concepts-phenomenologies, because it contradicts the philosophical connection of the general and the particular, as well as their interaction and interdependence; d) an approach based on the principle of absolute collaboration, according to which democracy and local self-government are not only inextricably linked and interact with each other, but also complement each other, determining mutual development and improvement. Therefore, using this approach, it can be stated that local self-government and local democracy are close, but not identical and still different concepts. Because local democracy is the social environment where local self-government operates, which, by its ontological essence, acts as an organization of power of the territorial community. At the same time, common to both studied concepts-phenomenologies is the public interest that they implement, as well as the principles of its development and implementation: A) solidarity - as unity, commonality of interests, views and actions, active sympathy and mutual support of people or groups, arising from the awareness of common goals (intersubjectivity) and expressed in coordinated actions (coordination), especially in moments of crisis - acts as a powerful and optimal tool for mobilizing society and achieving common goals, based on mutual understanding and shared responsibility; B) subsidiarity - as a principle according to which tasks should be solved at the lowest possible level, and only those tasks that cannot be effectively solved at the local level are transferred to a higher (central) level - it is based on the idea that the highest level of power should have a supporting, not a dominant, role, intervening only when necessary. Thus, the principle of subsidiarity is closely related to decentralization and is applied in public administration at the local level of society. In turn, the difference between the studied concepts-phenomenologies is that local democracy is focused on achieving a general consensus in the community, and local self-government is focused on the implementation of the state interest at the local level of governance.*

#### **Анотація**

Стаття присвячена дослідженню ролі локальної демократії та місцевого самоврядування в умовах демократичної правової державності в контекстуалізації розуміння змістовної завантаженості та розмежування даних феноменологій. Доводиться, що формування, прояв, розвиток і вдосконалення феноменології демократичної правової державності супроводжується могутніми процесами децентралізації публічної влади та муніципалізацією всіх сторін існування і функціонування людини, її груп та асоціацій в умовах стратегічних тенденцій демократизації суспільного і державного життя. Наведені державотворчі та правотворчі процеси часто-густо

характеризуються через застосування і використання лексико-термінологічних систем «локальна демократія» та «місцеве самоврядування», бо саме вони відображають сутність самоврядних процесів, що виникають в умовах існування і функціонування територіальних локальних людських громад (в розумінні української історіографії та сучасних національних конституційного і муніципального права України – територіальних громад) та логіку визнання державою на конституційному (ст. ст. 5, 7, 92, Розділ XI Конституції України) та законодавчому рівнях таких громад у всьому розмаїтті визначення і визнання їх соціально-політичної, соціально-економічної, соціально-культурної, соціально-громадської ролі і значення. Констатується, що в доктрині муніципального права ще не знайдено єдиних підходів до розуміння досліджуваних терміносистем, хоча такі спроби мають регулярний характер, – але вони не завершуються успіхом, завдяки наявності різних, підчас діаметрально протилежних, авторських позицій, що засновані на різних методологічних підходах, які спираються на різні теорії походження інститутів-феноменологій локальної демократії та місцевого самоврядування. Аргументовано, що саме в даному аспекті актуальним та контекстуальним виступає питання про співвідношення демократії та місцевого самоврядування – тому у контекстуалізації та розумінні управлінсько-коопераційного потенціалу, можна поділити на кілька підходів, а саме: а) альтернативно-антагоністичний підхід, що базується на тому, що самоврядування – це традиційний інститут, який не узгоджується з основними принципами демократії. Звідси він існує та функціонує по своїм внутрішнім закономірностям, спираючись на волю або більшість населення, або публічної влади, що ним управляє – а це не завжди співпадає з настановами демократії; б) пріоритетно-демократичний підхід, який спирається на те, що основи демократії, як влада більшості, не можуть бути застосовані до самоврядування, як явища обмеженого, вузько скерованого на вирішення тільки питань місцевого значення та створення загальних умов для організації життєдіяльності населення; в) отожднюючий підхід, відповідно до якого локальна демократія це теж саме, що й місцеве самоврядування – це дуже спрощений підхід, що порушує єдність усвідомлення і розуміння профільних понять-феноменологій, бо суперечить філософський зв'язок загального і часткового, а також їх взаємодію та взаємозалежність; г) підхід, що заснований на принципі абсолютної колаборації, відповідно до якого демократія і місцеве самоврядування не тільки нерозривно пов'язані і взаємодіють між собою, але й доповнюють один одного, детермінуючи взаємний розвиток і вдосконалення. Отже, використовуючи такий підхід, можна констатувати, що місцеве самоврядування та локальна демократія є близькими, але не ідентичними і все-таки відмінними поняттями. Бо локальна демократія є тим соціальним середовищем, де діє місцеве самоврядування, що, за своєю онтологічною суттю, виступає як організація влади територіальної громади. В той же час спільним для обох досліджуваних понять-феноменологій виступає публічний інтерес, який вони реалізують, а також принципи його розбудови й реалізації: А) солідарність – як єдність, спільність інтересів, поглядів та дій, активне співчуття та взаємна підтримка людей або груп, що виникає з усвідомлення спільності цілей (інтерсуб'єктивність) і виражається у погоджених діях (координація), особливо в кризові моменти – виступає як потужний і оптимальний інструмент для мобілізації суспільства та досягнення спільних цілей, оснований на взаєморозумінні та спільній відповідальності; Б) субсидіарність – як принцип, згідно з яким задачі мають вирішуватися на найнижчому можливому рівні, і лише ті завдання, які не можуть бути ефективно вирішені на місцевому рівні, виносяться на вищий (центральный) рівень – в її основі лежить ідея про те, що вища ланка влади повинна мати допоміжну, а не домінуючу роль, втручаючись лише тоді, коли це необхідно. Отже, принцип субсидіарності тісно пов'язаний з децентралізацією і застосовується в державному управлінні на локальному рівні соціуму. Своєю чергою, відмінність між досліджуваними поняттями-феноменологіями полягає в тому, що локальна демократія орієнтована на досягнення загального консенсусу у громаді, а місцеве самоврядування – на реалізацію державного інтересу на локальному рівні управління.

**Keywords:** local democracy, local self-government, territorial community, person, his/her groups and associations, human rights, democratic, legal statehood.

**Ключові слова:** локальна демократія, місцеве самоврядування, територіальна громада, людина, її групи та асоціації, права людини, демократична, правова державність.

### Вступ

Формування, прояв, розвиток і вдосконалення феноменології демократичної правової державності супроводжується могутніми процесами децентралізації публічної влади та



муніципалізацією всіх сторін існування і функціонування людини, її груп та асоціацій в умовах стратегічних тенденцій демократизації суспільного і державного життя. Наведені процеси частіше характеризуються лексико-термінологічними системами «локальна демократія» та «місцеве самоврядування (далі – МСВ)», бо саме вони відображають сутність самоврядних процесів, що виникають в умовах існування і функціонування територіальних локальних людських громад (в розумінні української історіографії та сучасних національних конституційного і муніципального права України – територіальних громад /далі – ТГ/) та логіку визнання державою на конституційному (ст. ст. 5, 7, 92, Розділ XI Конституції України [1]) та законодавчому рівнях таких ТГ –

- по-перше, як первинних суб'єктів МСВ;
- по-друге, таких, що вирішують на основі Конституції та законів України питання місцевого значення;
- по-третє, таких, що через використання виборчих процедур формують органи публічної самоврядної (муніципальної) влади на місцях, що,
- по-четверте, репрезентують такі громади, діють від їх імені, в їх інтересах;
- по-п'яте, такі органи, що сформовані безпосередньо ТГ, через використання виборчих технологій або опосередковано, через механізм демократичних призначень, володіють відповідними компетенційними повноваженнями в різних сферах соціального життя, здійснюючи в них відповідну управлінську діяльність, та,
- по-шосте, створюючи для управлінської діяльності відповідні структурні інституції, сприяють виникненню, формуванню, прояву та реалізації прав, свобод і обов'язків у людини-жителя та одночасно члена ТГ, а також у груп та асоціацій людини, що нею створюються, та,
- по-сьоме, створюючи на локальному рівні соціуму локальну систему охорони, захисту, реалізації, гарантування такої реалізації прав людини [2];
- по-восьме, враховуючи той безальтернативний факт, що в умовах МСВ, в межах ТГ, в філософському стані повсякденності, в процесі реалізації феноменології соціалізації, а також формування, прояву та здійснення конституційно-правового та муніципально-правового статусів людини, а також її групи та асоціації реалізують свій життєвий цикл (людина), а також цикл існування і функціонування (групи та асоціації людини) – наведені вище лексико-термінологічні системи «локальна демократія» та «місцеве самоврядування» відіграють стратегічно-повсякденну та стратегічно-перспективну роль і значення в соціальному існуванні, управлінському функціонуванні, релятивістському розвитку та нормативно-формалізованій трансформації, в розумінні подальшого і сталого вдосконалення, макрофеноменології демократичної правової державності, а також
- по-дев'яте, враховуючи стратегічну важливість рівня локальної демократії та феноменології МСВ для стабільного та сталого існування і функціонування макрофеноменології демократичної правової державності, міжнародне співтовариство держав обрало наведені самоврядні явища як об'єкти міжнародно-правового регулювання, – закріпив їх правовий статус на рівні багатосторонніх міжнародних договорів, що приймаються на універсальному та регіональному рівнях, а також у численних документах «м'якого права», що: по-перше, приймаються структурними інституціями міжнародних організацій; по-друге, регулюють актуальні питання існування і функціонування місцевого самоврядування та його відносини з іншими органами публічної влади держави; по-третє, виступають своєрідним прообразом нових міжнародно-правових актів довірливого характеру в сфері локальної демократії.

Отже, саме тому актуалізується та контекстуалізується необхідність належного об'єктивного вивчення і дослідження вказаних феноменологій з метою їх подальшого концептуально-доктринального розуміння і визначення, теоретико-філософської ідентифікації через виявлення відмінностей та знаходження спільних рис, наративно-конотаційного супроводження, а також нормативно-правового забезпечення.

#### **Актуалізація доктринального супроводження і забезпечення досліджуваної проблематики в контексті розуміння та розмежування локальної демократії та місцевого самоврядування**

Варто зазначити, що в доктрині муніципального права ще не знайдено єдиних підходів до розуміння досліджуваних терміносистем, хоча такі спроби мають регулярний характер. Але вони не завершуються успіхом, завдяки наявності різних, підчас діаметрально протилежних, авторських позицій, що засновані на різних методологічних підходах, які спираються на різні теорії походження інститутів і феноменологій локальної демократії та місцевого самоврядування.



Звідси саме в даному аспекті актуальним та контекстуальним виступає питання про співвідношення демократії та місцевого самоврядування. Вже зазначалося, що погляди науковців та фахівців у даному питанні різняться та їх, у контекстуалізації та розумінні управлінсько-коопераційного потенціалу, можна поділити на кілька підходів, а саме:

- по-перше, альтернативно-антагоністичний підхід, що базується на тому, що самоврядування – це традиційний інститут, який не узгоджується з основними принципами демократії. Звідси він існує та функціонує по своїм внутрішнім закономірностям, спираючись на волю або більшості населення, або публічної влади, що ним управляє – а це не завжди співпадає з настановами демократії;

- по-друге, пріоритетно-демократичний підхід, який спирається на те, що основи демократії, як влада більшості, не можуть бути застосовані до самоврядування, як явища обмеженого, вузько скерованого на вирішення тільки питань місцевого значення та створення загальних умов для організації життєдіяльності населення;

- по-третє, ототожнюючий підхід, відповідно до якого локальна демократія це теж саме, що й місцеве самоврядування – це дуже спрощений підхід, що порушує єдність усвідомлення і розуміння профільних понять-феноменологій, бо суперечить філософський зв'язок загального і часткового, а також їх взаємодію та взаємозалежність;

- і, по-четверте, підхід, що заснований на принципі абсолютної колаборації, відповідно до якого демократія і місцеве самоврядування не тільки нерозривно пов'язані і взаємодіють між собою, але й доповнюють один одного, детермінуючи взаємний розвиток і вдосконалення. Отже, використовуючи такий підхід, можна констатувати, що місцеве самоврядування та локальна демократія є близькими, але не ідентичними і все-таки відмінними поняттями. Бо локальна демократія є тим соціальним середовищем, де діє місцеве самоврядування, що, за своєю онтологічною суттю, виступає як організація влади територіальної громади.

В той же час спільним для обох досліджуваних понять-феноменологій виступає публічний інтерес, який вони реалізують, а також принципи його розбудови й реалізації:

А) солідарність – як єдність, спільність інтересів, поглядів та дій, активне співчуття та взаємна підтримка людей або груп, що виникає з усвідомлення спільності цілей (інтерсуб'єктивність) і виражається у погоджених діях (координація), особливо в кризові моменти – виступає як потужний і оптимальний інструмент для мобілізації суспільства та досягнення спільних цілей, оснований на взаєморозумінні та спільній відповідальності.

Б) субсидіарність – як принцип, згідно з яким задачі мають вирішуватися на найнижчому можливому рівні, і лише ті завдання, які не можуть бути ефективно вирішені на місцевому рівні, виносяться на вищий (центральный) рівень – в її основі лежить ідея про те, що вища ланка влади повинна мати допоміжну, а не домінуючу роль, втручаючись лише тоді, коли це необхідно. Отже, принцип субсидіарності тісно пов'язаний з децентралізацією і застосовується в державному управлінні на локальному рівні соціуму.

Своєю чергою, відмінність між досліджуваними поняттями-феноменологіями полягає в тому, що локальна демократія орієнтована на досягнення загального консенсусу у громаді, а місцеве самоврядування – на реалізацію державного інтересу на локальному рівні управління.

**Усвідомлення та розуміння локальної демократії та місцевого самоврядування в контекстуалізації розуміння та розмежування досліджуваних понять-феноменологій**

Вартю зазначити, що існують доктринальні підходи, що володіють внутрішньою логікою та достатньою аргументацією, що демонструє конструктивність та доброякісність наукової позиції. Так, учасники Освітнього проекту «Локальна демократія: кращі європейські практики для України», що реалізувався в рамках проекту Модуль Жана Моне програми Erasmus+ ERASMUS-JMO-2021-HEI-TCH-RSCH-101047645 – «EULOCDEM: Локальна демократія: кращі європейські практики для України» в колективному монографічному дослідженні «Локальна демократія: роль громад та органів місцевого самоврядування», що була видана в Сумах (2024) [3], вперше провели системний аналіз феноменологій «локальна демократія» та «міське самоврядування».

Так, вони вбачають, що локальна демократія – це філософія та система цінностей, що передбачає активну участь громадян у прийнятті рішень на місцевому рівні (філософсько-аксіологічний критерій – авт.), тоді як місцеве самоврядування – це юридично закріплений механізм (структура органів та їхні повноваження) для реалізації цієї демократії на практиці (нормативно-праксеологічний критерій – авт.). Іншими словами, локальна демократія є ідеєю (концептуально-теоретичний рівень – авт.), а МСВ – інструментом, що її втілює (функціонально-телеологічний рівень – авт.).

Отже, вони вважають, що основоположними рисами локальної демократії виступають такі основоположні настанови (у нашій інтерпретації та тлумаченні – авт.):

А) Змістовно-визначальна – локальна демократія це фактично прояв феноменології муніципалізму, що виступає органічною та складовою частиною та іманентним елементом демократичної правової державності.

Б) Онтологічна (сутнісна) – передбачає активну участь жителів-членів ТГ (як громадян держави так й інших фізичних осіб, що володіють іншим правовим станом (іноземство, апатридство, біженство тощо), які на законних підставах знаходяться на території держави перебування та постійно проживають у відповідній ТГ, у процесі прийняття рішень на місцевому рівні, а також через розвиток місцевої ініціативи.

В) Засадино-фокусна (конкретно-визначальна) – передбачає наявність демократичних принципів і громадянської участі в місцевих справах.

Г) Реляційна (у контекстуалізації формування відносин профільної спрямованості) – передбачає і включає в себе саму феноменологію МСВ як одного із своїх елементів.

На різницю від локальної демократії, учасники наведеного Освітнього проекту вважають, що феноменологія МСВ характеризується такими настановами (у нашій інтерпретації та тлумаченні – авт.), а саме:

А) Змістовно-визначальна – сама феноменологія МСВ виступає як один з видів локальної демократії.

Б) Онтологічна (сутнісна) – розуміється та сприймається як система управління публічною владою на місцевому рівні, що реалізується місцевими органами публічної влади /публічної самоврядної (муніципальної) влади/, що формуються самою територіальною людською спільнотою (ТГ) через використання виборчих технологій (представницькі органи МСВ, сільській, селищний, міський голова, голова об'єднаної ТГ, староста) та механізму демократичних призначень (виконавчі органи МСВ).

В) Засадино-фокусна (конкретно-визначальна) – передбачає наявність управлінських інститутів всередині ТГ, процесуальних процедур реалізації форм їх функціонування та компетенційних повноважень органів публічної самоврядної (муніципальної) влади.

Г) Реляційна (у контекстуалізації формування відносин профільної спрямованості) – передбачає і включає механізм для реалізації локальної демократії.

Разом з тим, на наш погляд, наведений перелік настанов, що є характерологічними для досліджуваних феноменологій, що аналізуються, можна доповнити наступними, а саме:

Г') Телеологічна настанова (система цільових домінант) – у контекстуалізації усвідомлення і розуміння ролі і значення системи самоврядних відносин, що формуються на рівні локального соціуму, в межах територіальної локальної людської спільноти (територіальної громади), в філософському стані повсякденності, – завдяки системі локальної демократії у вигляді муніципалізму (основоположний метод – авт.), через використання інституту місцевого самоврядування (основоположний засіб – авт.), – що мають телеологічну настанову щодо створення сталої, оптимальної, ефективної, конструктивної системи життєдіяльності людини, її груп та асоціацій у контекстуалізації здійснення ними свого життєвого циклу (людина), а також циклу існування та функціонування (для груп людини та її асоціацій у вигляді громадських інституцій та інших інституцій громадянського суспільства).

Д) Аксіологічна настанова – у контекстуалізації усвідомлення і розуміння ролі і значення системи муніципальних цінностей, що фактично виступають як цінності локальної демократії у вигляді цінностей муніципалізму, а на практиці – зароджують, формують, сегрегують, посилюють та реалізують смисли, патерни, концепти, атидюд (поведінкові настанови), габітуси (практичні форми життєдіяльності), алгоритми, конотації, наративи та ітерації місцевого самоврядування.

Е) Ідеологічна настанова – у контекстуалізації усвідомлення і розуміння ролі і значення системної сукупності філософських, політичних, правових, етичних, релігійних та інших поглядів, переконань і принципів локальної демократії, що спирається на феноменологію муніципалізму та відображають насамперед інтереси певних соціальних груп всередині локального суспільства або макросуспільства на загальнодержавному рівні загалом, що існує та функціонує в умовах місцевого самоврядування – ба більше, саме така сукупність поглядів й слугує для усвідомлення, розуміння, пояснення та презентації багатоаспектності та стратегічної важливості муніципального світу та муніципально-суспільних відносин, включаючи й муніципально-правові

відносини, а також для обґрунтування дій, спрямованих на їхню соціальну динаміку формування, становлення, дію, збереження, гарантування, розвиток чи трансформацію.

Є) Екзистенційна настанова – у контекстуалізації усвідомлення і розуміння ролі і значення системної сукупності життєвоважливих настанов існування і функціонування людини, її груп та асоціацій, а також особливої ролі і діяльності органів публічної влади, що сприяють їх формуванню та реалізації, а також інституцій громадянського суспільства, що скеровані на формування системи локальних інтересів індивідуальної, групової та колективної властивості, – при цьому локальна демократія виступає природним простором та нормативно-правовим гарантом виникнення, формування, реалізації, гарантування, розвитку і вдосконалення таких екзистенційних настанов, а місцеве самоврядування, своєю чергою, стає могутнім інструментально-функціональним та нормативно-діяльним засобом реалізації наведених процесів.

Ж) Суб'єктна настанова – у контекстуалізації усвідомлення і розуміння ролі і значення сукупності суб'єктів (людина, її групи та асоціації /мікрогромади (родина, дерево родинних контактів тощо), мезогромади (трудоий колектив, колектив студентів тощо), макрорегіони (ТГ, що функціонує на відповідній території держави), об'єднанні громади (сукупність декількох ТГ, що функціонують територіально поряд одна з одною, та які інтегровані з метою вдосконалення управлінської домінантності та отримання більш високої і позитивної соціальної динаміки), інституції громадянського суспільства, що формуються відповідно до інтересів жителів-членів громади/, а також органи публічної влади та їх інституції, що формуються або напряму самою територіальною громадою /електоральним корпусом, який складається з повнолітніх жителів-членів громади/, або призначаються через застосування механізму демократичних призначень), – що, по-перше, існують і функціонують в межах системи самоврядних відносин; по-друге, їх соціально-нормативний статус детермінований засадничими настановами локальної демократії у формі муніципалізму; по-третє, вони існують та функціонують в умовах місцевого самоврядування на основі фактору локального формування, прояву, реалізації, охорони, захисту і гарантування прав, свобод і обов'язків /фізичні особи/ або компетенційних повноважень, що надані законом /юридичні особи, включаючи й юридичні особи публічного права (органи місцевого самоврядування)/.

З) Об'єктно-предметна настанова – у розумінні формування та реалізації суспільних відносин, що, по-перше, визначають сутність та предметну змістовність самоврядних відносин, що складаються в територіальній локальній людській спільноті та, по-друге, скеровані на побудову системи життєдіяльності людини, її груп та асоціацій відповідно до основоположних соціальних сфер їх існування та функціонування в межах державно організованого соціуму, – при цьому в межах локальної демократії така настанова проявляється саме в усвідомленні, розумінні, об'єктивізації організації життєвого циклу для наведених суб'єктів через розуміння і реалізацію самоврядно-демократичних настанов муніципалізму, а в умовах місцевого самоврядування – міститься у самостійному (громада) або опосередкованому (за допомогою органів місцевого самоврядування) вирішенні питань місцевого значення в межах Конституції та законів України, від вирішення яких залежить стабільне та стале існування та функціонування територіальної локальної людської спільноти (територіальної громади).

И) Біхевіористична настанова – в усвідомленні і розумінні стратегічних процесів формування в межах локальної демократії та МСВ системи екзистенційних інтересів людини, її груп та асоціацій, що об'єктивно «зціплюють» наведених суб'єктів в єдиний соціальний організм – при цьому, в умовах локальної демократії такі інтереси переважно спрямовані на формування методологічних засад виникнення, формалізації та реалізації самоврядних відносин через системний комплекс соціалізації, включаючи й її правову форму (правову соціалізацію), що реалізуються в межах територіальної локальної людської спільноти (територіальної громади); а в умовах МСВ – торкається практичної інструментально-видової реалізації таких екзистенційних інтересів людини, її груп та асоціацій в умовах повсякденного існування (людина) та функціонування (групи та асоціації людини) через застосування інституційно-фундаментальної моделі прав, свобод і обов'язків людини, а також через використання демократичних механізмів врахування суспільної думки (виборчі, референдумні та інші механізми безпосередньої демократії) та їх втілення в муніципально-правову реальність;

І) Інтеграційна настанова – в усвідомленні та розумінні інтеграційно-об'єднуючої тенденції соціально-самоврядних процесів профільної спрямованості, що, по-перше, володіють системно-комплексною властивістю, які, по-друге, формуються в межах територіальної локальної людської спільноти (територіальної громади), по-третє, обумовлені спільним комунікативно-



насиченим співіснуванням людей, їх груп та асоціацій в межах такої спільноти, і, по-четверте, скеровані на її формування, подальшу побудову, інституціоналізацію, сталий розвиток та подальше позитивне вдосконалення в умовах демократизації суспільного і державного життя, – причому в умовах локальної демократії – як спеціалізованого колективного соціального суб'єкта, що формується, по-п'яте, з метою проходження її жителями-членами життєвого циклу в межах соціального самоврядного простору та в умовах локалізму і муніципалізму; по-шосте, для природного продовження людського роду через реалізацію репродуктивної функції фертильною частиною населення; а в умовах МСВ – по-перше, як територіальної громади, що існує та функціонує на екзистенційно-гуманістичних засадах, в межах якої формується простір життєдіяльності конкретної людини; по-друге, як соціально-нормативного простору або фактично як локальної системи охорони і захисту прав і свобод людини, що формується за допомогою та за безпосередньої участі органів публічної влади (публічної самоврядної (муніципальної) влади);

і) Колабораційна настанова – в усвідомленні і розумінні стратегічної ролі і визначально-продуктивного значення співробітництва жителів-членів територіальної локальної людської спільноти (територіальної громади) в її власних межах для стабільного, оптимального, конструктивного, ефективного та телеологічно і темпорально передбаченого вирішення колективно-індивідуальних, колективно-групових та загальних колективних питань існування такої спільноти, – причому, в умовах локальної демократії, – як соціально-нормативної моделі локального соціуму, що базується (організується, формалізується, функціонує, розвивається тощо) на стратегічному принципі співробітництва; а в умовах МСВ – як конкретної системи локальної взаємодії жителів-членів територіальної громади, що характеризується історичними, географічними, економічними, культурологічними та іншими особливостями своєї інституціоналізації та функціонування.

й) Інтерсуб'єктивна настанова – в усвідомленні та розумінні наявності загальних задач та цілей, об'єктивної необхідності їх вирішення, – причому, їх успішне вирішення та реалізація потребує колективних зусиль і скоординованих дій жителів-членів територіальної локальної людської спільноти (територіальної громади), – по-перше, відповідно до внутрішньої логіки локальної демократії – збереження і самозбереження людської цивілізації через застосування концептуальної соціально-організуючої моделі такої спільноти (територіальної громади), що, по-друге, існує та функціонує відповідно до настанов муніципалізму, і, по-третє, спрямована на задоволення екзистенційних потреб існування та функціонування людини, її груп та асоціацій; а відповідно до настанов МСВ – це, насамперед, об'єднання реальних зусиль жителів-членів конкретної територіальної локальної людської спільноти (територіальної громади), що детермінуються в реалізації спільних поведінково-діяльнісних настанов щодо її існування та функціонування з метою формування, побудови, дії та функціонування, а також розвитку і вдосконалення системи локальної життєдіяльності людини, її груп та асоціацій;

к) Психологічна настанова – в усвідомленні та розумінні психічних та психологічних установок людини (індивіда), її груп та асоціацій, що, по-перше, спрямовані на соціальні об'єкти через індивідуальну, групову та колективну оцінки муніципально-правової та державно-правової реальності, які, по-друге, відбуваються через призму цінностей муніципалізму, по-третє, з наступною побудовою і модифікацією своїх поведінково-діяльнісних орієнтирів, через, по-четверте, застосування і використання відповідних соціально-самоврядних габітусів, що, по-п'яте, формуються завдяки наявному або надбаному досвіду муніципального життя. Результатом такого процесу в межах локальної демократії виступають процеси побудови та інституціоналізації феноменологій індивідуальної, групової і колективної муніципальної свідомості (правосвідомості), а в умовах МСВ – наявність та застосування зазначених вище форм муніципальної свідомості (правосвідомості) застосовне до конкретних подій в муніципальному житті людини, її груп та асоціацій.

л) Праксеологічна настанова – в усвідомленні та розумінні практичних настанов життєдіяльності людини, її груп та асоціацій – отже, саме такі настанови на рівні локальної демократії фактично концептуалізують, об'єктивують, детермінують і контекстуалізують феноменологію муніципального життя основоположних суб'єктів локальної демократії – людини, її груп та асоціацій, – ба більше, саме вони її конотують та супроводжують через формування профільних наративів. Крім того, саме з муніципальним життям, як соціально-поведінковою, соціально-діялісною та соціально-нормативною основами повсякденного буття людини та її груп і асоціацій – з його належною організацією та реалізацією, органічно пов'язані питання локального управління на відповідному рівні МСВ, а також питання належного, оптимального і



ефективного компетенційного супроводження і забезпечення локальними органами публічної влади, тобто органами МСВ, що сформовані самими ТГ, повсякденної життєдіяльності людей-жителів, їх груп та асоціацій в різних сферах соціального буття.

М) Соціалізаційна настанова – в усвідомленні та розумінні процесу входження людини, її груп та асоціацій в суспільство та активного засвоєння ними соціального досвіду, норм, цінностей і рольових позицій в такому стратегічному дискурсі, який триває протягом усього життя – він починається з народження і формує особистість, забезпечуючи її здатність взаємодіяти з іншими, адаптуватися до вимог соціуму та виконувати різні соціальні функції. Звідси, в умовах локальної демократії логічно, органічно і об'єктивно формується стратегічний простір такої соціалізації, а в умовах МСВ – спостерігається конкретизація та деталізація таких профільних стратегічних настанов, що реалізуються в залежності від історичного досвіду, географічного розташування, економічного рівня розвитку, культурологічного забезпечення та інших аспектів існування і функціонування територіальної локальної людської спільноти (територіальної громади) та її жителів-членів такої громади.

Н) Ітераційна настанова – в усвідомленні та розумінні єдиного усталеного дефінітивного терміну та ідентифікованого ним процесу, що поєднує поняття «інтерації» (соціальної взаємодії) та «ітерації» (зазвичай, повторюваності поведінково-діяльнісних настанов в локальному соціумі), які означають повторне, циклічне, поступове впровадження змін або взаємодій у суспільстві для досягнення певних цілей (телеологічних доміант) чи адаптації, що відбувається через вплив і реакції людини, її груп та асоціацій, згідно з принципами соціальної інженерії чи комунікації – при цьому, варто враховувати, що це процес, де зміни не відбуваються миттєво, а проходять через послідовні кроки (ітерації), що враховують людську поведінку та цінності. Отже, в умовах локальної демократії власне ітераційна настанова виступає основою для засвоєння сукупності муніципальних цінностей, розуміння муніципальних прав і свобод, порядку їх застосування і використання, формування муніципальної культури та практичних аспектів її реалізації. В умовах місцевого самоврядування – профільні процеси знаходять свій конкретизуючий та деталізуючий прояв в умовах окремої територіальної локальної людської спільноти (територіальної громади) та її жителів-членів такої громади, з врахуванням особливостей її існування та функціонування.

О) Культурологічна настанова – в усвідомленні та розумінні способу розгляду і пояснення культури як специфічного феномену або будь-якого культурного явища, що безпосередньо створені конкретним суспільством і передані з покоління в покоління, – зазвичай, це суперкультура або домінуюча культура (якщо вона сприймається всіма членами суспільства) – і саме в такому розумінні є визначальним людинотворчим феноменом для ідентифікації суспільства в умовах локальної демократії; в умовах МСВ – це сукупність спільних цінностей, норм, традицій, знань та способів поведінки людини, її груп та асоціацій, що формують унікальну ідентичність територіальної локальної людської спільноти (територіальної громади), і процес її засвоєння наведеними суб'єктами у ході соціалізації.

П) Трансформаційна настанова – в усвідомленні та розумінні різних складових, а саме:

а) способу і форм діяльності людини, її груп та асоціацій в межах муніципального життя (атитюдно-габітусна характеристика локально-муніципального життя – авт.),

б) відносин, спілкування людини, її груп та асоціацій в межах муніципального життя (комунікативна характеристика локально-муніципального життя – авт.) й

в) духовного освоєння людиною, її групами та асоціаціями засад муніципалізму і комунітаризму в межах муніципального життя (свідома характеристика локально-муніципального життя – авт.) та

г) перетворення дійсності людиною, її групами і асоціаціями, що містить в собі специфічні ідентифікаційно-характерологічні ознаки муніципального життя (свідомо-психологічна характеристика локально-муніципального життя – авт.).

Саме наведений процес в умовах локальної демократії лежить в основі трансформаційних змін в межах територіальної локальної людської спільноти (територіальної громади), а в межах місцевого самоврядування завдяки наведеному процесі – спостерігається формування трансформаційного потенціалу такої спільноти, що формується за рахунок наявності чітких екзистенційно-телеологічних настанов її існування і функціонування, які реалізуються в умовах повсякденності та перспективі.

Р) Інституційна настанова – в усвідомленні та розумінні інституційно-правового супроводження і забезпечення самоврядних відносин, існування яких детермінується (об'єктивується,

стимулюється, реалізується, розвивається та вдосконалюється) як результат розвитку концепту публічної влади та її розділення на відносно автономні та самостійні рівні публічної державної та публічної самоврядної (муніципальної) влади (при збереженні пріоритету публічної державної влади як засновницької), – через формування відповідних органів публічної влади, організаційного супроводження і забезпечення їх діяльності, компетенційного забезпечення, форм і методів їх діяльності, взаємодії з належними суб'єктами державно-правових та муніципально-правових повноважень, можливостей формування корпусу (переліку) дискреційних повноважень, нормативних засад юридичної відповідальності тощо. Отже, на рівні локальної демократії вона проявляється, насамперед, у створенні та інституціоналізації, а також у функціонуванні публічної самоврядної (муніципальної) влади як відносно самостійного (в межах наданих державою повноважень) рівня публічної влади, що бачить телеологічною домінантою цінності муніципалізму; а на рівні місцевого самоврядування – у конкретній діяльності органів місцевого самоврядування, що сформовані за допомогою виборчих механізмів і технологій територіальною локальною людською спільнотою (територіальною громадою), діють від її імені та в її інтересах на засадах реалізації власних (самоврядних) або делегованих (від виконавчої влади) повноважень.

С) Гуманістично-особистісна настанова – в усвідомленні та розумінні ролі і значення людини, її груп та асоціацій в межах самоврядних та публічно-владних відносин, що виникають, формуються та реалізуються в умовах її існування та функціонування територіальної локальної людської спільноти (територіальної громади) та реалізації ними свого конституційно-правового і муніципально-правового статусу, – причому, в умовах локальної демократії в системі координат «людина в системі локальної демократії», а в місцевому самоврядуванні – людина як первинний суб'єкт місцевого самоврядування, житель відповідної території і одночасно, член відповідної територіальної громади.

Т) Міжнародно-правова настанова – в усвідомленні та розумінні міжнародної ролі і значення інституту локальної демократії, як формалізованого прояву концепту муніципалізму, та місцевого самоврядування, – як її найбільш застосованої у світі форми такої демократії для міжнародного співтовариства держав, що відображають правовий статус людини, її груп та асоціацій, що не тільки здійснюють свій життєвий цикл (людина), існування і функціонування (групи та асоціації, що створені людиною) в межах територіальної локальної людської спільноти (територіальної громади), але також суттєво сприяють продовженню існування людської цивілізації через вирішення репродуктивної функції фертильною частиною населення – жителями-членами таких громад.

Усвідомлення і розуміння особливої ролі і значення інституту локальної демократії та місцевого самоврядування демонструє міжнародне договірне право, що містить велику кількість міжнародних багатосторонніх угод, які регламентують і регулюють міжнародно-правові зобов'язання держав-учасників та їх публічної влади щодо різних аспектів становлення, легалізації, розвитку і вдосконалення наведених інституційних феноменів, починаючи від їх загального визнання на рівні конкретних держав, наступної легалізації в національному законодавстві, належному і оптимальному формуванню правового статусу профільних суб'єктів, компетенційному супроводженню і забезпеченню діяльності представницьких і виконавчих органів місцевого самоврядування, – і закінчуючи формуванням інституту юридичної відповідальності останніх перед територіальною громадою та публічною державною владою, а також питаннями охорони і захисту прав місцевого самоврядування.

У) Синергічна настанова – в усвідомленні та розумінні формування та наявності, а також розвитку і вдосконалення зав'язків між локальною демократією та місцевим самоврядуванням, що характеризується синергічним наповненням, потенціалом та перспективою, – причому, така динаміка демонструє їх поглиблення щодо органічно-генетичної природи та філософсько-облігаторної взаємодії профільних феноменологій, де система координат самоврядних відносин містить інститут локальної демократії, що базується на концепті муніципалізму, – може бути визначеною як ордината (вертикальний рівень), а місцеве самоврядування, як складова локальної демократії, – може бути визначеною як логічний прояв абсциси (горизонтальний рівень) цієї специфічної системи координат – взаємодія наведених складових створює мультиплікативний ефект, коли спільна дія двох елементів створює соціальний та соціально-нормативний результат, що значно перевищує суму їхніх індивідуальних дій (саме в цьому й міститься синергічне наповнення, потенціал та перспективу існування профільних феноменологій).

Ф) Публічно-владна настанова – в усвідомленні та розумінні формування та інституціоналізації відносно автономного і самостійного рівня публічної влади – публічної самоврядної

(муніципальної), в основі якої лежить існування та функціонування територіальних локальних людських спільнот (територіальних громад), що самостійно створюють органи публічної влади, в тому числі й локальні, які виступають від їх імені, представляють їх інтереси та діють в контекстуалізації реалізації останніх

В онтологічному розумінні варто зазначити, що в основі сучасного розуміння локальної демократії лежать онтологічні, нормативні та технологічні настанови європейського муніципалізму. Отже, можна констатувати, що значимість локальної демократії зумовлюється саме її сутністю та роллю. Адже локальний рівень – це, по-перше, найбільш наближений до населення, його потреб та проблем; саме тому, по-друге, саме тому вирішення всіх питань місцевого значення, створення належних умов для життя доцільно забезпечити саме на місцевому рівні; по-третє, це забезпечується завдяки діяльності органів публічної влади, що функціонують на рівні локального соціуму; по-четверте, для чого вони повинні бути забезпеченими належними, оптимальними, ефективними повноваженнями. Адже, по-п'яте, саме на місцевому рівні це можливо зробити оперативно на управлінському рівні, технологічно безпосередньо та обґрунтовано, з врахуванням компетенційних повноважень уповноважених інституцій. І лише, якщо виникають об'єктивні труднощі, перепони – вирішити питання вже на державному рівні – через застосування принципу реординації.

Критично важливим є розуміння організаційного та нормативного процесів супроводження і забезпечення інституційного фундаменту локальної демократії – це детермінується тим, що для сучасної демократичної держави важливим та визначальним фактором є раціональна та ефективна організація публічної влади, причому не лише центральної, а й місцевої, представленої системою органів місцевого самоврядування. Адже місцеве самоврядування є матеріальною основою становлення і розвитку інститутів локальної демократії.

**Методологічні підходи до розуміння локальної демократії та місцевого самоврядування в контекстуалізації розуміння загальних рис та розмежування особливостей досліджуваних понять-феноменологій**

Наведені вище чинники щодо формування і функціонування досліджуваних понять-феноменологій свідчать про наявність у процесі формування профільної управлінської парадигми ідентифікаційних ознак, які повинні в обов'язковому порядку враховуватись в процесі наукового аналізу, а саме:

А) суб'єктно-об'єктного складу локальної демократії та місцевого самоврядування,  
Б) структурної організації локальної демократії та місцевого самоврядування,  
В) національного та міжнародного нормативно-правового супроводження і забезпечення локальної демократії та місцевого самоврядування, що, своєю чергою, наділяє її:

а) теоретичним базисом – в контексті розуміння і визначення основоположного значення локальної демократії та місцевого самоврядування, як сфери формування, прояву і реалізації природних прав людини, пріоритету прав і свобод людини над правами держави, а також конкретного місця (простору) реалізації конституційно-правового і муніципально-правового статусу людини і громадянина, що виступають відповідним ядром конституційної та муніципальної свідомості (правосвідомості);

б) доктринальним обґрунтуванням – відносно розуміння необхідності наукового супроводження і забезпечення концепції публічної влади та її рівнів – публічного державного та публічного самоврядного (муніципального), їх відносної самостійності та автономії в межах власних компетенційних повноважень, що виступають ідейно-імперативним та структурно-динамічним функціоналом локальної демократії та місцевого самоврядування;

в) потенційно-праксеологічною реалізованістю – в контексті практичної реалізації конституційно-правових і муніципально-правових настанов відносно того, що права і свободи людини та їх гарантії визначають зміст і спрямованість діяльності держави (ст. 3 Конституції України) – саме в цьому контексті зростає функціонально-реалізаційна та поведінково- і діяльнісно-технологічна роль локальної демократії та місцевого самоврядування;

г) ціннісно-методологічною орієнтацією – у розумінні формування дидактично-технологічних засобів пізнання державно-правової та муніципально-правової реальності через призму конституційних і муніципальних цінностей, що лежать в основі формування і реалізації локальної демократії та місцевого самоврядування;

г') екзистенційною сутністю та об'єктивно-екзистенційним потенціалом – у розумінні того, що локальна демократія та місцеве самоврядування не є інституційними суб'єктами права, що потребують безумовної та спеціальної глорифікації, але є важливими соціально-



правовими інституціями, які, по-перше, побудовані по принципу «мотрійки» та, по-друге, об'єктивно, напряду, безпосередньо і органічно пов'язані з життєдіяльністю кожної людини-члена територіальної людської спільноти, її груп і асоціацій, більш того, по-третє, фактично формують сферу такої життєдіяльності людини за допомогою соціально-нормативних атитюдів і поведінково-діяльнісних габітусів – саме таке усвідомлення виступає основою розуміння процесів формування локальної демократії та місцевого самоврядування;

д) нормативним визначенням – відносно існування системи конституційно-правових та муніципально-правових норм, що супроводжують та забезпечують легалізацію, визнання, використання, охорону, захист, реалізацію, гарантування прав і свобод людини державою в межах локальної демократії на конституційному рівні (ст. 140 Конституції України) і визнання місцевого самоврядування, як оптимальної правової сфери для формування, прояву і реалізації конституційно-правового та муніципально-правового статусу людини, який фактично й лежить в основі профільних понять-феноменологій;

е) констатацією існування управлінських імпульсів – наведене вище існування і функціонування локальної демократії та місцевого самоврядування в їх організаційних і організаційно-правових формах об'єктивує необхідність управлінської діяльності в зазначеній сфері функціонування публічної влади та її суб'єктно-об'єктного складу, включаючи й фізичних осіб, що знаходяться під юрисдикцією конкретної держави, але в межах територіальної локальної людської спільноти (територіальної громади), що відображають технологічно-нормативний вплив досліджуваних понять-феноменологій на соціально-нормативну реальність;

є) об'єктивізацією управлінських дій – отже, наявність управлінських імпульсів детермінує реалізацію необхідних оптимальних, ефективних, конструктивних, соціально-обґрунтованих управлінських дій в профільній сфері щодо дотримання і захисту прав людини в державі, через їх реалізацію на рівні локальної демократії та місцевого самоврядування в межах ТГ, тобто в соціально-правовому просторі, де й формується, існує, реалізується життєвий цикл людини, а також функціональний цикл її груп та асоціацій;

ж) конотаційним наповненням – розумінням того, що здійснення людиною свого життєвого циклу в умовах локальної демократії та місцевого самоврядування, в межах ТГ, є основоположним фактором, що надає не тільки особливого значення локальній демократії, як сфери пріоритетів людських інтересів, але й додаткове значення, акценти, відтінки, які накладаються на основоположну феноменологію «права людини», що виступає відповідним тригером формування конституційної і муніципальної правосвідомості, що є характерологічними рисами досліджуваних понять-феноменів;

з) комунікативною системою координат – розумінням того, що саме комунікаційна взаємодія між жителями-членами ТГ, ними та ОМСВ, ними та іншими суб'єктами системи МСВ, ними та органами публічної державної влади, – виступає основоположною функціонально-статусною константою, що обумовлює виникнення, формування та реалізацію екзистенційних інтересів людини, що в умовах локальної демократії трансформуються в конституційні права, свободи і обов'язки людини, які лежать в основі взаємодії індивідуальної, групової та колективної форм взаємодії людини, її груп та асоціацій в межах місцевого самоврядування;

і) стратегічним наративним змістом – відносно формування сукупності пов'язаних між собою реальних чи вигаданих подій, фактів, думок або вражень, які складають розуміння і оцінку локальної демократії та місцевого самоврядування, їх ролі у виникненні, формуванні, функціонуванні і розвитку ТГ, в т. ч. й найважливішої ролі і значення прав людини в становленні, реалізації і розвитку локальної демократії та взагалі демократичної правової державності, що стають основоположним функціонально-змістовним елементом місцевого самоврядування;

ї) системний аналіз складових елементів управлінської парадигми щодо формування локальної демократії та місцевого самоврядування логічно спирається та органічно пов'язаний з парадигмою «права людини – муніципальні права людини – муніципальна людина» – саме це дає змогу визначити органічний зв'язок між ними завдяки наявності і визначенню їх споріднених характерологічних рис.

**Висновки.** Резюмуючи положення, що викладені вище, можна дійти наступних висновків:

- формування, прояв, розвиток і вдосконалення феноменології демократичної правової державності супроводжується могутніми процесами децентралізації публічної влади та муніципалізацією всіх сторін існування і функціонування людини, її груп та асоціацій в умовах стратегічних тенденцій демократизації суспільного і державного життя;



- наведені державотворчі та правотворчі процеси часто-густо характеризуються через застосування і використання лексико-термінологічних систем «локальна демократія» та «місцеве самоврядування», бо саме вони відображають сутність самоврядних процесів, що виникають в умовах існування і функціонування територіальних локальних людських громад (в розумінні української історіографії та сучасних національних конституційного і муніципального права України – територіальних громад) та логіку визнання державою на конституційному (ст. 5, 7, 92, Розділ XI Конституції України) та законодавчому рівнях таких громад у всьому розмаїтті визначення і визнання їх соціально-політичної, соціально-економічної, соціально-культурної, соціально-громадської ролі і значення;

- в доктрині муніципального права ще не знайдено єдиних підходів до розуміння досліджуваних терміносистем, хоча такі спроби мають регулярний характер, – але вони не завершуються успіхом, завдяки наявності різних, підчас діаметрально протилежних, авторських позицій, що засновані на різних методологічних підходах, які спираються на різні теорії походження інститутів- феноменологій локальної демократії та місцевого самоврядування;

- саме в даному аспекті актуальним та контекстуальним виступає питання про співвідношення демократії та місцевого самоврядування – тому у контекстуалізації та розумінні управлінсько-коопераційного потенціалу, можна поділити на кілька підходів, а саме: а) альтернативно-антагоністичний підхід, що базується на тому, що самоврядування – це традиційний інститут, який не узгоджується з основними принципами демократії. Звідси він існує та функціонує по своїм внутрішнім закономірностям, спираючись на волю або більшість населення, або публічної влади, що ним управляє – а це не завжди співпадає з настановами демократії; б) пріоритетно-демократичний підхід, який спирається на те, що основи демократії, як влада більшості, не можуть бути застосовані до самоврядування, як явища обмеженого, вузько скерованого на вирішення тільки питань місцевого значення та створення загальних умов для організації життєдіяльності населення; в) ототожнюючий підхід, відповідно до якого локальна демократія це теж саме, що й місцеве самоврядування – це дуже спрощений підхід, що порушує єдність усвідомлення і розуміння профільних понять-феноменологій, бо суперечить філософський зв'язок загального і часткового, а також їх взаємодію та взаємозалежність; г) підхід, що заснований на принципі абсолютної колаборації, відповідно до якого демократія і місцеве самоврядування не тільки нерозривно пов'язані і взаємодіють між собою, але й доповнюють один одного, детермінуючи взаємний розвиток і вдосконалення. Отже, використовуючи такий підхід, можна констатувати, що місцеве самоврядування та локальна демократія є близькими, але не ідентичними і все-таки відмінними поняттями. Бо локальна демократія є тим соціальним середовищем, де діє місцеве самоврядування, що, за своєю онтологічною суттю, виступає як організація влади територіальної громади;

- в той же час спільним для обох досліджуваних понять-феноменологій виступає публічний інтерес, який вони реалізують, а також принципи його розбудови й реалізації: А) солідарність – як єдність, спільність інтересів, поглядів та дій, активне співчуття та взаємна підтримка людей або груп, що виникає з усвідомлення спільності цілей (інтерсуб'єктивність) і виражається у погоджених діях (координація), особливо в кризові моменти – виступає як потужний і оптимальний інструмент для мобілізації суспільства та досягнення спільних цілей, оснований на взаєморозумінні та спільній відповідальності; Б) субсидіарність – як принцип, згідно з яким задачі мають вирішуватися на найнижчому можливому рівні, і лише ті завдання, які не можуть бути ефективно вирішені на місцевому рівні, виносяться на вищий (центральний) рівень – в її основі лежить ідея про те, що вища ланка влади повинна мати допоміжну, а не домінуючу роль, втручаючись лише тоді, коли це необхідно. Отже, принцип субсидіарності тісно пов'язаний з децентралізацією і застосовується в державному управлінні на локальному рівні соціуму;

- своєю чергою, відмінність між досліджуваними поняттями-феноменологіями полягає в тому, що локальна демократія орієнтована на досягнення загального консенсусу у громаді, а місцеве самоврядування – на реалізацію державного інтересу на локальному рівні управління;

- враховуючи стратегічну значущість досліджуваних понять-феноменологій локальної демократії та місцевого самоврядування у процесах формування, функціонування, розвитку і вдосконалення демократичної правової державності, представляється доцільним продовжити доктринально-теоретичні пошуки в профільній сфері, що має особливе сучасне і перспективне значення в конституційно-правовій та муніципально-правовій теорії та практиці.

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## *Mathematical sciences*

### KINEMATICS PROBLEMS USING THE COORDINATE-VECTOR METHOD

**Sabina Mammadzade**

Nakhchivan State University, Master's and Doctoral Center,  
Nakhchivan city, Azerbaijan  
ORCID: 0009-0007-7079-2081

#### **Abstract**

*This paper presents an analytical approach to solving kinematics problems using the coordinate-vector method, which combines vector and coordinate representations of particle motion. The method allows the determination of velocity, acceleration, and trajectory equations for particles in both linear and curvilinear motion. Kinematics is the branch of mechanics that studies the motion of bodies without regard to the causes that produce it. In motion analysis, the coordinate method and vector method play an important role. The coordinate-vector method combines  $x, y, z$  coordinates with the radius vector, simplifying both analytical and computational tasks. Examples include parabolic motion and motion along a circular path with equal tangential and normal accelerations. The approach simplifies calculations, enhances visualization, and provides a systematic framework applicable in mechanics, robotics, engineering simulations, and motion modeling. The results demonstrate the effectiveness of the coordinate-vector method in analyzing complex kinematics problems.*

**Keywords:** kinematics, inverse problem, velocity, coordinate Method, vector, kinematics of a rigid body, magnitudes, trajectory.

#### **1. Introduction**

*Kinematics is a branch of mechanics that studies motion without regard to the causes that produce it. In kinematics, all reference frames are considered equivalent. In kinematics, direct and inverse problems are distinguished. The direct problem of kinematics consists in determining the velocity and acceleration of a body at any moment in time, provided that its position in space is known at any time. The method of solution is differentiation. The inverse problem of kinematics consists in determining the velocity and the coordinates, or the radius vector, of a particle at any moment in time, when the acceleration is given as a function of time. The method of solution is integration. For a unique solution of the inverse problem, it is necessary to specify the initial conditions, namely, the position of the body and its velocity at the initial moment of time. There are three main ways to describe motion- the vector method, the coordinate method, the natural (intrinsic) method. These methods will be considered in more detail below.*

**Definition 1.** (Direct problem of kinematics) *The time dependence of the radius vector describing the position of a material point,  $\vec{r} = \vec{r}(t)$  is given. It is required to determine the velocity  $\vec{v}(t)$  and the acceleration  $\vec{w}(t)$ . The velocity is defined as*

$$\vec{v}(t) = \frac{d\vec{r}(t)}{dt} = \dot{\vec{r}}(t). \quad (1.1)$$

*This is the instantaneous velocity. (Here we use the notation commonly adopted in physics: a dot over a symbol denotes the derivative with respect to time.)*

*If average values are of interest, then*

$$v_{avg} = \frac{s}{\Delta t}, \quad (1.2)$$

$$\vec{v}_{avg} = \frac{\Delta \vec{r}}{\Delta t}. \quad (1.3)$$

*Here  $s$  and  $\Delta \vec{r}$  denote the path length and the displacement of the body during the time interval  $\Delta t$ , respectively. The instantaneous acceleration is determined from the relation*

$$\vec{w}(t) = \frac{d\vec{v}(t)}{dt} = \frac{d^2\vec{r}(t)}{dt^2} = \ddot{\vec{r}}(t). \quad (1.4)$$

*To determine average values, one can use formulas analogous to (1.2) and (1.3).*

**Definition 2** (Inverse problem) The acceleration is given as a function of time,  $\vec{w} = \vec{w}(t)$ , and it is required to find the velocity and the radius vector. The initial conditions are  $\vec{v}(0) = \vec{v}_0, \vec{r}(0) = \vec{r}_0$ . Multiplying both sides of equation (1.4) by  $dt$ , we obtain

$$d\vec{v} = \vec{w}(t) dt. \quad (1.5)$$

Integrating with allowance for the initial conditions yields

$$\int_{\vec{v}_0}^{\vec{v}(t)} d\vec{v} = \int_0^t \vec{w}(t) dt. \quad (1.6)$$

In the case of uniformly accelerated motion, where  $\vec{w} = \text{const}$  instead of (1.6) we obtain  $\vec{v}(t) - \vec{v}_0 = \vec{w} t$ ,  
or

$$\vec{v}(t) = \vec{v}_0 + \vec{w} t. \quad (1.7)$$

Next, multiplying equation (1.1) by  $dt$  and integrating, we have

$$\int_{\vec{r}_0}^{\vec{r}(t)} d\vec{r} = \int_0^t \vec{v}(t) dt. \quad (1.8)$$

For uniformly accelerated motion, substituting (1.7) into (1.8), we obtain

$$\vec{r}(t) - \vec{r}_0 = \int_0^t (\vec{v}_0 + \vec{w} t) dt = \vec{v}_0 t + \frac{1}{2} \vec{w} t^2,$$

or

$$\vec{r}(t) = \vec{r}_0 + \vec{v}_0 t + \frac{1}{2} \vec{w} t^2. \quad (1.9)$$

Relations (1.7) and (1.9) yield the well-known formulas for uniformly accelerated motion from the school physics course. If, however,  $\vec{w} = \vec{w}(t)$ , then relations (1.6) and (1.8) should be used. The distance traveled by the body is given by

$$s(t) = \int_0^t |\vec{v}(t)| dt. \quad (1.10)$$

From (1.6), in the general case we obtain

$$\vec{v}(t) = \vec{v}_0 + \int_0^t \vec{w}(t) dt. \quad (1.11)$$

Substituting the obtained expression for the velocity into equation (1.8), we have

$$\vec{r}(t) = \vec{r}_0 + \int_0^t \left( \vec{v}_0 + \int_0^t \vec{w}(t) dt \right) dt. \quad (1.12)$$

**Definition 3** (Coordinate Method). Direct problem of kinematics. The coordinates of a material point are given as functions of time. It is required to determine the projections of the velocity and acceleration:

$$x = x(t), y = y(t), z = z(t). \quad (1.13)$$

Proceeding in the same way as in the previous case, we obtain

$$\begin{aligned} v_x &= \frac{dx}{dt}, w_x = \frac{dv_x}{dt} = \frac{d^2x}{dt^2}, \\ v_y &= \frac{dy}{dt}, w_y = \frac{dv_y}{dt} = \frac{d^2y}{dt^2}, \\ v_z &= \frac{dz}{dt}, w_z = \frac{dv_z}{dt} = \frac{d^2z}{dt^2}. \end{aligned} \quad (1.14)$$

Relations (1.14) solve the stated problem. The magnitudes of the velocity and acceleration vectors are determined using the definitions

$$|\vec{v}| = \sqrt{v_x^2 + v_y^2 + v_z^2}, |\vec{w}| = \sqrt{w_x^2 + w_y^2 + w_z^2}.$$

One can pass from the coordinate method to the vector method by introducing the unit vectors  $\vec{i}$ ,  $\vec{j}$ , and  $\vec{k}$  of the corresponding coordinate axes:

$$\vec{r}(t) = x(t)\vec{i} + y(t)\vec{j} + z(t)\vec{k},$$



$$\vec{v}(t) = v_x(t)\vec{i} + v_y(t)\vec{j} + v_z(t)\vec{k},$$

$$\vec{w}(t) = w_x(t)\vec{i} + w_y(t)\vec{j} + w_z(t)\vec{k}.$$

**Definition 4** (Inverse problem). The projections of the acceleration are given. It is required to determine the projections of the velocity vector and the coordinates. The initial conditions are  $v_x(0) = v_{x0}$ ,  $x(0) = x_0$ . Proceeding as in the previous case, we obtain

$$v_x(t) = v_{x0} + \int_0^t w_x(t) dt,$$

$$x(t) = x_0 + \int_0^t v_x(t) dt. \quad (1.15)$$

Analogous relations hold for the y and z coordinates and for the velocity components  $v_y$  and  $v_z$ . In the case of uniformly accelerated motion, instead of (1.15), by analogy with (1.7) and (1.9), we obtain

$$v_x(t) = v_{x0} + w_x t,$$

$$x(t) = x_0 + v_{x0} t + \frac{1}{2} w_x t^2. \quad (1.16)$$

The equation of the line along which a body moves is called the trajectory equation. If the time variable is eliminated from equations (1.13), one obtains the trajectory equation. Equations (1.13) are called the trajectory equations in parametric form.

**Definition 5** (Kinematics of a Rigid Body) Let us consider the rotational motion of a rigid body about a fixed axis  $O'O$ . In this case, all points of the rigid body rotate along circular paths whose planes are perpendicular to the axis of rotation, while their centers lie on the axis.

An infinitesimal angle of rotation  $d\vec{\varphi}$  can be treated as an axial vector. The linear displacement  $d\vec{r}$  and the angular displacement  $d\vec{\varphi}$  are related by

$$d\vec{r} = d\vec{\varphi} \times \vec{r}, \quad (1.21)$$

where  $\vec{r}$  is the radius vector describing the position of an elementary mass with respect to the chosen origin. To characterize rotational motion, the concepts of angular velocity  $\vec{\omega}$  and angular acceleration  $\vec{\beta}$  are introduced:

$$\vec{\omega} = \frac{d\vec{\varphi}}{dt}, \quad (1.22)$$

$$\vec{\beta} = \frac{d\vec{\omega}}{dt} = \frac{d^2\vec{\varphi}}{dt^2}. \quad (1.23)$$

The vectors  $\vec{\omega}$  and  $\vec{\beta}$  are axial vectors and are directed along the axis of rotation.

Relation (1.21) makes it possible to establish the connection between the linear and angular kinematic characteristics of motion:

$$\vec{v} = \vec{\omega} \times \vec{r}, \quad (1.24)$$

$$\vec{w} = \vec{\beta} \times \vec{r} + \vec{\omega} \times (\vec{\omega} \times \vec{r}). \quad (1.25)$$

The first term in equation (1.25) represents the tangential acceleration  $\vec{w}_\tau$ , while the second term represents the normal (centripetal) acceleration  $\vec{w}_n$ , whose magnitudes are given by

$$w_\tau = \beta \rho, \quad (1.26)$$

$$w_n = \omega^2 \rho = \frac{v^2}{\rho}. \quad (1.27)$$

Here  $\rho$  is the radius of the circular path along which the rotation takes place.

## 2. Kinematics Problems Using the Coordinate-Vector Method

The radius vector of point A relative to the origin changes with time according to the law

$$\vec{r}(t) = \alpha t \vec{i} + \beta t^2 \vec{j},$$

where  $\alpha$  and  $\beta$  are constants, and  $\vec{i}$  and  $\vec{j}$  are the unit vectors along the x- and y-axes, respectively. Find:

a) the time dependence of the velocity and acceleration vectors and the magnitudes of these quantities; b) the trajectory equation ( $x, y$ ) of the point;

c) the time dependence of the angle  $\phi$  between  $\vec{v}$  and  $\vec{w}$ . Solution. Given:  $\beta = \text{const}$

a) Velocity and acceleration (direct kinematics): Since this is a direct kinematics problem, and the motion is given in vector form, using formulas (1.1) and (1.4) we find:

$$\vec{v} = \frac{d\vec{r}}{dt} = \frac{d}{dt}(\alpha t \vec{i} + \beta t^2 \vec{j}) = \alpha \vec{i} + 2\beta t \vec{j},$$

$$\vec{w} = \frac{d\vec{v}}{dt} = \frac{d}{dt}(\alpha \vec{i} + 2\beta t \vec{j}) = 0 \cdot \vec{i} + 2\beta \vec{j}. \quad (1)$$

From this we see:

$$v_x = \alpha, v_y = 2\beta t, w_x = 0, w_y = 2\beta.$$

The magnitudes of velocity and acceleration are

$$\begin{aligned} |\vec{v}| &= \sqrt{v_x^2 + v_y^2} = \sqrt{\alpha^2 + (2\beta t)^2}, \\ |\vec{w}| &= \sqrt{w_x^2 + w_y^2} = \sqrt{(2\beta)^2} = 2\beta. \end{aligned} \quad (2)$$

Observation: The acceleration vector is directed along the y-axis and does not depend on time. Consequently, only the y-component of velocity changes with time.

b) Trajectory equation: To find the trajectory, we move from vector form to coordinate form:

$$x(t) = \alpha t, y(t) = \beta t^2. \quad (3)$$

This system gives the trajectory in parametric form. To find  $y(x)$  explicitly, eliminate  $t$  by expressing it from the first equation and substituting into the second:

$$t = \frac{x}{\alpha} \Rightarrow y = \beta \left(\frac{x}{\alpha}\right)^2 = \frac{\beta}{\alpha^2} x^2.$$

Thus, the trajectory is a parabola.

c) Angle between velocity and acceleration: The angle  $\phi$  between vectors  $\vec{v}$  and  $\vec{w}$  can be found using the scalar (dot) product:

$$\cos \phi = \frac{\vec{v} \cdot \vec{w}}{|\vec{v}| |\vec{w}|}.$$

Substituting the known components:

$$\vec{v} \cdot \vec{w} = v_x w_x + v_y w_y = \alpha \cdot 0 + (2\beta t)(2\beta) = 4\beta^2 t,$$

$$|\vec{v}| = \sqrt{\alpha^2 + (2\beta t)^2}, |\vec{w}| = 2\beta,$$

$$\cos \phi = \frac{4\beta^2 t}{2\beta \sqrt{\alpha^2 + (2\beta t)^2}} = \frac{2\beta t}{\sqrt{\alpha^2 + 4\beta^2 t^2}}.$$

Hence, the angle as a function of time is

$$\phi(t) = \arccos\left(\frac{2\beta t}{\sqrt{\alpha^2 + 4\beta^2 t^2}}\right).$$

Using the values obtained, we have

$$\cos \phi = \frac{2\beta t}{\sqrt{\alpha^2 + (2\beta t)^2}}. \quad (4)$$

In this problem, the angle can be found much more simply. Since the acceleration  $\vec{w}$  is directed along the OY-axis, the required angle  $\phi$  is simply the angle that the velocity vector  $\vec{v}$  forms with this axis:

$$\tan \phi = \frac{v_x}{v_y} = \frac{\alpha}{2\beta t}.$$

It is easy to see that for  $\beta > 0$ , this motion is completely analogous to the motion of a body thrown horizontally in a gravitational field, because in this case  $v_x = \text{const}$  and the vertical component of velocity increases linearly with time.

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## *Pedagogical sciences*

### *USING ARTIFICIAL INTELLIGENCE IN ENGLISH LANGUAGE LEARNING*

*Mukusheva Gulsum Ramazanovna*  
*cand. Sci. (Pedog)., Associate Professor.*  
*Karaganda Kazpotrebsoyuz University. Kazakhstan*  
*Bolinger Veronica.*  
*Karaganda Kazpotrebsoyuz*  
*University. Student.*

#### **Abstract**

*The rapid development of digital technologies has fundamentally transformed modern society, impacting manufacturing, healthcare, and, most importantly, education. Among these innovations, artificial intelligence (AI) has emerged as a powerful tool capable of transforming foreign language learning, particularly in the context of English language teaching. This article examines the pedagogical potential of AI technologies in English language teaching and learning, focusing on their benefits, practical applications, methodological integration, and associated risks. The article also examines effective pedagogical approaches to integrating AI into higher education, focusing on the Flipped classroom and the Socratic method. These methodologies promote active learning, critical thinking, and ethical awareness by combining independent learning using AI with classroom discussions, problem-solving, and reflective analysis. The role of the instructor is reimagined as that of a facilitator, guiding interpretation, monitoring the quality of learning, and fostering students' ability to critically evaluate AI-based results.*

**Keywords:** *artificial intelligence, effective approach, Flipped Classroom, critical thinking, Socratic Method, ChatGPT*

*Modern society is almost unimaginable without the use of technology. It not only simplifies everyday tasks but also opens new horizons for development. For instance, automation of production processes allows companies to increase efficiency, reduce costs, and accelerate product output. In healthcare, digital technologies help doctors diagnose diseases more accurately and develop personalized treatment plans.*

*Education has also embraced digitalization: online courses, digital platforms, and remote lectures make learning accessible to millions of people worldwide. As a result, knowledge is no longer a privilege of the few—now; anyone can study topics of interest regardless of location.*

*We all know that AI-technologies became the most popular topic nowadays. People use Artificial Intelligence everywhere: at school, university, work. Scientists say that AI can improve our lives and help us cope with different problems and tasks. You can use these technologies for cooking, by finding different recipes, for sport (you can get your personal training plan) and other daily things. It sounds good, of course, but we all need to remember about our education. Studying is the most important part of our lives and it's important to use all our abilities and possibilities to become smarter, especially in English.*

*This article consists of beneficial advices and practices, which can help people in learning English language. This article will present:*

- 1. The main things about AI and key advantages;*
- 2. How AI improves English skills;*
- 3. Practical AI-generated tasks and exercises;*
- 4. Easy topics to learn with AI;*
- 5. How teachers should integrate AI;*
- 6. Limitations, risks and ethical considerations.*

*AI brings three connected strengths to language learning: personalization, immediate, targeted feedback, and new interactive practice. Modern AI-driven adaptive platforms analyze learners' responses, mistakes, and time-on-task to adapt the difficulty, sequencing, and types of exercises to each learner's needs - simulating a one-on-one tutor experience for many learners at once. This adaptive personalization is always highlighted in systematic reviews of AI in English language learning. AI can provide immediate corrective comments on grammar, vocabulary, and pronunciation - feedback that learners can act on right away using voice calls or voice messages. Several studies show that automated feedback tools are effective for improving writing and speaking accuracy when used with human instruction. AI bots and*

virtual conversation partners allow learners to practice speaking and fluency with reduced anxiety. Research indicates bots improve engagement and oral practice frequency.

AI systems can select vocabulary based on a learner's exposure without any problems and retention data, create spaced-repetition practice, and generate reading passages according to interest and level. Adaptable vocabulary and context-rich examples help with faster retention. Writing assistants (e.g., grammar checkers and paraphraser) give immediate corrections, explain errors, and suggest style, clarity improvements. When paired with ordinary tasks and reflection prompts, automated feedback leads to measurable improvement. Automatic Speech Recognition (ASR) and speech-analysis models can detect segmental and suprasegmental errors (sounds, stress, intonation) and provide targeted exercises. Studies show AI pronunciation trainers and speaking practice bots can raise learners' accuracy and confidence when feedback is specific and actionable. AI bots can be tuned to prompt learners, ask follow-up questions, correct in real time, or provide delayed corrective comments to keep fluency-focused practice intact. Evidence suggests this reduces speaking anxiety and increases practice time.

Below presented concrete task types AI can generate for learners at different levels:

1. Adaptive short modules - 5-10 minutes micro-lessons that adjust vocabulary/grammar items to the learner's error profile.
2. Personalized reading understanding - AI rewrites a news story at an appropriate CEFR level and generates comprehension questions (multiple choice, open-ended) plus vocabulary glosses.
3. Spoken-response prompts with ASR scoring - prompts that require a 30–90 second spoken answer; AI provides pronunciation scores, error highlights, and follow-up exercises.
4. Writing scaffold and automated feedback - AI gives a writing tips, suggests a plan, checks drafts for grammar and logic, and offers revision-focused tasks.
5. Role-play chatbots - themed conversation bots (ordering food, job interview, travel) that adapt to responses and simulate realistic turn-taking.
6. Error-focused practice sets - AI identifies repeated learner errors (e.g., articles, prepositions) and auto-generates practice sentences and explanations.

During our research, we identified the easiest parts of studying to learn with AI. At first, grammar and vocabulary. These parts of English are very important and in the same time easy to practice using new technologies. For example, we asked chatbot "ChatGPT" to give us a table with twenty words about family. It translated them into Russian in one column and into English in the other. After that we were asked to do exercises to practice. AI made us more than five variations of different quizzes. It can give words letter by letter to remember how to write it, or write the word and give you shorted time to remembering and repeating. Second pronunciation. It can make the sound of every letter or word. And you can ask it to repeat them any times you need. Thirdly, you can learn grammar and text's logic through NLP models that detect and explain common error types.

So, to integrate AI into education, teachers should automate routine feedback and their free time for higher-order tasks, let AI surface patterns of errors and student misconceptions for targeted lesson planning and teach students to evaluate AI suggestions (some corrections may be contextually wrong) and to revise corrected.

Limitations, risks and ethical considerations are very important sections. ASR and NLP models can be less accurate for speakers with strong accents or for less-represented dialects, what cause unfair marks. Speech and writing data are sensitive; institutions should use platforms with clear data policies and informed agreement. Big dependence on automated correction can be barrier for learners' development of self-editing strategies so human scaffolding is important. Effective implementation needs teacher professional development so instructors can interpret AI results and integrate outputs successfully.

Now we'd like to share with the "Flipped Classroom" method. This approach is widely used in modern education and involves students studying theoretical material in advance so that during class they can focus on practical assignments, discussions, and application of knowledge.

What is a "Flipped Classroom"?

The "Flipped Classroom" method involves students studying theoretical material before class (e.g., through video tutorials, articles, or presentations), and using class time for practice, discussions, and in-depth study of the topic.

Key principles:

1. Transferring theory to home learning:
  - Students study the material in advance using multimedia: video lectures, articles, podcasts.
2. Emphasis on practice during the lesson:



- During the lesson, students complete assignments, participate in discussions, or solve practical cases.

### 3. The role of the teacher:

- The teacher becomes a facilitator, helping students apply knowledge and solve problems, rather than simply imparting information.

#### Advantages of the Method

##### For students:

- Ability to study the material at their own pace.
- Deeper understanding of the topic through practical application.
- Increased engagement and critical thinking.

##### For teachers:

- More time for individual work with students.
- Opportunity to analyze complex topics in depth during class.
- Strengthened interaction with students.

#### How to use the Flipped Classroom Method in universities?

##### 1. before class:

- Record short video lessons (10-15 minutes) covering key theoretical aspects.
- Create interactive materials, such as quizzes or assignments with automatic marking.
- Post the materials on an LMS platform (Moodle, Google Classroom).

##### 2. during class:

- Start by discussing questions or difficulties students have encountered while studying the material.

- Organize active tasks: group projects, case studies, role-playing games.
- Use active learning methods such as discussions, debates, or brainstorming.

##### 3. after class:

- Offer students a reflective assignment: write an essay, create a presentation, or fill out a table based on the lesson's results.

- Analyze the lesson results to adjust the materials or assignments.

#### Specifics of application in online learning

The Flipped Classroom methodology adapts perfectly to the online format. Here's how to use it:

##### 1. Preparing materials:

- Create videos with interactive questions.

##### 2. Platforms for hosting materials:

- Platonus or Google Drive - for organizing lessons.
- YouTube (with limited access) - for storing video lectures.

##### 3. Conducting lessons:

- Use Zoom or Microsoft Teams for synchronous meetings.
- Divide students into groups using breakout rooms to discuss practical cases.

##### 4. Tools for practice:

- Padlet - for collaboration;
- Mentimeter — for surveys and voting;
- Kahoot — for game testing.

#### Examples of successful application of the method:

##### In universities:

- Medical schools use the method to study complex theoretical concepts, such as anatomy. In class, students analyze practical cases.

- Law schools use the method to study laws and court cases. Before class, students familiarize themselves with case law, and in class, they participate in role-playing games or courtroom simulations.

##### In online learning:

- Coursera and Khan Academy actively use the "Flipped Classroom," offering video lectures that students study at home, and practical assignments that they complete in forums or online discussions.

In conclusion the Flipped Classroom approach makes learning more flexible, interactive, and practical. It's particularly useful in online learning environments and adapts well to university teaching.

The experts' advice is to try incorporating elements of this approach into the courses and see how it transforms students interactions!

#### Developing Critical Thinking.

*The Socratic Method is the art of asking questions that encourage thought, analysis, and the pursuit of truth. In the age of AI, this method is even more relevant, as it helps students not only use AI as a tool but also critically evaluate its answers. With ChatGPT, the Socratic Method can be adapted to create dialogues, simulate discussions, and analyze information.*

*Practical Part*

#### *1. Asking Questions for ChatGPT*

*Use the Socratic Method to validate the information provided by the AI.*

*For example:*

*"Why do you think this decision is correct?"*

*"What is the basis for this conclusion?"*

*"What alternatives are there?"*

#### *2. Analyzing the AI's Responses*

*Discuss with students:*

*Which responses seemed logical to them?*

*Which arguments raised doubts?*

*What would they add or change in the AI's responses?*

#### *3. Lesson Scenario Using the Socratic Method and ChatGPT*

*Begin the lesson by posing a general question, such as: "Why is ethics important when using technology?" Request a ChatGPT response and ask students to analyze it. Continue the discussion by asking Socratic questions:*

*"What could go wrong if ethics is ignored?"*

*"How could the proposed recommendations be improved?"*

*Socratic Method Question List for Use with ChatGPT*

#### *1. Clarification Questions*

*What do you mean by this?*

*Can you explain this in more detail?*

*What are the assumptions underlying this statement?*

*What is your answer based on?*

#### *2. Questions about Reason and Evidence*

*Why is this so?*

*What arguments support this point of view?*

*What examples support this conclusion?*

*What data or facts are used to support this?*

#### *3. Questions about Opposing Viewpoints*

*What if this is false?*

*What are the alternative explanations?*

*Who might disagree with this? Why?*

*What counterarguments exist for this position?*

#### *4. Questions about Consequences*

*If this is true, what does it follow?*

*What are the possible consequences of this approach?*

*What could go wrong if this is accepted as true?*

*What are the risks associated with this conclusion?*

#### *5. Questions about Assumptions*

*What assumptions are made in this answer?*

*Can we be sure these assumptions are correct?*

*What would change if the assumptions were incorrect?*

*What underlying assumptions influence this conclusion?*

#### *6. Questions to Test Logic*

*How did you reach this conclusion?*

*Is it logical? Why?*

*Could the data be interpreted differently?*

*What inconsistencies are there in this reasoning?*

#### *7. Questions for Synthesis and Generalization*

*How does this relate to other facts we know?*

*Can we generalize this? How?*

*How can this knowledge be used in practice?*

*What new questions arose during the discussion?*

*So, the information above gives us a pretty clear overview of how AI technologies help us in learning and teaching English. We would say, that AI technologies are so significant and unchangeable now, so we should know how use them correctly and safety. Also, people should understand that learning English is very important thing and they need to use all possibilities to improve their knowledge.*

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## ACADEMIC INTEGRITY AND ASSESSMENT IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE IN FOREIGN LANGUAGE EDUCATION

*Malikova Alina Amangeldikyzy*

*Uzbekali Zhanibekov South Kazakhstan Pedagogical University*

### **Abstract**

*This increasing integration of AI into educational environments has brought about significant changes in foreign language teaching, learning, and assessment. The current functions of AI-based tools in supporting writing, speaking, translation, and feedback in language education indeed provide learners with more personalized learning experiences and greater opportunities for practice. While these developments enhance instructional efficiency and learner autonomy, they also raise critical concerns regarding the ethical foundations of education, particularly academic integrity and assessment validity.*

*This article highlights the implications of AI for maintaining academic integrity in foreign language education, with a focus on assessment practices in particular. The study addresses how AI-mediated language production challenges the conception of independent learner performance, authorship, and originality. The investigation also discusses how existing assessment formats may not reflect learners' communicative competence adequately once AI tools are used without explicit pedagogical regulation. The framing of artificial intelligence as nothing but disruptive is avoided; instead, this article approaches AI as a pedagogical reality requiring thoughtful integration into both educational and assessment systems.*

*An analysis based on the conceptual review of international and domestic scholarly positions regarding artificial intelligence, academic integrity, and language testing is presented. Particular attention is paid to the possible transformation of assessment models with the impact of AI, especially to the rising significance of process-oriented, performance-based, and task-based assessment approaches. It is stated that these formats can better reflect authentic language use and are positioned to decrease the possibility of unethical AI-assisted test completion. Additionally, the article examines the dynamics of institutional policies, educator responsibility, and student ethical awareness that work to sustain academic honesty within an AI-enhanced learning environment. The findings indicate that artificial intelligence does not necessarily need to be rejected to preserve academic integrity in foreign language education, but rather that transparent assessment frameworks should be developed that are based on ethical grounds. Such frameworks should clearly specify acceptable uses of AI, encourage learner responsibility, and facilitate reflective engagement with language learning processes. By linking assessment practices to both technological innovation and ethical principles, it would be possible for educational institutions to ensure that artificial intelligence supports rather than undermines meaningful language development in a manner consistent with academic standards. The article concludes that the key to sustaining trust, fairness, and validity in foreign language assessment is to adopt a balanced and pedagogically informed approach to artificial intelligence.*

**Keywords:** *ethical assessment; learner authorship; performance-based evaluation; digital pedagogy; formative feedback; educational ethics; language proficiency measurement*

**Introduction.** *The rapid development of artificial intelligence technologies has significantly transformed modern teaching practices into their current status, especially in foreign language education. Various digital tools driven by AI include automated writing assistants, machine translation systems, adaptive learning platforms, conversational agents, and more, which are getting integrated into language learning environments. These technologies offer substantial pedagogical potential by enhancing learner autonomy, thus providing personal feedback, and fostering the development of communicative competence. On the flip side of benefits, however, such widespread use of AI has brought in serious concerns on a whole new dimension about academic integrity and the validity of assessment practices.*

*Academic integrity is traditionally defined as a set of ethical principles guiding honest behavior in learning, teaching, and assessment. Within foreign language education, academic integrity is inherently linked with the authenticity of language production, individual effort, and proper evaluation of learners' linguistic competence. The development of generative AI tools capable of producing grammatically correct and contextually appropriate texts has challenged these traditional notions of authorship, originality, and independent performance. Consequently, the ability to distinguish between a learner's actual language ability and AI-assisted output has become increasingly difficult, especially in written and take-home assessments.*



Assessment holds a central place in foreign language education since it is not only a measure of learning outcomes but also a strong driver of instructional practices and learner behavior. Traditional assessment formats, such as standardized tests and written assignments, have not considered AI-mediated language production. As a result, their reliability and fairness are questioned in AI-rich learning environments. This reality demands a critical reevaluation of assessment design, criteria, and methods with the aim of keeping evaluation valid, transparent, and combined with learning objectives.

While the research of AI in education is increasingly growing, the concrete connection of AI-supported assessment to academic integrity in foreign language learning has not yet been duly investigated. Most of the studies have a core orientation to technological innovation; ethical and assessment-related implications have received considerably less attention. This underlines the importance of analysis regarding how assessment practices may be adapted to maintain academic integrity without rejecting technological progress. **This study aims** to analyze challenges and opportunities related to academic integrity and assessment in the context of AI work in foreign language education. The article aims to conceptualize the main issues, identify risks to academic honesty, and discuss pedagogically sound strategies for aligning assessment practices with ethical standards in an AI-enhanced learning environment. Given this background, the study will try to contribute to elaborating sustainable and ethically responsible assessment models that reflect the realities of contemporary foreign language education.

**Artificial Intelligence in education: Concept.** Artificial intelligence in education is commonly regarded as the use of computational systems that are able to do things generally thought to require human intelligence, such as reasoning, language processing, and decision-making [1, p.17]. Within foreign language education, AI is first and foremost associated with Natural Language Processing-technologies that enable automated text generation, speech recognition, and language analysis. As scholars underline, AI systems cannot be seen as just technical tools but are pedagogical agents shaping learning processes and their outcomes [2, p.41].

Linguistically, AI technologies simulate communicative interaction and create continuous exposure for learners to target language input. According to Luckin et al., AI in education reshapes the roles of both learners and teachers by mediating interaction, feedback, and assessment [3, p.56]. This transformation appears particularly evident in foreign language learning, whereby AI-driven systems can model genuine usage of language and adapt to individual learner needs.

Examples of AI-based tools used in foreign language education include automated writing assistants, machine translation systems, speech recognition applications, and adaptive learning platforms. Generative AI models, such as large language models, can create coherent and contextually appropriate texts that might help learners during drafting and revision stages.. According to the researchers, this kind of tool promotes more lexical variety and better grammatical accuracy, especially among intermediate- and advanced-level learners.

Speech recognition and pronunciation evaluation systems also contribute significantly to oral skills development. According to Chapelle and Douglas, AI-based speech analysis makes the evaluation of pronunciation and fluency more objective and scalable [4, p.89]. These tools can give immediate feedback often not possible in a traditional setting. However, scholars also caution that if the pedagogical guidance is inadequate, then an overdependence on AI tools may decrease cognitive engagement among learners..

**Pedagogical benefits of AI.** Personalization is one of the major pedagogical advantages of AI in foreign language education. Data analytics from learner performance feeds into the development of adaptive learning systems that adapt task difficulty, content, and feedback accordingly. A personalized approach comes to support learner autonomy and promote self-regulated learning, a significant condition for successful language acquisition.

AI also supports formative assessment through the provision of regular feedback and diagnosis. As Holmes et al. point out, AI-driven feedback systems enable learners to spot mistakes and track progress in real time [5, p.137]. With regard to foreign language learning, this enhances the acquisition of metalinguistic awareness and encourages reflective approaches to learning.

Despite all of the pedagogical potential, integration of AI into foreign language education raises a lot of serious ethical and methodological concerns. One of the most critical issues, while not exclusively related to AI but particularly poignant because of the assumed assessment practices, relates to academic integrity in assessed tasks. The generative AI tools can easily produce texts which closely resemble human-written language, making it difficult to determine authorship and originality. This is a challenge to the traditional assumptions of learner perhaps and assessment validity.

For example, G.K. Nurgaliyeva stresses that in conditions of uncontrolled implementation of digital and AI-tools into language learning, students are subjected to the threat of superficial learning; they may perform tasks formally without any development of real competence [6, p.97]. According to Russian researcher E.S. Polat, digital technologies should be pedagogically regulated with the purpose of saving learners' responsibility and academic conscientiousness [7, p.114]

**Implications for assessment.** AI use in foreign language education immediately influences assessment practices. Traditional assignments in the written mode are becoming increasingly vulnerable to AI-assisted completion, strongly denting their diagnostic value. As Boud and Falchikov have expressed it, assessment needs to reflect not only outcomes but also learning processes [8, p.55]. This proposition acquires particular relevance in AI-saturated learning environments, in which process-oriented and performance-based assessment methods obtain prominence. Researchers consequently suggest the use of oral examinations, reflective tasks, and performance assessments during classes to create a balance with AI tools. Such approaches help maintain academic integrity by acknowledging realities within technological advancement.

Artificial intelligence is now an embedded element within modern foreign language learning, providing enormous pedagogical advantages via personalization, feedback, and adaptive learning. Concurrently, AI technologies bring serious challenges regarding academic integrity and assessment validity. The analysis of foreign and domestic research testifies that effective integration of AI requires not only technological competencies but also pedagogical regulation and ethical awareness. In this respect, the systems of foreign language assessment must be revised to ensure that AI-enhanced learning environments will support actual language development and maintain academic honesty.

**Concept of academic integrity.** Academic integrity represents a system of ethical values and principles aimed at ensuring honesty, trust, fairness, respect, and responsibility in carrying out academic work.. Academic integrity is centrally related to the credibility of learning outcomes and assessment results in higher education. In foreign language education, this concept is closely associated with the authenticity of language use, individual cognitive effort, and the accurate demonstration of communicative competence.

According to Fishman, academic integrity is not confined to the absence of plagiarism; it is a broader academic culture that shapes one's attitudes to create knowledge and be responsible. This understanding becomes particularly topical in the context of AI, where technological assistance may blur the line separating legitimate support from academic misconduct.

The arrival of the generative AI tool has brought a sea change in traditional notions of academic malpractices. Unlike conventional plagiarism, AI-generated texts may well be original in form but without real learner authorship [8, p.41]. The above phenomenon makes the detection of academic malpractices more complex, for the usual plagiarism detection software is inept against AI-generated content.

Foreign language education is particularly vulnerable to this challenge. Writing tasks, translations, and even reflective essays can be completed without notable contributions from the learner using AI tools. According to Perkins et al., a new category arises in "contract cheating without a contractor," where machines take over the place of human contractors [9, p.77]. In such cases, independence of performance will need to be rethought within an AI-supported learning environment.

**Ethics in AI.** While AI poses threats regarding academic integrity, many scholars emphasize that the ethical use of AI should not be equated with misconduct. Eaton claims that responsible AI use involves transparency, attribution, and pedagogical alignment rather than prohibition [9, p.96]. In this respect, AI can be seen as a cognitive tool that will support learning if its use is set under explicit regulation and ethical framing.

According to G.K. Nurgaliyeva, academic integrity in the digital learning environment depends neither on technological control alone nor on institutional norms, but rather on students' ethical awareness [6 p.118]. Thus, it would confirm the necessity for integrity policies to evolve and incorporate clear guidelines on acceptable and unacceptable uses of AI in academic tasks.

Accountability among students is one of the aspects of integrity that remains unchanged with AI. Scholars highlight the need for learners to be aware when AI assistance reaches its limitations and that academic work belongs to them alone. In foreign language education, this involves active engagement in language production, reflection on processes of learning, and critical evaluation of AI-generated output.

E.S. Polat points out that over-reliance on digital tools may lead to weakening the motivation of learners and diminishing deep learning when responsibility is transferred from the student to the

technology [7, p. 101]. Thus, while developing academic integrity, students need a parallel development of metacognitive abilities, ethical judgment, and linguistic competence

Institutions bear a great responsibility in preserving academic integrity under AI influence. Clearly defined policies on the use of AI in learning and assessment avoid the gray areas and ensure consistent academic standards are upheld accordingly. It is through international experience that universities increasingly adopt specific integrity guidelines for AI, rather than continuing to rely on traditional academic codes for honesty.

Such a policy should focus more on educational guidance rather than punishment. As seen by Bretag et al., integrity frameworks are best in preventing, transparency, and shared responsibility between students and educators. In foreign language teaching, such an approach helps establish a fine line between innovation and ethical accountability.

**Conclusion.** Artificial intelligence is a game-changer in foreign language education, realigning the multiple dimensions of teaching, learning, and assessment. Supported by this research study, AI technologies hold immense pedagogical promise for creating personalized learning routes, continuous feedback, and increasing learners' motivation. Simultaneously, however, this growth in generative and adaptive AI tools creates significant threats to academic integrity related to authorship, originality, and the validity of assessment outcomes.

The analysis of international and domestic research shows that traditional assessment models are increasingly inadequate in AI-enhanced learning environments. Written assignments and take-home tasks, which were considered over time to be relatively dependable indicators of language proficiency, become now vulnerable to AI-assisted completion. This calls for a turn toward those assessment approaches that orient to learning processes, authentic performance, and direct evidence of communicative competence. Process-oriented, task-based, and performance-based assessments emerge under these conditions as more resistant and pedagogically valid alternatives.

Academic integrity in the age of AI should not be understood as a matter of control or prohibition but rather as one requiring an integral approach to education, which Sala-Martin has summarized as the combination of ethical awareness, pedagogical guidance, and institutional regulation. Clear policy on acceptable use of AI, transparent assessment criteria, and the development of students' metacognitive and ethical competencies will be required to safeguard academic honesty while embracing technological innovation.

Overall, this study emphasizes the importance of balanced and responsible inclusion of artificial intelligence into foreign language education. Consequently, connecting assessment practices with ethical principles and current learning reality will help higher education institutions to take AI as a supportive tool but not a threat to academic integrity. Further research could be related to discipline-specific assessment models or empirical data regarding the long-term effects of AI on outcomes in language learning and academic culture.

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## THE ROLE OF TEACHERS IN FORMING UNIVERSITY STUDENTS' METACOGNITIVE ABILITIES

Tanatova A.D.

Associate Professor, Department of Pedagogy,  
Abai Kazakh National Pedagogical University  
Candidate of Pedagogical Sciences

**Abstract**

The article considers the problem of forming university students' metacognitive abilities in the context of a higher school teacher's professional activity. The relevance of the research is conditioned by the increasing demands on the quality of training future specialists capable of conscious learning, self-regulation, and continuous professional development in the context of educational reforms and digitalization. The focus is on the role of the teacher as a key figure ensuring the development in students of skills for planning, monitoring, and reflective evaluation of their own educational and cognitive activity.

The work presents an analytical review of domestic and foreign pedagogical and psychological-pedagogical research dedicated to the essence of metacognition, its structural components, and mechanisms of formation in the educational process. It is shown that metacognitive abilities act as a basic condition for successful learning and professional development, and their insufficient development leads to a decrease in learner autonomy, critical thinking, and reflective activity. Special attention is paid to the constructivist approach in education, within which learning is viewed as a conscious and actively self-regulated process by the student.

The article analyzes the experience of reforming the education system of the Republic of Kazakhstan, oriented towards developing learners' metacognitive strategies, and justifies the necessity of transferring these approaches to the system of higher pedagogical education. It is emphasized that the effectiveness of forming students' metacognitive abilities is largely determined by the teacher's professional readiness, including methodological competence, reflective culture, and the ability to create an educational environment that stimulates independent choice of learning strategies.

A separate emphasis is placed on the contradictions arising in conditions of active use of digital technologies and artificial intelligence tools, which, on the one hand, expand educational opportunities, and on the other hand, can reduce the level of students' independent analysis and reflective thinking. The article shows that overcoming these risks is possible with targeted pedagogical support and a consciously organized learning process.

Using the example of implementing a discipline focused on pedagogical research, the possibilities for developing students' metacognitive skills through their inclusion in reflective, research, and practice-oriented activities are revealed. It is concluded that the university teacher acts as a facilitator of metacognitive learning, providing conditions for forming in students a sustainable ability for self-learning, professional reflection, and effective activity under conditions of uncertainty.

**Keywords:** metacognitive abilities; self-regulated learning; reflective teaching; constructivist learning environment; higher education pedagogy; professional development; cognitive monitoring.

**Introduction**

Successful professional life in modern conditions is associated with highly developed metacognitive skills necessary for conscious understanding and regulation of one's own cognitive activity.

Knowledge about the course of one's own cognitive processes and understanding of how to regulate these processes for more effective learning constitute the basis of metacognitive strategies. Therefore, in modern conditions, education is oriented towards developing learners' metacognitive skills.

Learners, acquiring metacognitive strategies, learn skills of self-control, self-regulation, and self-learning. That is, the learning process becomes self-regulated and successful.

The definition of the concept of "metacognition" is associated with Flavell [1], who substantiated that in children, the ability to correctly assess their capabilities develops only gradually. Flavell [Flavell 1979] and others (1995) believed that conscious learning helps students better understand their own thought process by taking control of organizing their own learning process. Students' ability for metacognition changes as they mature, and by high school age, they assimilate a greater amount of metacognitive information. The emergence of learning difficulties is associated with a low level of development of metacognitive strategies, and therefore they need support from teachers. Based on the results of these studies, those learners who developed metacognitive skills from an early age will be more successful.



Consequently, in modern conditions, teachers should pay close attention to the processes of teaching and learning students, emphasizing the development of self-regulation and metacognition skills. Modern children must learn how to learn successfully. This is possible provided the observance and implementation of a constructivist learning process, based on the conscious study of educational material and practical skills of applying knowledge in life situations.

### Context

In education, the importance of implementing the idea of a constructivist approach is reflected in the works of L.S. Vygotsky [2], J. Piaget [3], J. Bruner [4], J. Dewey [5], H. Gardner [6], E.S. Polat [7], M.A. Choshanov [8].

The school system of education in the Republic of Kazakhstan since 2016 has transitioned to updated learning, based on the implementation of the theory of constructivist learning and the development of students' metacognitive strategies. For this purpose, school teachers conduct learning by creating a collaborative environment in the classroom, using dialogic learning, new approaches in learning, criterion-based assessment, while applying information and communication technologies, emphasizing learners' ability to consciously perceive, control, and regulate their own learning process.

For pedagogical activity, the role of metacognitive skills is of great value and significance. However, in modern conditions, a contradiction may arise between the readiness of university students training to be future school teachers and the level of metacognitive strategies of school students. Therefore, in universities in Kazakhstan, the education system is also being reformed with an orientation towards implementing constructivist learning. It is necessary to teach students to recognize their strengths and weaknesses, evaluate real possibilities, and regulate their learning through the application of adequate metacognitive strategies in managing their educational and cognitive activity [9, 10]. It is necessary to prepare students for their future professional activity, based on a high-quality process of teaching and educating school students.

We believe that the rapid development of artificial intelligence (AI) unfortunately presents some difficulty in developing students' own metacognitive skills. This situation is related to the fact that students, focusing to a greater extent on AI assistants, cease to develop their own analytical perception of information, and critical thinking weakens. Overall, this affects the weakening of reflective thinking and a decrease in the quality of cognitive learning activity.

Based on this, the development of students' metacognitive skills is influenced not only by the conditions created in higher educational institutions but also, first and foremost, by the competence and professionalism of the teachers themselves. A successful teacher is an educator who can reflect on their pedagogical activity, evaluating the reflective activity of students, and correlating it with making changes to their own process of teaching and learning.

For example, authors studying metacognitive processes have actualized the significance of the teacher in forming students' metacognitive skills. Authors such as T.E. Titovets [11], N.A. Leushina [12], E.G. Medvedeva, A.V. Rubtsova [13] believe that the teacher must possess methodological preparedness, reflective activity, and special skills in organizing the educational environment.

According to T.E. Titovets, metacognitive skills represent the student's conscious management of the cognitive cycle, including setting an individual goal, choosing a strategy, monitoring and correcting actions, as well as final reflection on results [11]. The author emphasizes that these skills become the basis for the future teacher's professional self-development, ensuring the ability for creative problem-solving and overcoming cognitive difficulties. T.E. Titovets highlights the teacher's diagnostic function, including: determining the student's characteristics and difficulties; selecting an optimal combination of metacognitive strategies; assisting in setting an individual goal considering the learner's cognitive style.

N.A. Leushina [12] shows that metacognitive competence is necessary not only for future teachers but also for engineering students, as it forms the ability for self-organization and independent learning, especially when working with foreign language texts under conditions of limited classroom hours.

In turn, E.G. Medvedeva, A.V. Rubtsova [13] draw attention to the fact that the formation of metacognitive skills is possible only when the teacher creates special psychological and pedagogical conditions, including activation of cognitive activity, development of self-regulation, and application of the principles of personality-oriented education and intercultural communication.

The works of N.A. Leushina, E.G. Medvedeva emphasize the importance of: providing the student with the opportunity to choose strategies; incorporating independent and asynchronous forms of learning; practicing metacognitive control when solving professionally oriented tasks.

*The importance of applying conversation (dialogue) between the teacher and students when studying a foreign language in the process of forming the learners' own metacognitive knowledge and skills was substantiated by E.G. Evdokimova [14].*

*The readiness of the teacher to form learners' metacognitive competencies is presented in the work of S.A. Khazova [15]. The author presented the structural-content readiness of the teacher, consisting of theoretical, practical, and psychological readiness.*

*The works of researchers substantiate the key role of the teacher in forming students' metacognitive skills. The authors believe that the teacher's activity extends far beyond traditional teaching and includes modeling cognitive processes, guiding reflection, creating conditions for independent choice of strategies, diagnosing individual difficulties, and forming sustainable motivation for self-regulation.*

*The common position of the researchers is that the development of metacognitive skills is possible only with the systematic, targeted, and methodologically competent work of the teacher. Metacognitive learning becomes a basic tool for preparing a modern student - a future professional capable of self-learning, innovative thinking, and effective activity under conditions of uncertainty. Consequently, metacognitive skills, including the awareness and control of thinking for learning, allow students to effectively plan, monitor, and evaluate their learning process.*

### **Methodology**

*At Abai Kazakh National Pedagogical University, future teachers for schools, colleges, and universities of the Republic of Kazakhstan are trained. The university's main mission is to educate a new cohort of intellectually educated specialists possessing new modern pedagogical technologies of teaching and learning.*

*For 2nd-year students, starting in 2024, a new discipline "Pedagogical Research" has been introduced. The goal of the discipline is the development of competencies for professional development, mastery of the theoretical foundations of pedagogical research. Students studying this discipline must master the skills of:*

- searching for and critically selecting theoretical knowledge from various reliable sources,*
- using research results in the development of pedagogical thinking and practice.*

*Students must be ready for learning based on conducting pedagogical research, as well as the constant development of these skills with the aim of readiness for professional self-improvement.*

*The topics of the main lectures and practical classes of the discipline cover themes that allow students to:*

- understand the significance of conducting psychological and pedagogical research in school;*
- realize the importance of observing research ethics and teacher culture;*
- learn about the types of scientific-pedagogical research and their foundations;*
- compare the integration of Action Research abroad and in the Republic of Kazakhstan;*
- become acquainted with the methodology of pedagogical research;*
- consolidate the logic and technology of organizing pedagogical research.*

*Each lesson is structured by teachers based on the constructivist theory of learning, providing students with the opportunity to apply knowledge in practice, researching relevant topics. Students, studying the discipline, realize the significance of the teacher's reflective thinking in conducting Action Research.*

*Through conducting their own mini-research, learners come to understand the relevance of the constant development of metacognitive processes in the professional pedagogical activity of every teacher, student. Students realize that the introduction of innovations into the education process is connected with the innovative pedagogical activity of the teachers themselves, implementing pedagogical research in practice. Therefore, thanks to the personal and professional motivation of teachers, serious changes occur in the educational sphere, and, most importantly, school students develop critical and creative thinking, improve skills of communicability, teamwork, development of metacognition and self-regulation.*

*Consequently, it is the university teacher who is the key figure in forming students' reflective learning. Teachers, continuing to teach students in a traditional format, simply cannot contribute to their reflective development and professional formation.*

### **Conclusions**

*Summarizing the above, it can be concluded that issues of metacognition attract the majority of scientists, actualizing the connection with a successful learning process. We agree with the presented authors of research emphasizing the key role and central position of teachers developing students' metacognitive processes, providing conditions for reflection, self-control, and conscious choice of learning*

strategies. University teachers should be facilitators in students' reflection and self-regulation on the path to their professional formation and development.

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## *Philological sciences*

### THE ROLE OF ARTIFICIAL INTELLIGENCE IN LEARNING FOREIGN LANGUAGES

*Mammadzadeh Natavan Yusif*

*Senior Lecturer, Ganja State University*

*Musayeva Mujgan Rustam*

*Lecturer, Ganja State University*

*Aliyeva Aytaj Sahib*

*Lecturer, Azerbaijan Agrarian State University*

#### **Abstract**

*In the face of rapid technological progress, education requires modernization. This is especially true for foreign language learning, as their importance and demand have increased dramatically in recent years.*

*It's clear that the use of artificial intelligence (AI) in this area is becoming increasingly relevant. For example, Google released Semantris, a game designed to help learn English, in which users compete against AI in selecting and/or creating associations for words.*

*In this article, we would like to define the role of AI in foreign language learning: how significant it is and whether AI can replace humans in language teaching.*

**Keywords:** *Artificial intelligence, foreign languages, teaching foreign languages, automation of the educational process.*

*In recent years, modern higher education has been marked by the incredibly rapid growth and advancement of artificial intelligence (AI) technologies, which are fundamentally changing various areas of the educational system – from the teaching of general subjects and foreign languages to extracurricular activities and student entertainment.*

*Education and educational systems occupy a special place among the areas where AI is actively being applied, as they are recognized as a promising field where the potential for AI to modernize, transform, and even revolutionize traditional teaching practices is evident. Specifically, in the context of teaching English as a foreign language, various AI-powered educational tools and applications have begun to transform the way language skills are acquired and improved, teaching and assessment methods, and the design of curricula in higher education institutions.*

*It's safe to say that new technologies in the modern educational process have challenged and placed new demands on both teachers and students. As Larisa Milyaeva, Associate Professor in the Department of English Language and Professional Communication at the Financial University under the Government of the Russian Federation and a PhD in Philology, notes, academic communities of educators and methodologists are still discussing the role of ICT and internet technologies in organizing the educational process, with artificial intelligence as a direct assistant and creator of educational content already on the agenda. The introduction of AI technologies into the educational process demonstrates that foreign language teachers are facing new challenges: mastering specialized skills in working with AI technologies, which are already having a significant impact on existing practices and methods for organizing the educational process in the classroom.*

*Recent developments in AI and research into its application indicate that the role of the teacher is undergoing significant changes when using AI technologies. This is primarily because AI can perform tasks typically assigned to teachers. For example, as Larisa Milyaeva, PhD in Philology and Associate Professor of the Department of English Language and Professional Communication, argues in this article, AI-based applications already exist that can provide feedback by analyzing the grammatical aspects of students' written work without the teacher's intervention. Artificial intelligence can serve as a means of mastering practical and communicative grammar in context and within the framework of an individual, personalized approach. In addition to the aforementioned applications, there are AI-based applications aimed at improving other language skills (for example, speaking) or developing communicative competence (learning a specific vocabulary and developing the skill of using it consciously in a specific context).*

*Moreover, such applications are also available in mobile versions, making learning convenient for students by providing authentic learning environments and self-monitoring modes.*

*In this case, AI technologies can be viewed as a tool for assisting both students and teachers.*



*The integration of AI technologies into foreign language teaching in higher education represents a complex and diverse landscape of opportunities, but at the same time, it presents a distinct challenge for all those working in this field.*

*On the one hand, AI-enabled platforms offer personalized learning content that facilitates the development of individual learning paths and provides instant feedback; all of this is aimed at meeting the diverse needs of learners. Platforms such as VZNANIA and Socrative, which offer a variety of exercises and simulators, as well as engVid (a free website with video courses taught by native speakers, where lessons are categorized by difficulty level and equipped with self-assessment tests), are actively used by faculty in the Department of English Language and Professional Communication at the Financial University under the Government of the Russian Federation in their English language teaching. Faculty members also actively work in the VR lab at the Financial University's CyberHub center, which has created several interactive VR learning environments.*

*Such innovations increase student engagement in the learning process, improve foreign language proficiency and provide high-quality language education, help assess student knowledge, and ensure active and productive interactions between teachers and students.*

*However, on the other hand, concerns inevitably arise about both students and teachers becoming overly dependent on technology, the potential loss of the human element (the diminishing role of the teacher in the educational process), and ethical and data privacy issues. All of this leads to discussions and debates about whether AI serves as a valuable asset or a potential challenge for teachers and students in English language learning in higher education.*

*The invaluable experience accumulated by faculty at the Department of English Language and Professional Communication at the Financial University under the Government of the Russian Federation demonstrates that the use of AI in the educational process brings a number of benefits to students: it facilitates meaningful communication, supports productive teamwork, improves speaking skills, develops critical thinking through analysis of reading comprehension, and, of course, increases student motivation.*

*In conclusion, the integration of artificial intelligence technologies into English language teaching in higher education opens up new horizons for teachers and students, creating unique opportunities for personalized and effective learning. While the use of technology raises a number of ethical and practical questions, the achievements achieved through its implementation demonstrate significant improvements in the quality of education and student engagement. This dynamic development encourages the teaching community to seek a balance between the use of AI and preserving the human aspect of learning, which will undoubtedly be an important step in shaping the future of the educational system. Ultimately, the successful application of AI in education depends on the willingness of all stakeholders to adapt to changes and openly discuss emerging issues, thereby maximizing the potential of new technologies to achieve high levels of student language proficiency.*

*AI itself is currently undergoing rapid development. AI systems can now generate text, audio, and images with relatively high quality [1, p. 44]. For the purposes of this article, it's important to understand how well a system understands natural language.*

*There's no definitive answer to this question yet. The aforementioned Semantris uses a fully trainable  $e^{40}$ - $e^{\wedge}$  algorithm, which is typically used to work with various natural languages. That is, the neural network independently builds models for working with lexemes. Initially, the neural network was trained using examples from natural languages, where each sentence, phrase, or word was pre-assigned with a translation, meaning, or other semantic connection, such as an implication or question-answer pair [2].*

*The largest and most advanced language model currently available is GPT-3. It was released by the American research company OpenAI in July 2020. GPT-3 has 175 billion parameters and was trained on 570 gigabytes of text. By comparison, its predecessor, GPT-2, was more than 100 times smaller, with 1.5 billion parameters. This increase in scale leads to unexpected behavior: GPT-3 can perform tasks on which it was not explicitly trained [1, p. 65].*

*However, despite such significant advances, AI's skills in constructing meaningful dialogue are still far from those of humans. While AI can grasp the meaning of simple linguistic structures and even respond to them, it is limited by the literal nature of its own interpretation of questions. A computer may know the definition of words, but it does not understand their meaning in a broader context [4].*

*In other words, AI lacks the so-called creative approach to words that humans possess. This creative approach to words is one of the most important human skills, enabling them to conduct dialogue with precision and wit, surprising their interlocutors with a brilliant idea. This enables the development of orthographic patterns, stylistic codes, and rhetorical algorithms. All of this constitutes a "sense of words,"*

which makes a person the creator of their own words, which accumulate knowledge and skills acquired through contact with literary (journalistic) texts [5, pp. 173-174].

At the same time, AI offers several advantages over a real person, one of which is its speed of response. This facilitates virtual brainstorming, or "cyberstorming," based on the spontaneity of interaction and the reverse dynamics of effective collective thought, whereas interactions with humans can be subject to various delays [3, p. 157].

However, it's important to remember that AI and the bots built on it are only capable of maintaining simple conversations and engaging in discussions within the framework of carefully selected keywords [3, p. 157].

Modern bots, in general, can hardly be called intelligent. Despite the fact that they are created using advanced machine learning and NLP technologies, they are all capable of handling only the highly specialized tasks for which they were created. [6].

That's why the AI in the app our team is developing will not attempt to replace a human conversation partner. The SpeakLab app, which will be available to users in March 2022, is designed specifically for Language Speaking Clubs. In this app, AI will only be used to provide recommendations for our events. These recommendations will be based on the user's language level and interests.

To summarize, we can conclude that the role of artificial intelligence in foreign language learning is quite significant today and continues to grow. AI has great potential in education and foreign language teaching. However, its functionality in this area is currently limited. Therefore, it is advisable to use AI only in tasks where it is most effective, rather than attempting to completely replace human resources in foreign language teaching.

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## *Psychological sciences*

### ANALYSIS OF THEORETICAL MODELS OF SCHOOLCHILDREN'S PSYCHOLOGICAL WELL-BEING, RISK FACTORS, AND INTERVENTION STRATEGIES

*Zhaparov Eldar Zhanatovich*

*Doctoral student at the Kazakh National Pedagogical University named after Abai*

*Tapalova Olga Bisenovna*

*Doctor of Psychology, Professor at the Kazakh National Pedagogical University named after Abai*

### АНАЛИЗ ТЕОРЕТИЧЕСКИХ МОДЕЛЕЙ ПСИХОЛОГИЧЕСКОГО БЛАГОПОЛУЧИЯ ШКОЛЬНИКОВ, ФАКТОРОВ РИСКА И СТРАТЕГИЙ ИНТЕРВЕНЦИИ

*Жапаров Эльдар Жанатович*

*докторант Казахского национального педагогического университета имени Абая*

*Тапалова Ольга Бисеновна*

*доктор психологических наук, профессор Казахского национального педагогического университета имени Абая*

#### **Abstract**

*This article presents a comprehensive scientific review of schoolchildren's psychological well-being amidst global digital transformation and socio-economic changes. The study is grounded in a fundamental paradigm shift: the transition from a traditional clinical model focused on treating pathologies to a salutogenic approach, which views well-being as the presence of positive personal resources rather than merely the absence of illness. The work is particularly relevant within the regional context of the Republic of Kazakhstan, which is experiencing a demographic "baby boom" where children constitute over 33% of the population. This creates a unique strain on educational infrastructure and necessitates a revision of psychological support strategies in schools.*

*The authors employ theoretical analysis and synthesis methods, drawing on meta-analytic reviews and data from international monitoring studies (UNICEF, WHO, HBSC). The paper conducts a comparative analysis of hedonic and eudaimonic approaches, integrating them into modern frameworks such as the PERMA model and C. Ryff's six-factor model. Central to the study is the Dual-Factor Model of Mental Health, which allows for the identification of a "vulnerable" group of children (low well-being in the absence of obvious symptoms). These children often remain invisible to specialists yet are at high risk for future depression.*

*An analysis of risk factors revealed that modern schoolchildren face the phenomenon of information overload, leading to fragmented thinking and increased anxiety. Cyberbullying poses a serious threat: according to HBSC data, one in eight adolescents in Kazakhstan is subjected to online harassment, with boys being involved more frequently than girls. Despite the positive trend in reducing completed suicide rates (from 11.3 to 2.9 per 100,000 population), a high prevalence of self-harming behavior and depressive states persists, often correlating with family material deprivation.*

*The article substantiates the effectiveness of implementing Social and Emotional Learning (SEL) programs, which, according to meta-analyses, contribute to improved academic performance and reduced distress. The authors also emphasize the role of physical activity and civic engagement (exemplified by environmental initiatives and hackathons) as powerful tools for building resilience.*

*The activity of school psychological services in Kazakhstan is critically analyzed. It is revealed that high administrative burdens and the use of outdated diagnostic tools hinder the transition from a reactive model ("firefighting") to proactive community engagement.*

*The authors conclude that it is necessary to introduce standardized psychometric scales (PWB-c, CD-RISC-25) and reorient school psychologists toward developing future competencies: digital hygiene, emotional intelligence, and attention management skills. Psychological well-being is posited by the authors as a necessary condition for successful learning and the social development of the nation.*

#### **Аннотация**

*В данной статье представлен комплексный научный обзор проблемы психологического благополучия школьников в условиях глобальной цифровой трансформации и социально-экономических изменений. Исследование базируется на фундаментальном сдвиге научной парадигмы: переходе от традиционной клинической модели, сфокусированной на лечении патологий, к*

салютогенному подходу, который рассматривает благополучие как наличие позитивных ресурсов личности, а не просто отсутствие болезней. Особую актуальность работе придает региональный контекст Республики Казахстан, переживающей демографический «бэби-бум»: дети в возрасте 0–17 лет составляют 33,4% населения страны, а молодежь — еще 28,4%. Эта демографическая волна создает колоссальную нагрузку на образовательную инфраструктуру и требует пересмотра стратегий психологического сопровождения в школах, особенно в условиях дефицита ученических мест и урбанизации.

Авторы используют метод теоретического анализа и синтеза, опираясь на мета-аналитические обзоры и данные международных мониторинговых исследований (ЮНИСЕФ, ВОЗ, HBSC). В работе проводится сравнительный анализ гедонистического (субъективное благополучие) и эвдемонического (психологическое благополучие) подходов, которые интегрируются в современные схемы, такие как модель PERMA и шестифакторная модель К. Рифф. Центральное место в исследовании занимает Двухфакторная модель психического здоровья. Она позволяет классифицировать учащихся на четыре группы и, что наиболее важно, выделить категорию «уязвимых» детей (низкое благополучие при отсутствии явных симптомов). Эти дети часто остаются невидимыми для специалистов, так как не нарушают дисциплину, но подвержены высокому риску депрессии в будущем.

Анализ факторов риска выявил, что современные школьники сталкиваются с феноменом информационной перегрузки, ведущей к фрагментарности мышления, снижению концентрации и росту тревожности. Серьезную угрозу представляет кибербуллинг: согласно данным HBSC, каждый восьмой подросток в Казахстане подвергается онлайн-травле, причем мальчики вовлечены в этот процесс чаще (15% жертв и 14% агрессоров), чем девочки. Несмотря на позитивную динамику снижения уровня завершенных суицидов (с 11,3 до 2,9 на 100 000 населения), сохраняется высокая распространенность самоповреждающего поведения и депрессивных состояний, часто коррелирующих с бедностью и семейным неблагополучием.

В статье обоснована эффективность внедрения программ социально-эмоционального обучения (SEL), которые способствуют улучшению академической успеваемости и снижению дистресса. Подчеркивается, что эффективность таких программ зависит от соблюдения критериев SAFE (последовательность, активность, фокус, ясность) и включения компонентов благополучия учителей. Авторы также акцентируют внимание на роли физической активности и гражданской вовлеченности (на примере экологических инициатив, таких как «Urbathon») как мощных инструментов формирования резильентности.

Критическому анализу подвергнута деятельность школьных психологических служб Казахстана. Выявлено, что высокая административная нагрузка и использование устаревшего диагностического инструментария мешают переходу от реактивной модели («тушение пожаров») к проактивной работе с сообществом.

Сделан вывод о необходимости внедрения стандартизированных психометрических шкал (PWB-с, CD-RISC-25) и переориентации школьных психологов на развитие компетенций будущего: цифровой гигиены, эмоционального интеллекта и навыков управления вниманием. Психологическое благополучие рассматривается авторами как необходимое условие успешного обучения и социального развития нации.

**Введение.** Современная психологическая наука переживает фундаментальный сдвиг парадигмы в понимании детского развития и ментального здоровья. Если традиционная клиническая психология и психиатрия на протяжении XX века фокусировались преимущественно на патогенезе — изучении механизмов возникновения психических расстройств, их диагностике и лечении, — то XXI век ознаменовался переходом к салютогенному подходу. В центре внимания исследователей оказалось психологическое благополучие как сложный, многофакторный конструкт, который не сводится к простому отсутствию симптомов болезни, а подразумевает наличие позитивных психологических ресурсов, позволяющих личности процветать, реализовывать свой потенциал и продуктивно взаимодействовать с социумом (Magalhães, 2024).

Актуальность данной проблематики для системы образования и школьной психологии трудно переоценить. Глобальные трансформации, включающие цифровизацию всех сфер жизни, ускорение информационных потоков, изменение структуры занятости и социальную нестабильность, предъявляют к психике современного школьника беспрецедентные требования. Школа перестает быть лишь местом трансляции знаний, превращаясь в ключевой институт



социализации, ответственный за формирование жизнестойкости и эмоциональной компетентности подрастающего поколения.

Особую остроту вопросы психологического благополучия приобретают в региональном контексте. Республика Казахстан, находясь в фазе активного демографического роста и социально-экономических реформ, сталкивается с уникальным комплексом вызовов. Высокая доля детского населения (более 33%), урбанизация, региональные диспропорции в уровне жизни и доступе к образовательным ресурсам создают специфическую экосистему развития, требующую глубокого научного осмысления. Статистика суицидального поведения и распространенности пограничных психических состояний среди подростков указывает на необходимость пересмотра существующих стратегий психологического сопровождения в образовательной среде (UNICEF Kazakhstan Country Office Annual Report, 2024).

Целью настоящего анализа является исчерпывающий анализ феномена психологического благополучия школьников, базирующийся на систематизации современных научных публикаций, мета-аналитических обзоров и данных международных мониторинговых исследований (ЮНИСЕФ, ВОЗ). В работе детально рассматриваются эволюция теоретических моделей благополучия, специфика факторов риска цифровой эпохи, механизмы формирования резильентности, а также доказательная база современных интервенционных программ, направленных на укрепление ментального здоровья учащихся.

**Методы исследования.** В основе данной публикации лежит метод теоретического анализа и синтеза научной литературы, который позволил авторам систематизировать современные подходы к пониманию психологического благополучия и проследить эволюцию научных взглядов от традиционной клинической модели, ориентированной на лечение патологий, к салютогенному подходу, фокусирующемуся на развитии ресурсов личности. Исследователи применяют сравнительный анализ для сопоставления различных теоретических парадигм, в частности гедонистического и эвдемонического подходов, объединяя их в интегративные схемы, такие как модель PERMA и многомерная модель К. Риффа, и адаптируя эти конструкты к специфике образовательной среды. Важным методологическим компонентом работы является вторичный анализ статистических данных и результатов международных мониторинговых исследований, включая отчеты ЮНИСЕФ, ВОЗ и данные исследования HBSC. Этот метод используется для контекстуализации теоретических положений в рамках социально-демографической ситуации в Казахстане, позволяя оценить влияние макросоциальных факторов, таких как урбанизация, цифровизация и экономическое неравенство, на психическое здоровье школьников. Кроме того, авторы опираются на анализ мета-аналитических обзоров, что позволяет им оценить доказательную базу эффективности различных стратегий интервенции, таких как социально-эмоциональное обучение (SEL), и сформулировать обоснованные рекомендации для внедрения в практику.

**Результаты исследования.** Понимание природы психологического благополучия прошло долгий путь эволюции, опираясь на философские традиции античности и современные эмпирические исследования. В научном дискурсе закрепилось разграничение двух магистральных подходов, которые сегодня рассматриваются не как взаимоисключающие, а как комплементарные.

Исторически первым сформировался гедонистический подход, операционализируемый в понятии субъективного благополучия (Subjective Well-Being, SWB). Данная традиция, восходящая к работам Н. Брэдберна и Э. Динера, определяет благополучие через баланс позитивного и негативного аффекта в сочетании с общей удовлетворенностью жизнью. Ключевой постулат здесь заключается в том, что благополучие — это субъективное переживание счастья и удовольствия. Исследования показывают, что частота переживания позитивных эмоций является более надежным предиктором благополучия, чем их интенсивность, что имеет важное значение для диагностики: важны не редкие пиковые переживания восторга, а стабильный позитивный фон повседневной жизни школьника (Ryff & Keyes, 1995).

В противовес этому, эвдемонический подход (Psychological Well-Being, PWB) акцентирует внимание на полноценном функционировании личности и реализации потенциала. Согласно этой перспективе, чувство счастья не всегда тождественно истинному благополучию; развитие личности может сопровождаться трудностями и отсутствием сиюминутного удовольствия, но приводить к глубокому чувству осмысленности. В контексте школьного образования это различие критично: ученик может испытывать стресс и утомление (низкий гедонистический компонент) в процессе подготовки к важному проекту, но при этом ощущать высокую вовлеченность и смысл (высокий эвдемонический компонент) (Gökmen Arslan, n.d.).

Современные исследователи, такие как Райан и Деси, а также Селигман, предлагают интегративные модели. В качестве действующего примера можно привести модель **PERMA** объединяет пять элементов процветания:

- Позитивные эмоции (Positive emotions);
- Вовлеченность (Engagement);
- Взаимоотношения (Relationships);
- Смысл (Meaning);
- Достижения (Accomplishment).

Более поздние версии модели добавляют компонент «Здоровье» (Health), формируя аббревиатуру PERMA-H, что подчеркивает неразрывную связь физического и ментального состояния.

Одной из наиболее верифицированных и теоретически обоснованных концепций является шестифакторная модель психологического благополучия Кэрол Рифф. Данная модель синтезировала идеи К.Г. Юнга об индивидуации, А. Маслоу о самоактуализации и Э. Эриксона о психосоциальном развитии, выделив шесть независимых измерений позитивного функционирования.

| Компонент модели (Шкала)              | Содержание конструкта в контексте школьного возраста                                                                                         | Значимость для развития учащегося                                                                                                                        |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Автономия</b>                      | Способность противостоять социальному давлению, регулировать поведение изнутри, оценивать себя по собственным стандартам.                    | Критически важна в подростковом возрасте для сепарации от родителей и формирования собственной идентичности, защиты от конформизма в группе сверстников. |
| <b>Управление средой</b>              | Компетентность в управлении окружением, умение эффективно использовать возможности и создавать условия, соответствующие личным потребностям. | Способность школьника организовывать учебный процесс, совмещать учебу с хобби, адаптироваться к требованиям школы без ущерба для психики.                |
| <b>Личностный рост</b>                | Чувство непрерывного развития, открытость новому опыту, осознание реализации своего потенциала.                                              | Прямо коррелирует с учебной мотивацией и познавательным интересом; ощущение стагнации ведет к скуке и отчуждению от школы.                               |
| <b>Позитивные отношения</b>           | Наличие доверительных, теплых связей, способность к эмпатии, любви и близости.                                                               | Фундамент благополучия; качество отношений с учителями и сверстниками является предиктором школьной адаптации.                                           |
| <b>Цели в жизни (Purpose in Life)</b> | Ощущение осмысленности существования, наличие целей и чувства направленности.                                                                | Защитный фактор против девиантного поведения и суицидальных рисков; связывает текущую учебную деятельность с будущим.                                    |
| <b>Самопринятие</b>                   | Позитивная оценка себя, включая признание своих достоинств и недостатков, позитивное отношение к прошлому.                                   | База для здоровой самооценки; низкое самопринятие коррелирует с тревожностью и депрессией.                                                               |

Отечественные и казахстанские исследователи (Е. Белякова, М. Кечерукова) дополняют эту структуру специфическими для школьников аспектами, включая материальное благополучие, физическое здоровье и проблемы безопасности поведения.<sup>11</sup> Это расширение оправдано, так как школьники находятся в сильной зависимости от внешних материальных и социальных условий, которые они не могут контролировать в той же мере, что и взрослые.

Революционным шагом в понимании ментального здоровья стала разработка Двухфакторной модели (Dual-Factor Model of Mental Health). Традиционно психическое здоровье рассматривалось через призму отсутствия болезней. Однако эмпирические данные, полученные Гринспуном, Саклофски и их последователями, показали, что отсутствие психопатологии не гарантирует высокого уровня благополучия.

Психопатология и субъективное благополучие (удовлетворенность жизнью, позитивный аффект) представляют собой два взаимосвязанных, но отдельных измерения. На основе их пересечения выделяется типология из четырех групп школьников, что имеет фундаментальное значение для стратегии психологической поддержки (Magalhães, 2024).

*Типология психического здоровья школьников (на основе Двухфакторной модели):*

| Группа                                | Характеристика профиля                        | Психологический портрет и риски                                                                                                                                                                                              | Стратегия вмешательства                                                     |
|---------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Полное психическое здоровье</b>    | Высокое благополучие / Низкая психопатология  | Наиболее многочисленная группа (до 64% в некоторых выборках). Характеризуется высокими академическими результатами, развитыми социальными навыками и физическим здоровьем.                                                   | Поддержка развития, программы обогащения среды.                             |
| <b>Уязвимые</b>                       | Низкое благополучие / Низкая психопатология   | "Скрытая" группа риска (около 7-13%). У этих детей нет клинических симптомов, они не нарушают дисциплину ("невидимые" для психолога), но чувствуют пустоту, отсутствие интереса и смысла. Риск развития депрессии в будущем. | Программы вовлечения, тренинги жизнестойкости, поиск значимых целей.        |
| <b>Симптоматические, но довольные</b> | Высокое благополучие / Высокая психопатология | Парадоксальная группа (9-17%). Могут испытывать высокую тревожность или иметь поведенческие проблемы, но сохранять оптимизм, хорошие отношения и удовлетворенность жизнью. Ресурсы благополучия компенсируют симптомы.       | Терапия симптомов при сохранении поддержки сильных сторон.                  |
| <b>Проблемные</b>                     | Низкое благополучие / Высокая психопатология  | Группа максимального риска. Сочетание клинических расстройств с чувством безнадежности и социальной изоляции. Худшие академические и социальные показатели.                                                                  | Интенсивная клиническая и психокоррекционная помощь, кризисная интервенция. |

Данная модель доказывает, что школа не должна ограничиваться выявлением «проблемных» детей. Игнорирование группы «Уязвимых» (с низким благополучием, но без симптомов) приводит к тому, что значительная часть учащихся не реализует свой потенциал и со временем пополняет ряды дезадаптированных.

Психологическое благополучие невозможно рассматривать в отрыве от макросоциального контекста. Республика Казахстан представляет собой динамично развивающуюся среду, где демографические, экономические и культурные факторы создают специфический ландшафт рисков и ресурсов.

Казахстан переживает «бэби-бум»: дети в возрасте 0–17 лет составляют треть населения страны (33,4%), а молодежь (14-35 лет) — еще 28,4%. Эта демографическая волна, особенно выраженная в южных и западных регионах, а также в крупных агломерациях (Астана, Алматы, Шымкент), создает колоссальную нагрузку на образовательную инфраструктуру. Переполненность классов и дефицит учебных мест являются стрессогенными факторами среды, снижающими возможности для индивидуализированного подхода и реализации компонента «Управление средой» по Рифф (UNICEF Kazakhstan Country Office Annual Report, 2024).

Экономический фактор остается значимым предиктором благополучия. Несмотря на рост ВВП, реальные доходы населения демонстрируют тенденцию к снижению, а уровень бедности среди детей (7,8% в 2023 г.) превышает среднереспубликанские показатели. Особенно уязвимы дети в сельской местности, где уровень бедности достигает 10%. Исследования подтверждают, что материальное неблагополучие коррелирует с ограниченным доступом к развивающим ресурсам и повышенным уровнем семейного стресса, что напрямую влияет на эмоциональное состояние ребенка.

Внедрение государством инструментов цифровизации социальной сферы, таких как Digital Family Card, позволило в проактивном режиме выявлять семьи, нуждающиеся в помощи, и предоставлять меры поддержки без бюрократических барьеров. Тем не менее, охват адресной помощью остается неполным (около 52% нуждающихся детей), что требует дальнейшего совершенствования механизмов социальной защиты.

Статистика ментального здоровья подростков в Казахстане вызывает серьезную обеспокоенность специалистов. По данным исследований, уровень распространенности симптомов депрессии и тревожности среди казахстанских подростков может в три раза превышать показатели их сверстников из европейских стран.<sup>7</sup> Эти данные коррелируют с показателями суицидальной активности, которая, несмотря на позитивную динамику последних лет, остается острой медико-социальной проблемой.



Благодаря реализации комплексных межведомственных программ превенции суицидов (в том числе при поддержке ЮНИСЕФ), уровень завершенных суицидов среди подростков 15–19 лет снизился с 11,3 на 100 000 населения в 2016 году до 2,9 в 2024 году. Однако самоповреждающее поведение, не имеющее суицидальной интенции, но свидетельствующее о глубоком эмоциональном дистрессе и неспособности справляться с негативными эмоциями, остается ведущей причиной обращений за помощью и травматизма. Исследования показывают, что 90% подростков, совершивших суицид, имели недиагностированные симптомы депрессии и низкий уровень жизнестойкости (резильентности). Это подчеркивает необходимость смещения фокуса с предотвращения летальных исходов на раннюю диагностику депрессивных состояний и обучение навыкам эмоциональной регуляции (Adolescents and Youth | UNICEF, 2025).

Ключевым агентом обеспечения благополучия в школе должен выступать школьный психолог. В Казахстане деятельность психологических служб регламентирована нормативными актами, которые предписывают соблюдение этических норм, эмпатии и уважения к личности ребенка. Однако качественные исследования (интервью и опросы практиков) вскрывают системные проблемы.

Наблюдается противоречие между декларируемыми целями и реальной практикой, которая часто носит дефицитарный характер. Психологи перегружены административной работой и диагностикой, направленной на выявление «группы риска», в то время как времени на развивающую и профилактическую работу практически не остается. Исследования выделяют различные профили профессиональной идентичности психологов: те, кто ориентирован на работу с сообществом (учителями, родителями, школьным климатом), ощущают свою эффективность выше, чем те, кто сосредоточен исключительно на индивидуальной диагностике учащихся. Недостаток специфической подготовки в области современных методов интервенции и позитивной психологии также ограничивает потенциал психологических служб (Daniel Hernández-Torgano et al., n.d.).

Цифровая трансформация общества создала принципиально новую среду обитания для детей, породив специфические факторы риска, которые не были актуальны для предыдущих поколений.

Феномен информационной перегрузки (ИО) определяется как состояние, при котором объем поступающей информации превышает когнитивные способности индивида к ее обработке, что ведет к снижению эффективности деятельности и негативным психологическим последствиям. Современные школьники находятся в состоянии перманентного потока данных из мессенджеров, социальных сетей и образовательных платформ (Aadland & Heinström, 2024).

#### **Последствия информационной перегрузки для школьников:**

- Снижение концентрации внимания, фрагментарность мышления, ухудшение способности к глубокому анализу и запоминанию (эффект вытеснения информации из рабочей памяти).
- Рост тревожности, раздражительности, чувство беспомощности и потери контроля, эмоциональное выгорание.
- Снижение академической успеваемости, нарушения сна, социальная изоляция (Mazen Reda Ismail, 2022).

Парадокс заключается в неэффективности копинг-стратегий, используемых детьми. Исследования показывают, что школьники часто прибегают к стратегии "фильтрации" (отсеивания информации, часто важной) или эскапизма, что лишь усугубляет проблему накопления невыполненных задач. В отличие от взрослых, дети обладают меньшим опытом структурирования информации и слабее развитыми навыками тайм-менеджмента, что делает их более уязвимыми к ИО.

Кибербуллинг представляет собой одну из наиболее серьезных угроз психологическому благополучию. В Казахстане, согласно данным HBSC (2022/2024), около 13% подростков (примерно каждый восьмой) подвергались кибербуллингу. Примечательно, что мальчики чаще оказываются вовлеченными в этот процесс как в роли жертв (15%), так и в роли агрессоров (14%), по сравнению с девочками ('Каждый восьмой ребенок школьного возраста в Казахстане подвергается кибербуллингу. Данные международного исследования «Поведение детей школьного возраста в отношении здоровья» HBSC', 2024).

Воздействие онлайн-травли на психику разрушительно: жертвы испытывают острую социальную изоляцию, снижение самооценки, симптомы депрессии, гнев и страх. Специфика кибербуллинга (анонимность агрессора, круглосуточный доступ к жертве, огромная аудитория свидетелей) делает его переживание более травматичным, чем традиционный школьный буллинг.



Важным социологическим наблюдением является связь буллинга с социальным неравенством: подростки из семей с высоким доходом чаще выступают агрессорами, что может быть связано с большей доступностью цифровых устройств и ощущением вседозволенности (Бородина & Петимко, 2021).

Стремление родителей обеспечить конкурентные преимущества своим детям приводит к перегрузке внешкольными активностями (кружки, репетиторы, спорт). Исследования, проведенные в США и применимые к контексту элитных школ Казахстана, показывают, что после определенного порога «обогащение» среды перестает приносить пользу и начинает наносить вред. Чрезмерная организованная активность лишает подростков свободного времени, необходимого для развития навыков саморегуляции, рефлексии и простого отдыха. Этот феномен коррелирует с повышенным уровнем стресса, тревожности и психосоматическими расстройствами (головные боли, усталость), особенно в старших классах, где добавляется давление подготовки к экзаменам.

В противовес факторам риска, современная психология активно разрабатывает концепцию резильентности (жизнестойкости) — способности индивида к позитивной адаптации в условиях стресса и неблагоприятных обстоятельств. Резильентность не является врожденной константой, а формируется как динамический процесс взаимодействия личности и среды. Теоретический анализ (М. Раттер, Дж. Бонанно) позволяет выделить три уровня защитных факторов:

1. **Индивидуальный уровень** — когнитивные способности, эмоциональная стабильность, чувство юмора, оптимизм, вера в собственные силы (*self-efficacy*) и наличие жизненных целей.
2. **Семейный уровень** — теплая эмоциональная привязанность хотя бы к одному значимому взрослому (родителю, родственнику), поддерживающий стиль воспитания.
3. **Социальный уровень** — позитивный школьный климат, наличие друзей, доступ к социальной поддержке (Владимировна et al., 2020).

Лонгитюдные исследования, проведенные в Казахстане (с использованием шкалы CD-RISC-25), изучали влияние занятий исполнительским искусством на резильентность подростков. Результаты показали, что хотя творческая деятельность способствует самовыражению, общий уровень жизнестойкости возрастает со временем и в контрольных группах, что указывает на естественные процессы созревания личности и влияние школьной среды в целом, а не только специализированных интервенций (Ibraeva et al., 2025). Это подтверждает тезис о том, что закономерности нормального развития и поддержки работает для большинства детей.

Уникальным аспектом современных исследований является связь между гражданской активностью молодежи и их благополучием. Пример инициативы «Urbathon» в Казахстане, направленной на разработку решений для борьбы с паводками, демонстрирует, как вовлечение подростков в решение реальных проблем повышает их резильентность. Когда подростки используют цифровые инструменты (датчики, ИИ) для картирования рисков в своих районах, они переходят из позиции пассивных жертв обстоятельств в позицию активных субъектов изменений. Это развивает чувство компетентности, социальной ответственности и снижает тревогу перед лицом стихийных бедствий (How Youth Innovation Is Shaping Climate Resilience in Northern Kazakhstan, 2025). Такой подход оказывается более эффективным для формирования психологической устойчивости, чем традиционные лекции по безопасности.

Рекомендации ВОЗ и многочисленные исследования подчеркивают роль физической активности как мощного протективного фактора. Механизмы воздействия спорта на психическое здоровье многогранны:

- Аэробные нагрузки стимулируют выброс эндорфинов, улучшают кровоснабжение мозга и когнитивные функции, снижая симптомы депрессии и тревоги.
- Силовые тренировки и достижение спортивных целей повышают самооценку и чувство самоэффективности.
- Командные виды спорта удовлетворяют потребность в принадлежности, развивают коммуникативные навыки и снижают чувство одиночества (Li et al., 2024).
- Спорт выступает конструктивной альтернативой рискованному поведению и способом безопасной разрядки эмоционального напряжения.

На основе анализа литературы можно выделить иерархию стратегий поддержки психологического благополучия, доказавших свою эффективность.

Программы SEL (Social and Emotional Learning) являются наиболее изученным и эффективным инструментом универсальной профилактики в школах. Мета-анализы, охватывающие

сотни исследований и тысячи школьников, убедительно доказывают, что внедрение SEL приводит к:

- Улучшению академической успеваемости (размер эффекта  $d = 0.33$  для GPA, прирост на 11 перцентилей в тестах).
- Развитию социальных навыков и просоциального поведения.
- Снижению уровня эмоционального дистресса, поведенческих проблем и антисоциального поведения (Shi & Cheung, 2024).

**Ключевые факторы эффективности SEL программ (SAFE):**

1. *Sequenced* - последовательность;
2. *Active* - активность;
3. *Focused* – фокус;
4. *Explicit* – ясность (Mark T. Greenberg, 2023).

Критически важным является обучение самих учителей социально-эмоциональным компетенциям. Педагог, находящийся в стрессе, не может эффективно транслировать навыки благополучия ученикам. Программы, включающие компонент *teacher well-being*, показывают более высокие результаты.

Интервенции, основанные на позитивной психологии (ведение дневников благодарности, выявление сильных сторон характера, практики осознанности/*mindfulness*), демонстрируют эффективность в улучшении школьного климата и снижении выгорания. Для младших школьников разрабатываются игровые форматы PPI, однако исследователи отмечают необходимость дальнейшего накопления доказательной базы для этой возрастной группы. Важно, чтобы эти практики не становились формальностью, а были интегрированы в культуру школы.

Руководство ВОЗ и ЮНИСЕФ «*Helping Adolescents Thrive*» (HAT) предлагает системную рамку для организации помощи подросткам. Она включает:

- Многоуровневый подход – сочетание универсальных мер для всех (промоция психического здоровья) с таргетированными интервенциями для групп риска (подростки, подвергшиеся насилию, живущие в бедности, беременные).
- Мультисекторальность – координация усилий школ, медицинских учреждений и социальных служб.
- Цифровые решения – использование проверенных приложений и онлайн-платформ для доставки психологической помощи (EASE, чат-боты), что особенно актуально для регионов с дефицитом специалистов.

Эффективность любой интервенции зависит от качества диагностики и квалификации специалистов. В арсенале школьных психологов присутствует широкий спектр методик, однако наблюдается разрыв между научно обоснованными инструментами и реальной практикой. Рекомендованные перечни часто включают устаревшие или проективные методики, валидность которых для массового скрининга сомнительна.<sup>40</sup>

Научное сообщество настаивает на переходе к стандартизированным психометрическим шкалам, таким как:

- *PWB-c (Psychological Well-Being scale for children)*
- *CD-RISC-25*
- *HBSC* и другие международные протоколы.

Качественные исследования в Казахстане показывают, что школьные психологи часто оказываются заложниками "административного пресса". Они тратят львиную долю времени на заполнение отчетов и диагностику "проблемных" детей, выполняя функцию "пожарной команды". В то же время, психологи, которые находят возможность работать с сообществом (*community-focused approach*) — консультировать учителей, проводить тренинги для родителей, формировать среду, — оценивают свою работу как более эффективную и осмысленную. Основными барьерами являются недостаток специализированного обучения современным методам (например, КПТ, SEL) и низкий статус психолога в иерархии школы.

**Заключение.** Проведенный анализ научных публикаций позволяет констатировать, что проблема психологического благополучия школьников является многогранным вызовом, требующим системного ответа.

Современная наука убедительно доказывает ограниченность патоцентрической модели. Школа, ориентированная только на устранение проблем (двоек, прогулов, суицидов), упускает из виду огромный пласт работы по формированию ресурсов личности. Двухфакторная модель психического здоровья должна стать основой для проектирования воспитательных программ,

уделяя внимание не только «группе риска», но и «уязвимым» детям, чье неблагополучие скрыто за внешней нормой.

Цифровая среда и академическая гонка вооружений создают новые риски — информационную перегрузку и хронический стресс. Ответ системы образования должен заключаться не в запретах, а в обучении компетенциям будущего: цифровой гигиене, эмоциональному интеллекту и навыкам управления вниманием.

Опыт Казахстана показывает, что при наличии политической воли и международного сотрудничества (снижение уровня суицидов) возможен значимый прогресс. Однако для устойчивого результата необходимо переосмысление роли школьного психолога, инвестиции в обучение педагогов и создание инклюзивной, поддерживающей среды, где каждый ребенок чувствует свою ценность и причастность. Психологическое благополучие — это не роскошь, а необходимое условие для успешного обучения и социального развития нации.

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## *Sociological sciences*

### **REMOTE WORK IN THE INSURANCE SECTOR: EVIDENCE FROM GEORGIA ON JOB SATISFACTION, AUTONOMY, AND WORK INTENSITY**

**Zurab Mushkudiani**

Georgian International University  
ORCID: 0000-0003-0987-3564

**Eka Maghlaperidze**

Kutaisi International University  
ORCID 0000-0002-2126-4369

**Sophiko Mikabadze**

Akaki Tsereteli State University  
ORCID: 0000-0002-7001-8033

**Nino Zurashvili**

Georgian International University  
ORCID: 0009-0002-9706-7211

#### **Abstract**

*In the modern world technologies are changing rapidly. It caused the changing the living environment of humanity. Especially working conditions are changing. Insurance industry is one important business type, which is very demanded on the market. Remote work is very attractive and convenient in late decades. Talented candidates very often prefer to work remotely. Some researches show that in the insurance industry workforce prefer to be remotely.*

*The following article shows the experience, perception and attitudes of workforce which are working in insurance industry. The study was conducted in Georgia (the country). The survey is oriented to the role of occupational position and its intensity of remote work. The survey is based on the data which is collected by the electronic survey. The participants stayed anonymous. The survey was conducted in 14 insurance companies operating on Georgian market. The period of conducting the survey was one month period, November in 2025. The survey concluded demographic characteristics. It consisted work preferences and job satisfaction related to attitude of employees. There were surveyed well-being, autonomy and career development.*

*The data which were collected for the survey was analyzed in the program SPSS. There were used various statistical methods, which included descriptive statistics, crosstabulation analysis, Chi-square tests, analysis of variance, nonparametric tests, and correlation-regression analysis. There were used factor analysis and reliability testing. There were tested two key hypotheses. The hypotheses were related to the factors: managerial relationship trust and how remote employees were perceived their reduced feasibility.*

*Related to the results there were revealed differences between the experiences based on hierarchical position. Specialists who are working at the low position, are expressing their high level of dissatisfaction during fully remotely work. They show that there are lot of challenges throughout remote work, such are work – life imbalance, reduced chance for career progress caused to rare communication with their supervisors. In contrast, managers who are working as the middle level managers show higher level of satisfaction. These are work persons who are more engaged through remote work. Their perceptions are more positive than lower level specialists. The results of the survey has shown that autonomy of decision- making and managerial trust are strongly related to job satisfaction. Employees who are working partially remotely express their well-being and satisfaction related to various factors, such are good work-life balance, chances of career development, managerial awareness of activities daily.*

**Keywords:** Remote work; Hybrid work; Job satisfaction; Managerial autonomy; Career advancement; Work-life balance; Insurance sector

#### **Introduction**

*In the modern world, after COVID 19 pandemic remote has become popular all around the world. Development of digital technologies give an opportunity to the companies to offer to their employees working remotely. It has various advantages, such are saving of transportation expenses, saving time of transportation, an opportunity to work from any place all around the world, a possibility to have more*

*balanced work – family life. There are some challenges related to remote work, such as reduced level of communication between colleagues. Some employees consider that while they are working remotely their chance of career progress is reduced, cause their supervisor sees them rarely than other employees who are not working remotely. Some employees indicate that very often they can't perceive clear boundaries between work and non-work time due to remote job. Some employees consider that they are feeling isolation due to remote work.*

*Insurance sector is one crucial and most demanded industry on the market of Georgia. The companies operating on the market adopted remote and hybrid work. There are no researches through the field related to the job satisfaction of employees which are working remotely. This following research is very important and expresses how employees in insurance industry in Georgia perceive remote work, what difficulties, challenges and advantages do they see, according to their occupational position.*

*The aim of the study is to analyze the attitude toward remote work in insurance companies in Georgia. This particular study is focused to the hierarchical positions and their various levels of remote work intensity. The aim of the research is to reveal what are advantages and disadvantages and how the employees evaluate their job satisfaction, work-life balance and career development chances.*

### **Literature review**

*The era of modern civilization offers new opportunities and challenges to the humanity. It is related to the work environment. Traditionally employees were going to the work and it was daily activity, but today the development of technologies, give the opportunities to employees to work remotely from any part of the world. Different scientists describe remote work differently. There are several names of remote work.*

*According to Bloom remote work can be evaluated as teleworking. This means that an employee works away from the office (Baker, Bloom, Davis, & Terry, 2020). For years teleworking was not perceived as full time job. Colleagues were not perceive their remotely working personnel member as equal, while today IT technologies create the environment of being fully remote.*

*Baruch identified different characteristics that can influence remote work. There are many advantages and disadvantages of remote work (Baruch, 2000). Bonacini consider that working away from the office, where an employee have no communication with their colleagues can be damageable for them. Remote workers can't build up as strong relationship with their peers, as the other ones, who are meeting to each other everyday (Bonacini, Gallo, & Schicchitano, 2021). Another disadvantage is that there are some issues related to the safety of technology. Remote employees have no possibility to use the company's IT support. Some obstacles appeared during working can't be solved very often, which ruined the whole working process for remote workers.*

*Ai Mohamed indicates that sometimes when remote employees are working from other continent and other countries, there are time zone difficulties. The employees need to adjust their lifetime according to work time, that can be damageable for the health (Ai & Ai, 2023).*

*According to Adams-Prassl etc. one disadvantage is that remote work can blurred the boundaries between work and personal life. At first site, it seemed that personal life should have more time, but it is happening oppositely when employees are working longer hours remotely, than from the office (Adams-Prassl, Boneva, Golin, & Rauh, 2020).*

*Baily and Kurland consider that there are lot of challenges but still, the advantages of remote work is very convenient, that is the reason that it is attractive condition for talented candidates. Many employees indicate that remote work gave them more time and more chances to be more productive in their job and even their personal hobbies (Baily & Kurland, 2002).*

*Baker, Bloom, Davis and Terry consider that remote work can save time and money. The savings are not related to the employees only. Companies can save much money. They don't need big offices and other important related facilities which are necessary for office (Baker, Bloom, Davis, & Terry, 2020).*

*According to Biche, Cepoi, Aboura etc. remote work increases the motivation of employees. They have much time and can stay in their home, or choose the perfect place for working, which feels more safe and motivated for employees. Being remote means that employee members don't need to participate the policy of the company. They can avoid dress code and other strict rules, that need to be meet at the office (Biche, Cepoi, Aboura, & Fratiloiiu, 2021).*

*De Smet, Dowling and Mysore think that to create perfect environment for working increases the mood level and many employees indicate about improved well-being. Better work – life balance is the part of working remotely (De Smet, Dowling, Mysore, & Reich, 2021).*

*There are lot of aspects of remote work that are consider as advantages, and there are challenges as well, but many scientists consider this type of work the future all of the job.*

### **Research Methodology**

The main object of the research were insurance companies operating on Georgian market. The official information of total number of employees who are working in insurance organizations was requested from the Legal Entity of Public Law (LEPL) Insurance State Supervision Service of Georgia. According to the information in 2025 were 3 890 employees. The number of insurance companies is 18. Fourteen insurance companies expressed their willingness to participate in the study, and an electronic questionnaire was distributed to them.

The research process lasted approximately one month (start date: 27.11.2025 / end date: 25.12.2025). Using an anonymous survey method, 528 employees of the participating organizations took part in the study, which allows for the generalization of the obtained results.

The data collected through the questionnaire were processed and analyzed using the statistical software package SPSS. Various statistical procedures and methods were applied, including descriptive statistics, frequency analysis, crosstabulation analysis, contingency table analysis, analysis of variance (One-Way ANOVA, Univariate and Multivariate Analysis of Variance—MANOVA), data filtering, graphical analysis, and correlation–regression analysis. To test the research hypotheses, different statistical tests were employed depending on the types of variables, including Chi-square tests, the t-test, the Mann–Whitney U test, the Kruskal–Wallis test, and others. In addition, factor analysis of the research model and reliability testing of the model were conducted.

This part of the study enables us to address questions such as: what advantages and disadvantages emerge in the context of remote work under the influence of various factors; what intensity of remote work is considered optimal by respondents; what results are revealed through a comparative analysis of office-based and remote work under different conditions; whether respondents experience difficulties in distinguishing between working and non-working time; how convenient it is for them to perform work tasks while being with family members; what their overall attitudes and emotional states are during remote work; whether concerns regarding career advancement arise, and others. These and many other relevant issues are examined and analyzed in the present paper.

Based on the questionnaire, the variables created in the SPSS database were conditionally divided into three groups:

1. **Demographic and socio-economic variables** – encompassing variables Q1–Q10, including gender, age, education level, marital status, and related characteristics.

2. **Office-based and remote work variables** – encompassing variables Q11–Q28. This group identifies attitudes toward remote work, highlights its positive and negative aspects under the influence of various factors, provides a comparative analysis of work performed from home and from the office before and during the pandemic, and reveals respondents' preferred intensity of remote work, among other aspects.

3. **Variables related to respondents' attitudes and well-being during remote work** – encompassing variables Q29–Q42, constructed as interval variables based on Likert-scale data. This group examines respondents' ability to maintain a balance between work and personal life, their sense of well-being and happiness when spending more time with family members, their productivity and efficiency when working from home, the extent to which managers adequately perceive their daily work activities, and their expectations regarding career advancement, among other issues.

### **Analysis of Research Results**

The study revealed that at the low level, specialists are 62.9%. 8.5% of respondents were top level management, while 28.6% were holding middle-level management positions. With regard to the intensity of remote work, 63.8% of respondents work fully remotely (five days per week), whereas 25.9% work remotely on a partial basis. An important issue concerns the trends observed in respondents' perceptions and attitudes toward remote work according to their occupational positions and the intensity of remote work. To examine these issues and to test the relevant hypotheses, crosstabulation analysis and Chi-square tests were applied. The results are presented in the following two subsections.

#### **Data Analysis by Respondents' Occupational Positions**

The relationship between job position and several variables from the group of office-based and remote work variables, as well as variables from the group reflecting respondents' attitudes and well-being during remote work, was examined.

As the research findings indicate, the majority of top-level managers (57.8%) work partially remotely, whereas full remote work is predominantly characteristic of specialists (senior or junior specialists), amounting to 76.5% (Figure 1).

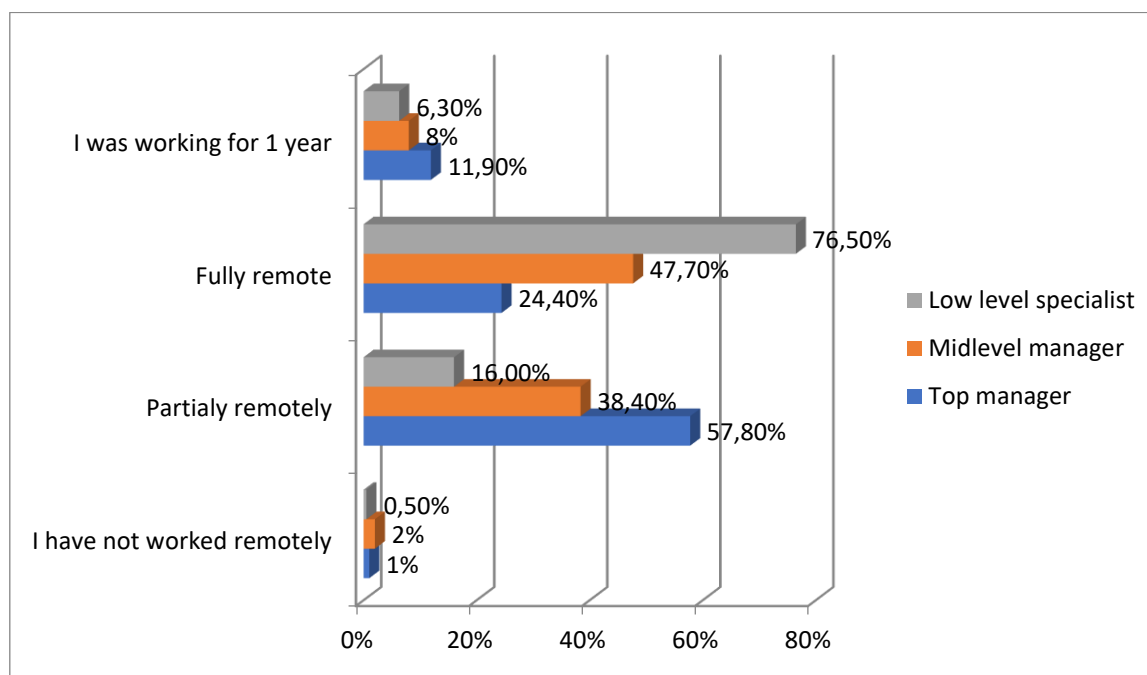


Figure N1. Which statement is the truth?

This result may be explained by the fact that top-level managers bear greater responsibilities and, consequently, are required to be physically present at the workplace at least several days per week. Nearly identical results were confirmed when analyzing the number of days worked remotely.

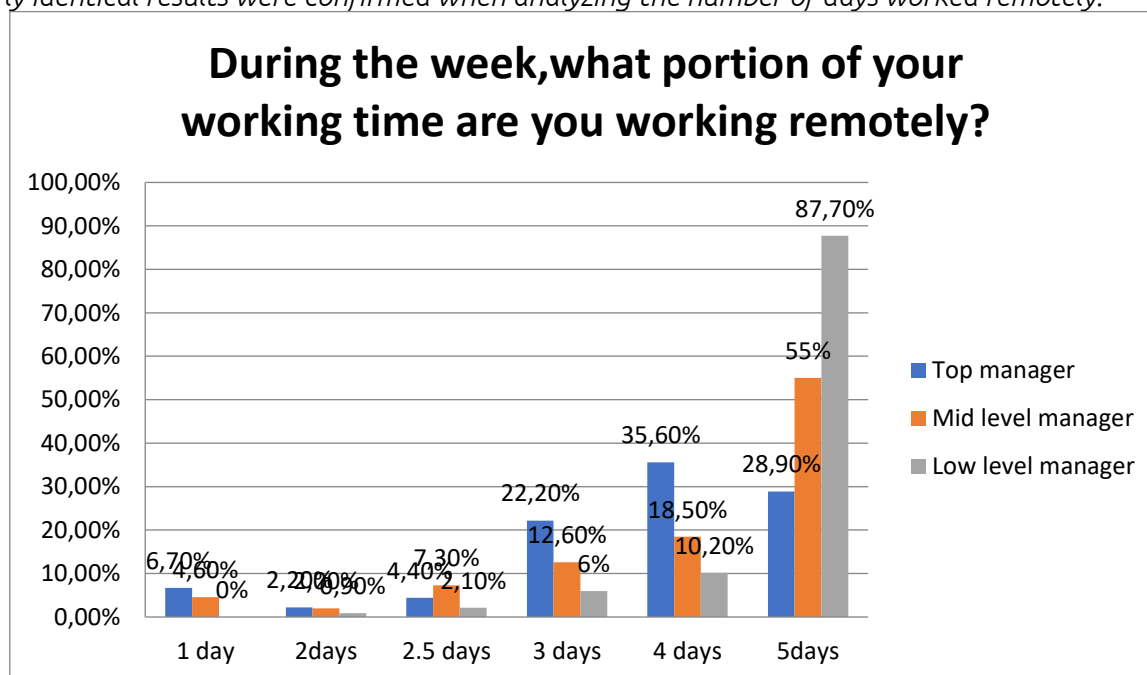


Figure 2. During the week, what portion of your working time are you working remotely

This result may be explained by the fact that top-level managers bear greater responsibilities and, consequently, are required to be physically present at the workplace at least several days per week. Nearly identical findings were confirmed when analyzing the number of days worked remotely. Specifically, 80.7% of specialists work fully remotely, that is, five days per week, while the remaining respondents operate under a partially remote work regime (Figure 2). In contrast, only 28.9% of top-level managers work fully remotely, whereas the majority of them work partially remotely.



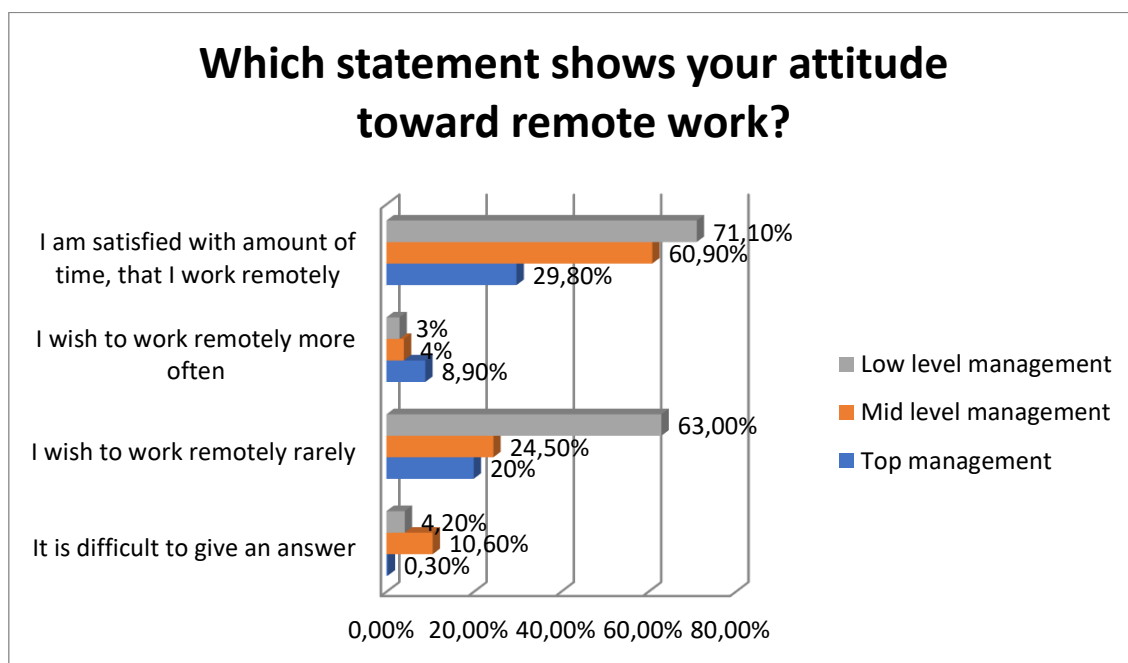


Figure 3. Which statement shows your attitude toward remote work?

As the findings indicate, 71.1% of top-level managers are satisfied with the amount of time they devote to remote work. By contrast, 63% of specialists expressed a preference to work remotely less frequently (see Appendix 3, Figure 3). This clearly suggests that employees who work fully remotely tend to experience a certain level of dissatisfaction with this mode of work. The specific shortcomings perceived by respondents will be examined through the subsequent survey questions.

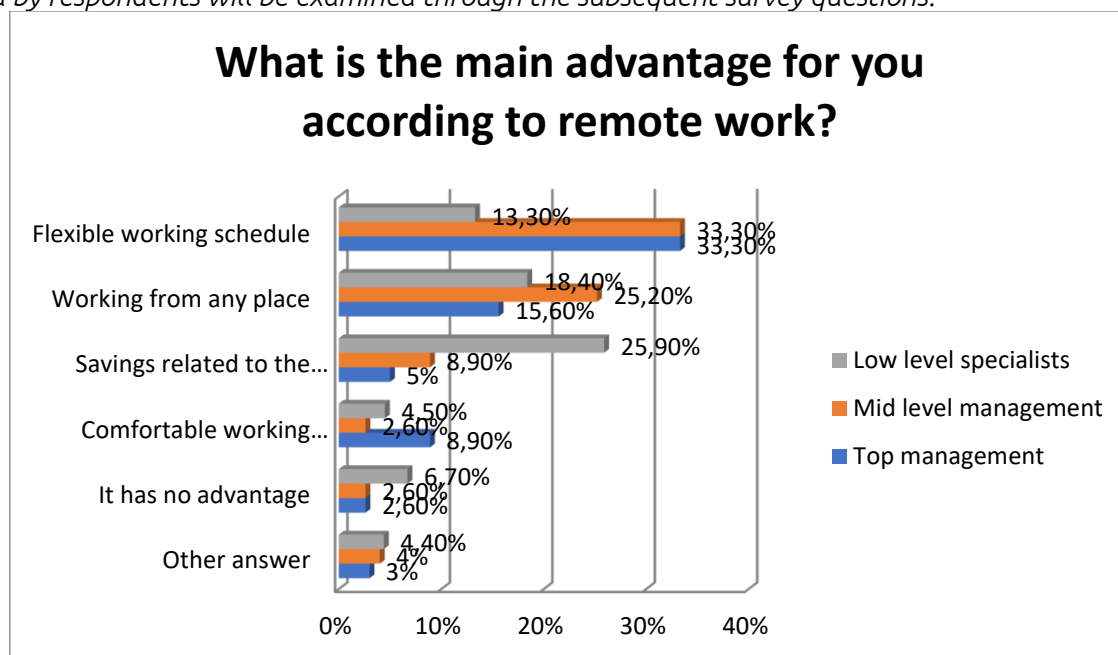


Figure N4. What is the main advantage for you according to remote work?

For top-level managers, a flexible work schedule emerged as the greatest advantage of remote work (33.3%), followed by a better work–life balance (20%) and the ability to work from any location (15.6%). For specialists, the most significant advantage was savings in commuting time (25.9%), followed by reduced transportation costs (23.8%) and the opportunity to work from any location (18.4%). As for middle-level managers, similar to top-level managers, a flexible work schedule was identified as the primary advantage (33.8%), followed by the ability to work from any location (25.2%) and savings in commuting time (16.6%) (Figure 4).

The obtained results suggest that remote work generates different positive outcomes depending on employees' hierarchical positions. Specialists presumably receive lower salaries; therefore, reductions in transportation costs are particularly important for them, as well as savings in time that can be spent either with family members or reallocated to work-related activities. For all three hierarchical levels, the

opportunity to work from any location appears among the top three advantages, indicating that flexibility in the organization of work is valued by employees across all positions.

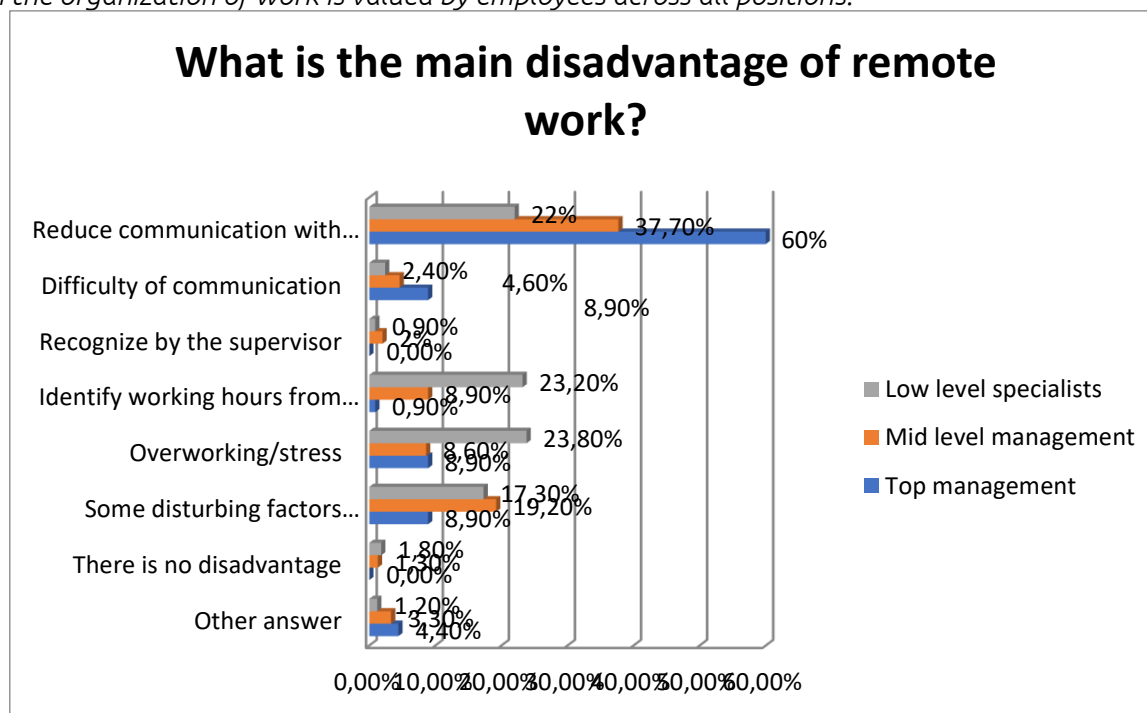


Figure N 5. What is the main disadvantage of remote work?

As shown in Figure 5, reduced interaction with colleagues represents the most significant drawback of remote work for both top-level managers (60%) and middle-level managers (37.7%). For specialists, the three most prominent disadvantages are difficulties in separating working time from non-working time, stress and fatigue caused by excessive workload, and reduced interaction with colleagues. In the Georgian context, relinquishing part of one's salary in exchange for remote work remains rather difficult, despite the fact that the vast majority of respondents express a positive attitude toward this mode of work. Nevertheless, 51.1% of top-level managers are willing to give up 5% of their salary in return for remote work, whereas 81% of specialists categorically refuse this option.

The question was related the offer if they would change their jobs in equal condition for starting work remotely, the responses were distributed as follows: 42.2% of top-level managers agreed, at the same time the same size of respondents were against to the change; the remaining respondents refused to answer the question, or selected alternative option.

Responses to this question are heterogeneous across all three hierarchical levels, suggesting that numerous additional factors influence such a decision.

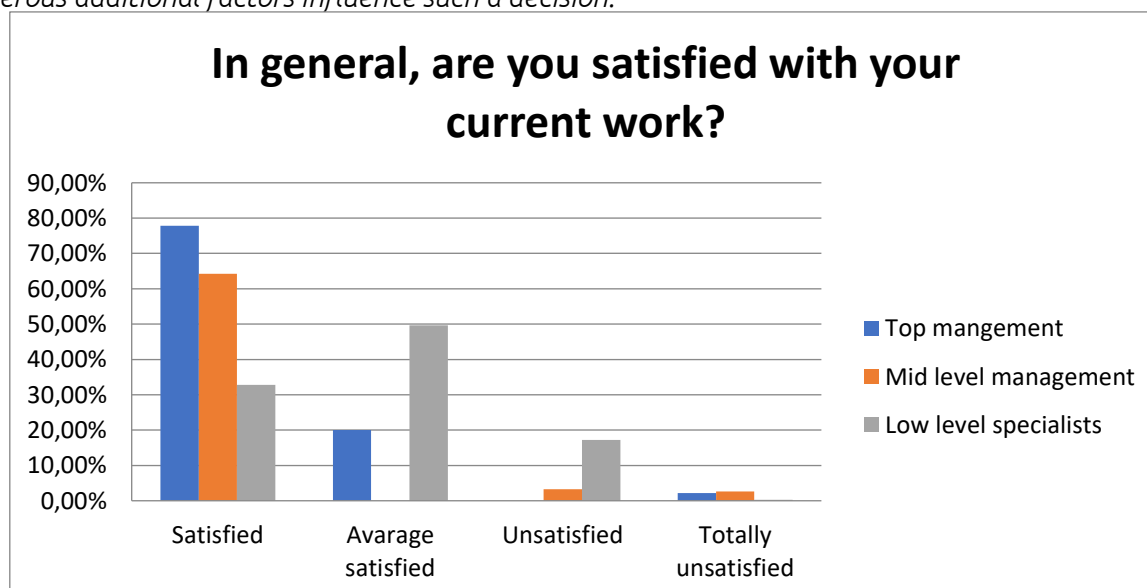


Figure N6. In general, are you satisfied with your current work?

As indicated in Figure 6, 77.8% of top-level managers and 64.2% of middle-level managers are satisfied with their current jobs. Among low level specialists only 32.8% were satisfied but 49.7% of mid level managers are satisfied. This results show, that in general higher positions in insurance industry are better for remote work.

This may be attributable to factors such as excessive managerial control over specialists, increased work–family conflict, social isolation, difficulties in separating work and non-work time, reduced opportunities for career advancement, and similar challenges.

During remote work, employees may either enjoy autonomy in performing their tasks or, conversely, experience excessive managerial control. Therefore, examining employees' attitudes toward this issue is of particular interest. The research results indicate that top-level managers most frequently enjoy autonomy and the ability to independently plan their work (66.7%), which positively affects their motivation. Similarly, managers demonstrate a higher degree of freedom in decision-making processes (73.3%). It is noteworthy that a considerable proportion of specialists also evaluate these aspects positively: 39.5% of specialists report having the ability to independently plan their work during remote work, and 42.8% state that they can freely make decisions regarding their tasks.

The results can be interpreted that there are subgroups of specialists. In one subgroup specialists have possibilities to make decisions freely and they have more level of autonomy, while other subgroups specialists are higher pressure and control of their supervisors. In order to examine this issue more deeply and to identify the relationship between employee autonomy and decision-making freedom during remote work and job satisfaction, the following hypothesis was formulated:

**H1:** Employees working remotely who are trusted by their managers and granted decision-making autonomy are more satisfied with their jobs than those who are not.

To test this hypothesis, data filtering was applied, which allowed the selection of respondents whose managers grant them decision-making autonomy. Based on this subset, a frequency analysis of job satisfaction was conducted (Table 1). The results were positive: among 301 respondents whose managers trust them and grant decision-making freedom, 295 respondents (98%) reported being satisfied with their jobs.

According to the Chi-square test results (see Table 1), there is a strong statistically significant association between variables Q28 and Q38 (the level of statistical significance does not exceed 0.001), indicating that decision-making autonomy has a significant impact on job satisfaction.

**Table 1. Chi-square test results**

|                                    | Value   | df  | Asymptotic Significance (2-sided) |
|------------------------------------|---------|-----|-----------------------------------|
| Pearson Chi-Square                 | 85.226a | 1   | .000                              |
| Continuity Correction <sup>b</sup> | 82.704  | 1   | .000                              |
| Likelihood Ratio                   | 90.964  | 1   | .000                              |
| Fisher's Exact Test                |         |     |                                   |
| Linear-by-Linear Association       | 85.041  | 1   | .000                              |
| N of Valid Cases                   |         | 460 |                                   |

Based on the findings of the present study, we conclude that **H1 is supported**, indicating that employees who are trusted by their managers and granted decision-making autonomy are more satisfied with their jobs than those who are not.

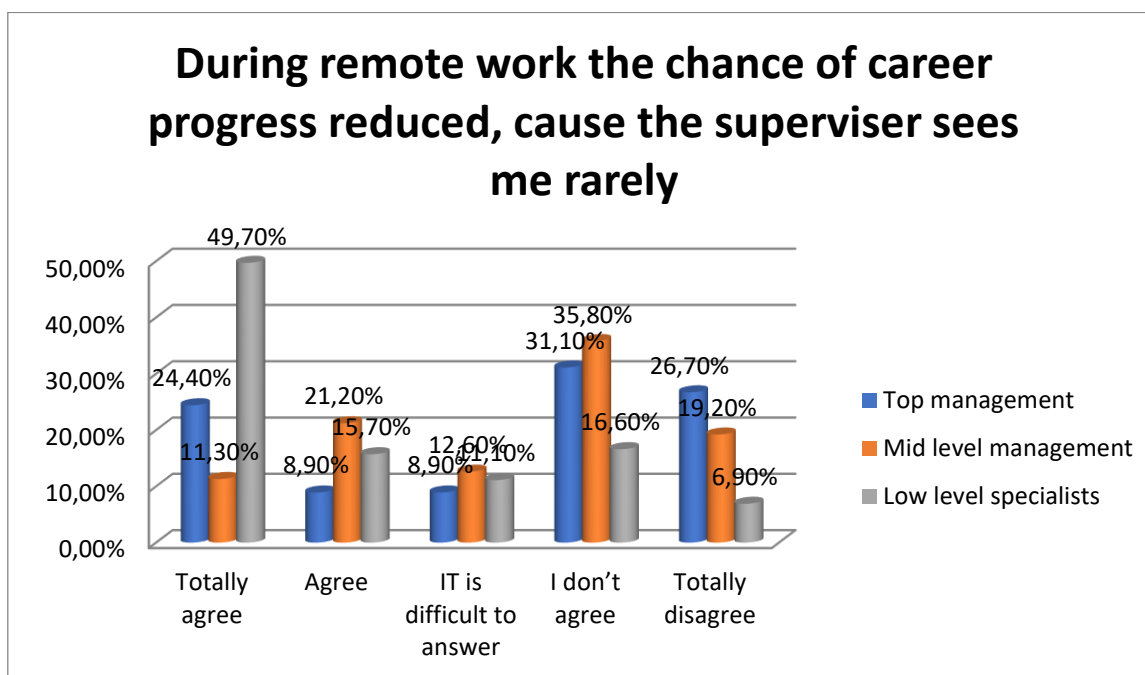


Figure N 7. During remote work the chance of career progress reduced, cause the supervisor sees me rarely

The crosstabulation analysis show that remote workers' that there is a connection between perception of career progress and particular job position of remote workers. Low level specialists have worse expectations toward career development when they are working remotely. (65.4%) ( Figure 7). These employees are precisely those who most strongly aspire to promotion; consequently, they perceive remote work as one of the key inhibiting factors and disadvantages in this regard. It is also of interest to examine whether additional indicators exist within the group of specialists that influence this perception—for example, whether age or length of work experience affects their views. We hypothesize that concerns about reduced career advancement opportunities are most pronounced among newly hired employees, particularly those whose tenure does not exceed one year. This issue will be addressed in a later section.

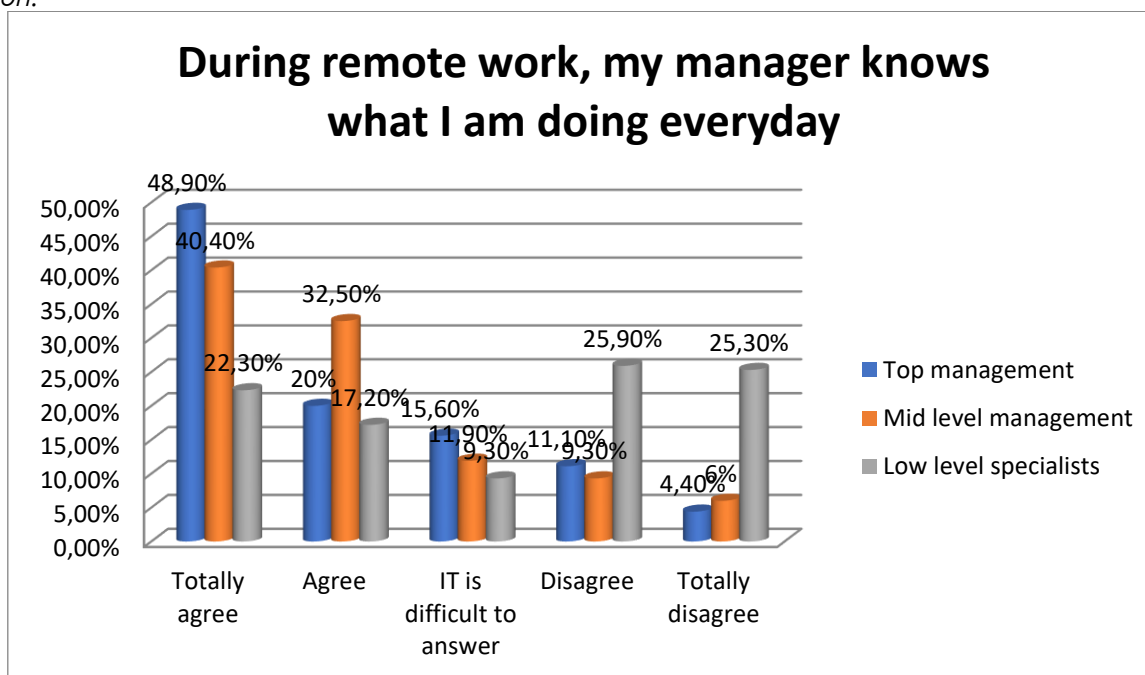


Figure 8. During remote work, my manager knows what I am doing everyday

The final two questions of the questionnaire address remote employees' evaluations of how well their supervisors/managers understand the content of their daily work activities and whether their work performance is adequately recognized. As the results indicate, specialists are the group most likely to disagree with both statements: 51.2% in the first case and 51.8% in the second case . Although some



respondents refrained from evaluating these statements, their proportion is relatively small. At the same time, a considerable number of specialists do evaluate these statements positively, which once again suggests the existence of subgroups within the specialist category—namely, those who believe that their supervisors understand their daily work well and appropriately recognize their performance.

The top – level managers' 70% consider the statement positively, only small number disagree. Middle level managers are showing the same patterns.

To summarize it can be said the results of the survey revealed that different positions held by the employees' impact their perception of remote work. The majority of specialists express a desire to work remotely less frequently and identify disadvantages of remote work such as difficulties in separating work and non-work time, stress and fatigue caused by excessive workload, and reduced interaction with colleagues. These disadvantages are closely associated with a lack of socialization and increased dependence on digital technologies. Regarding the advantages of remote work, employees across all three hierarchical levels identify the ability to work from any location as a major benefit. In the context of job satisfaction, it was found that specialists who are trusted by their managers and granted decision-making autonomy are more satisfied with their jobs than others. Furthermore, while managers generally report that they understand the content of employees' daily activities well, opinions among specialists are divided, suggesting the influence of various underlying factors leading to such divergent responses.

#### **Data Analysis by the Intensity of Remote Work**

From the general overview of the study, it is already known that 63.8% of employees in insurance companies work fully remotely, while 25.9% work partially remotely. The following section examines the relationship between the intensity of remote work and variables such as job satisfaction, work–life balance, perceptions of career advancement opportunities, and views on the advantages and disadvantages of remote work.

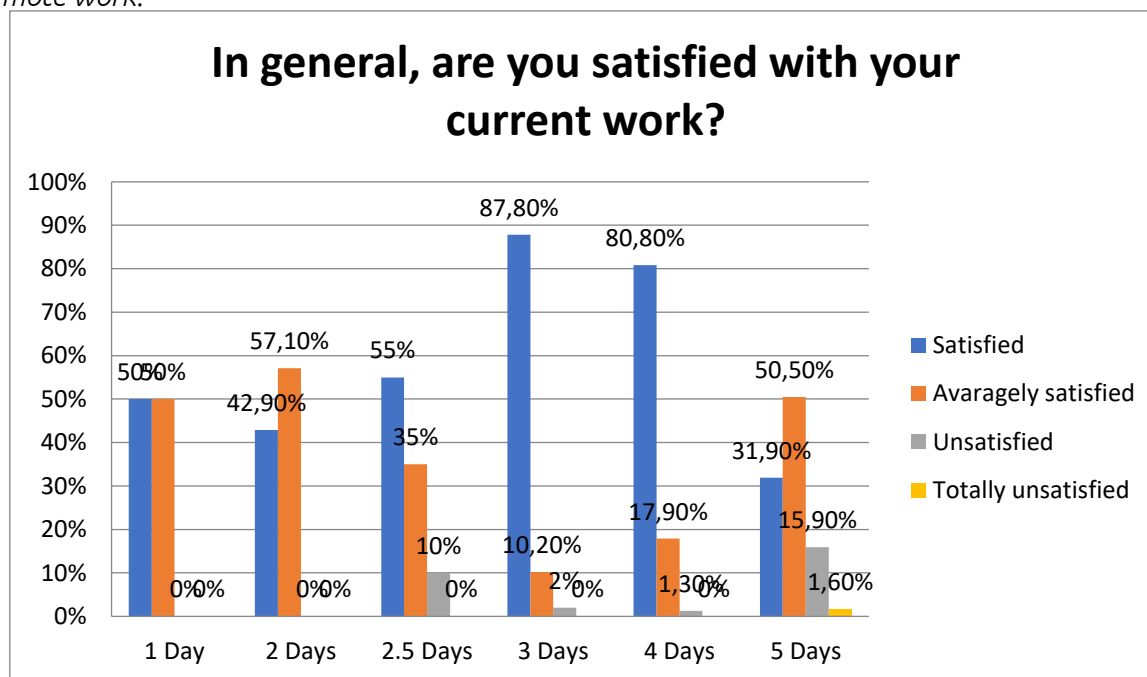


Figure 9. In general, are you satisfied with your current work?

Many researches agree the statement that the intensity of remote work can be influential directly to the level of job satisfaction. According to the research the personnel members who are working remotely three or four days in a week, indicates the highest levels of job satisfaction. Employees who are working remotely for 5 days, are the most dissatisfied (15.9%). Among fully remote workers, 50.5% report a moderate level of job satisfaction ( Figure 9). These outcomes may be explained by several factors, including feelings of social isolation associated with full remote work, reduced career advancement opportunities, and difficulties in separating work and non-work time.

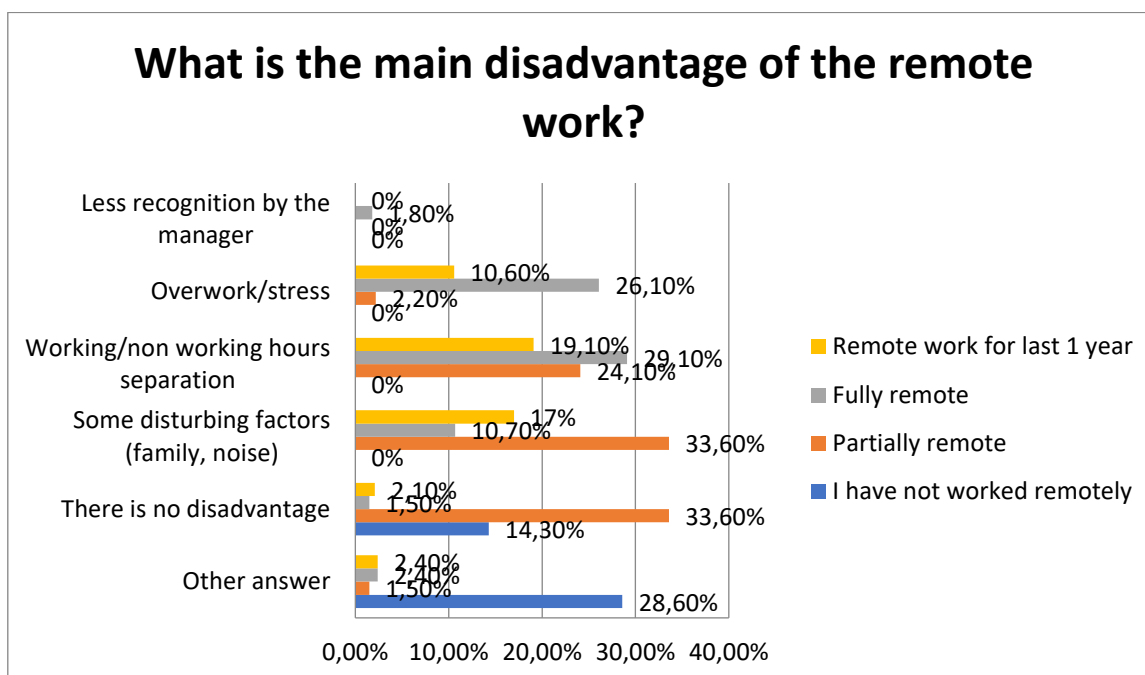


Figure 10. What is the main disadvantage of the remote work

For employees working fully remotely (five days per week), the most significant disadvantage of remote work is the difficulty of separating work time from non-work time (29.1%) (Figure 10).

In terms of advantages, for fully remote workers the greatest benefit is the ability to work from any location (24.3%), followed by savings in commuting time and transportation costs. For partially remote workers, the primary advantage is a flexible work schedule (44.5%), followed by commuting time savings (24.1%) and improved work-life balance (12.4%).

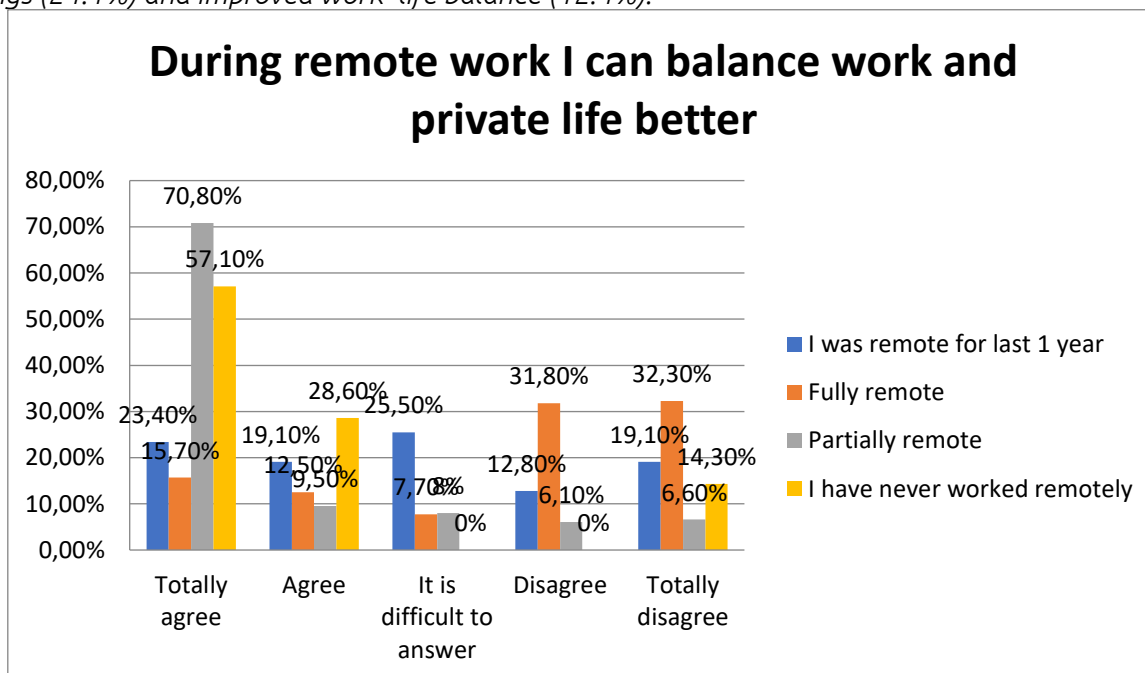


Figure 11. During remote work I can balance work and private life better

The findings further indicate that the majority of partially remote workers fully agree that remote work enables them to better maintain a balance between work and personal life (70.8%). In contrast, most fully remote workers disagree with this statement, with 64.1% rejecting it (Figure 11). This allows for an important conclusion: fully remote workers experience greater difficulty in effectively balancing professional and personal responsibilities. Continuous home-based work blurs the boundaries between work and family life, leading to work-family conflict and social isolation.

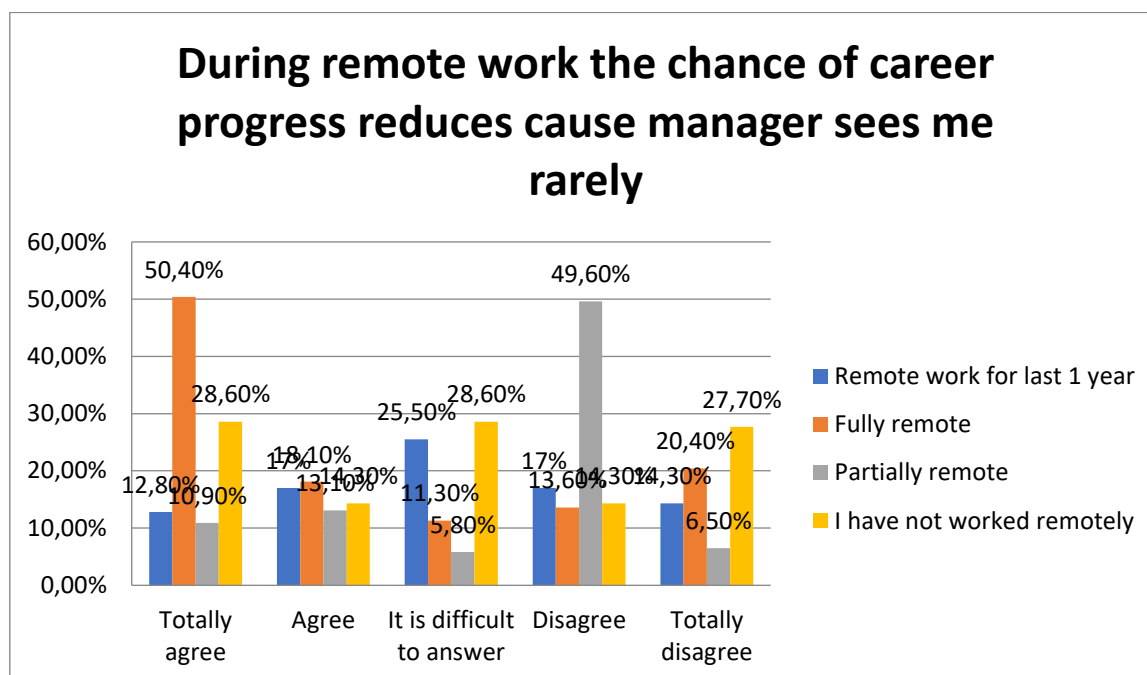


Figure 12. During remote work the chance of career progress reduces cause manager sees me rarely

A majority of fully remote workers (68.5%) believe that their opportunities for career advancement decrease when working remotely, as their supervisors see them less frequently. Partially remote workers, on the other hand, tend to disagree with this view ( Figure 12). This can be explained by the fact that partially remote workers do not experience professional isolation; they attend the office at least one day per week, interact with supervisors, and therefore do not perceive remote work as a factor that diminishes their career advancement opportunities.

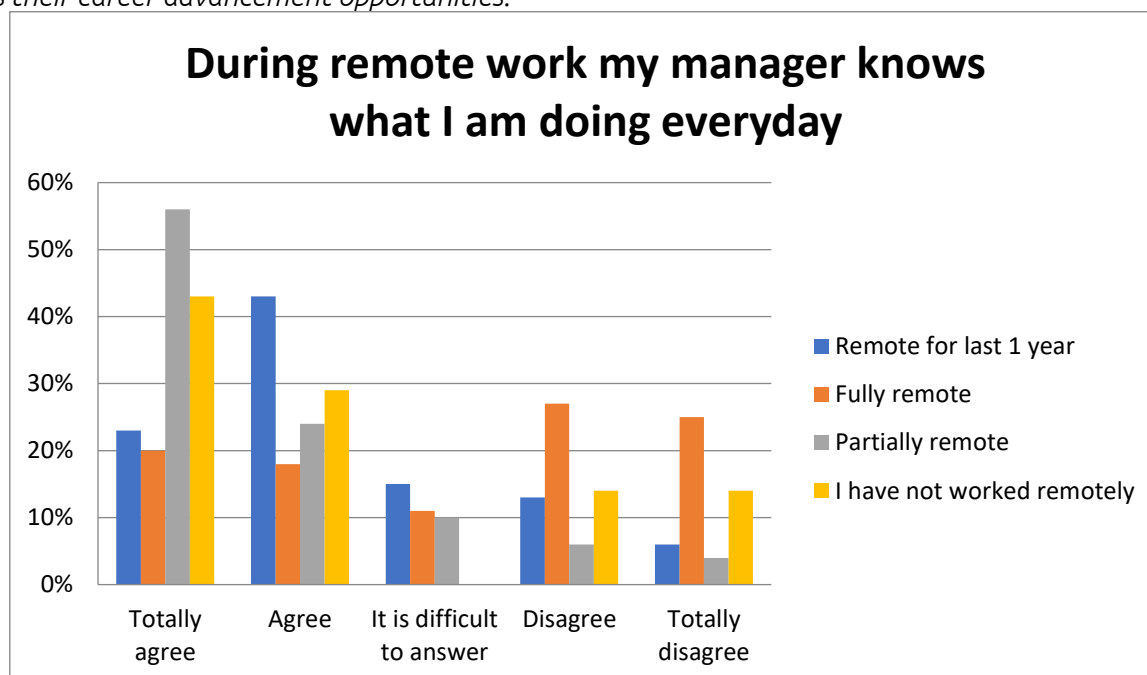


Figure 13. During remote work my manager knows what I am doing everyday

Furthermore, 80% of partially remote workers agree with the statement that their supervisor/manager understands the content of their daily work well when they work remotely, whereas only 37% of fully remote workers agree with this statement ( Figure 13). These findings suggest that partial remote work is more effective than full remote work, as it allows employees to benefit from flexible work arrangements while better maintaining work–life balance and having greater confidence—supported by objective reality—that supervisors can more accurately observe and evaluate their daily work activities.

It is also of interest how fully remote respondents assess the effectiveness of remote work and, based on their own experience, how they perceive their ability to fulfill job responsibilities if they were to

work remotely between 2.5 and 4 days per week (from a minimum of half a working week to a maximum of four days). To investigate this issue, the following hypothesis was formulated:

**H2:** Even respondents who currently work remotely five days per week consider it possible to fully perform their job responsibilities under conditions of remote work ranging from a minimum of 2.5 days (half of a working week) to a maximum of four days per week.

To test this hypothesis, data filtering and the Kruskal–Wallis test were applied. The grouping variable was Q24: “Do you believe that you would be able to fully perform your job responsibilities if you worked remotely from a minimum of 2.5 days (half of a working week) to a maximum of four days per week?” The test produced two tables. The first (see Table 2) presents the mean ranks, while the second (see Table 3) presents the results of the Kruskal–Wallis test, which examines the existence of an association between the intensity of remote work (Q15) and variable Q24.

**Table 2. Mean Ranks (Ranks)**

|                                                                                        | Q24. Would you be able to perform your duties remotely for 2.5 to 4 days per week? | N   | Mean Rank |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----|-----------|
| Q15. During the week, what portion of your working time do you spend working remotely? | 1 yes                                                                              | 451 | 260,1     |
|                                                                                        | 2 No                                                                               | 77  | 290,81    |
|                                                                                        | Total                                                                              | 528 |           |

**Table 3. Kruskal Valli Test Results (Test Statistics)**

|             | Q15 During the week, what portion of your working time do you spend working remotely? |
|-------------|---------------------------------------------------------------------------------------|
| Chi-Square  | 4,012                                                                                 |
| df          | 1                                                                                     |
| Asymp. Sig. | 0,045                                                                                 |

a. Kruskal Wallis Test

b. Grouping Variable: Q24

According to the test results, a statistically significant relationship between the two variables was identified at the 0.05 level ( $p = 0.045$ ), thereby confirming **Hypothesis H2**. It was found that even individuals who work fully remotely and are well acquainted with the specific characteristics of remote work believe that they would be able to perform their assigned duties effectively if they worked remotely for 2.5 to 4 days per week. This finding is particularly noteworthy for employers, as it directly indicates the feasibility of transferring so-called office-based work into a more flexible environment, which in turn enables substantial cost reductions for both employers and employees.

As the research results demonstrate, different attitudes toward the remote work format, which is depend on the level of intensity of remote job. As the results of the study show is that intensity of remote work has high influence between respondents' perception of advantages and disadvantages of it. The worst disadvantage perceived by fully remote workers is that they cant separate working and non-working hours from each other, but the most attractive advantage is the ability to work from any location. For partially remote workers, the most prominent disadvantage is reduced interaction with colleagues, whereas the primary advantage is a flexible work schedule.

Furthermore, the findings indicate that partially remote workers are more satisfied with their jobs than fully remote workers. It is not a surprise that personnel members who are partially remote have possibilities to maintain better balance of work and private life. With regard to the effectiveness of remote work, the study confirms that even respondents who work remotely five days per week consider it possible to fully perform their job responsibilities under conditions of remote work ranging from a minimum of 2.5 days (half of a working week) to a maximum of four days per week.

### Conclusion

To summarize this study it is necessary to notice that the work has various dimensions. It can describe and approve that occupational positions have significant influence on the perception of job satisfaction. The intensity of remote work varies depend on the occupation positions as well. it should be noted that in general, remote work in the insurance business industry in Georgia is perceived positively. Employees perceive fully remote work little bit difficult due to its challenges. But it should be noted that it is challenge for low level specialists. The main challenges they face are separation problems between working and non-working hours, stress for less communication, isolation, the worst chance for career advancement.

According to the research partial remote job can be consider as the most effective, attractive and convenient model for employees. Personnel members who work three or four days in a week, show the highest level of satisfaction. They indicate the best work-life balance and believe that they have good



opportunities to get career success. Employees who are partially remote have more autonomy throughout decision making process, which is important factor of higher level of job satisfaction.

There are some Georgian insurance companies who are adopting hybrid working conditions for their employees only for the reason to reduce some stress factors which are faced in front of fully remote workers. But the research has revealed that employees who are working fully remotely showing that they believe that they can accomplish their duties fully remotely.

The study suggest that Georgian insurance companies can establish strategies for remote work according to position and the personnel type of the employee. There are different characters and some of them like remote work and some of them prefer to work from the office and have intensive relationship with their colleagues. Such approaches can help maximize the benefits of remote work while minimizing its disadvantages, ultimately contributing to more sustainable and employee-centered work environments.

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## *Technical sciences*

### MARKETING STRATEGIES AND BRAND MECHANISMS FOR CREATING CONSUMER VALUE IN THE DIGITAL AGE

*Fatima Seyfullayeva Gagamali*

*Master's student (MBA in Marketing) of the Azerbaijan State University of Economics (UNEC)*

#### **Abstract**

*In recent years, the rapid development of digital technologies, the widespread use of internet platforms, and changes in consumer behavior have led to fundamental transformations in the structure and implementation of marketing activities. While traditional marketing approaches were primarily based on product functionality, mass communication, and sales-oriented strategies, marketing in the digital era has become more consumer-focused, interactive, personalized, and value-based. Modern consumers no longer place emphasis solely on the quality of a product or service, but also on the experience they gain through interaction with a brand, emotional attachment, and the brand image formed in a social environment.*

*The main objective of this article is to examine the impact of marketing strategies applied in the digital era on the formation and development of consumer value from a theoretical perspective. The study included a comprehensive analysis of key digital marketing strategies, such as personalized marketing, social media marketing, and content marketing. Drawing on scientific literature, we explain the mechanisms by which these strategies influence consumer behavior, their role in shaping the functional, emotional, and social components of perceived value, and their contribution to brand loyalty.*

*The study is methodologically based on a systematic analysis of existing academic literature and was conducted within a theoretical framework. The findings demonstrate that digital marketing strategies enable brands to more accurately identify individual consumer needs and expectations and build long-term, mutually beneficial relationships with them. Specifically, personalized communications and value-oriented content strengthen the consumer's emotional connection with the brand, creating the conditions for long-term brand loyalty.*

*The article's findings demonstrate that the effective and strategic implementation of digital marketing strategies is essential for brands not only in terms of short-term sales growth but also in achieving a sustainable competitive advantage and a strong market position. In this regard, value-focused digital marketing approaches can be considered a relevant and promising research direction for modern marketing theory and practice.*

**Keywords:** *digital marketing, customer value, personalized marketing, social media marketing, content marketing, brand loyalty, consumer behavior.*

#### **1. Introduction**

*Accelerating globalization and the rapid development of digital technologies have led to fundamental changes in the structure of modern economic relations and, in particular, marketing activities. The internet, mobile technologies, and social media platforms have become an integral part of everyday life and have radically altered the way consumers obtain information, evaluate products, and make purchasing decisions. The modern consumer is no longer a passive recipient of information, but an active subject who researches, compares, and interacts with brands (Kotler, Kartajaya & Setiawan, 2017).*

*The reduction in barriers to entry in the digital environment has further intensified competition and forced brands to focus on differentiation strategies. While traditional marketing approaches emphasized product functionality and price advantages, in the modern era, customer experience, emotional connection, and perceived value have become the primary drivers of competitive advantage (Lemon & Verhoef, 2016). These changes have created the conditions for marketing to emerge not only as a sales-oriented activity but also as a strategic mechanism for value creation.*

*The concept of customer value lies at the core of modern marketing theory and is defined as a subjective evaluation formed by comparing the overall benefit a consumer receives from a product or service with the costs incurred (Zeithaml, 1988). This value is not limited to functional advantages but also includes emotional, social, and psychological components. Digital marketing strategies enable brands to apply personalized approaches, analyze consumer behavior, and establish continuous communication with them to create this multidimensional value.*

*In particular, digital strategies such as personalized marketing, social media marketing, and content marketing foster trust and brand loyalty by enhancing consumer engagement with the brand. Research shows that positive experiences created at every consumer touchpoint have a direct impact on increasing overall brand value (Lemon & Verhoef, 2016). In this regard, research into the mechanisms of customer value creation within digital marketing strategies is relevant from both theoretical and practical perspectives. The main goal of this article is to analyze marketing strategies applied in the digital era from a theoretical perspective and systematically explore the mechanisms by which brands create consumer value. The goal of this analysis is to demonstrate that digital marketing is not simply a set of communication tools, but a strategic approach that creates a sustainable competitive advantage.*

## **2. Methodology**

*This article is based on a qualitative and theoretical research methodology. The primary objective of the study is to explain the influence of marketing strategies on the mechanisms of brand value creation in the digital age through a systematic analysis of existing scientific theories and academic research, rather than empirical measurements. This approach is considered a widely used method for understanding the conceptual foundations of marketing science and synthesizing existing theoretical models (Saunders, Lewis & Thornhill, 2019).*

*Secondary data sources were used in the study. These sources primarily include academic books by renowned marketing scholars, articles published in reputable scientific journals, and theoretical studies of consumer behavior. Research based on secondary data is widely used, especially in theoretical articles, as it allows for a systematization of the theoretical foundations of the subject and a comparative analysis of various scientific views (Bryman & Bell, 2015).*

*The study primarily utilized analytical and comparative methods. The impact of digital marketing strategies—specifically, personalized marketing, social media marketing, and content marketing—on the formation of customer value was examined using an analytical method. In this phase, the concept of customer value was interpreted based on the theoretical model proposed by Zeithaml (1988), and the functional, emotional, and social components of value were analyzed. This approach is based on scientific research proving that consumer purchasing decisions are not only rational but also shaped by psychological factors.*

*A comparative method was used to identify the key differences between traditional and digital marketing. Within the framework of the "Marketing 4.0" concept proposed by Kotler, Kartajaya, and Setiawan (2017), the shift in traditional marketing from a product-centric structure to a consumer-centric and value-oriented approach was explained. This comparison allowed for the scientific demonstration that digital marketing enables brands to build closer and more sustainable relationships with consumers.*

*Furthermore, the study utilized content analysis. Using content analysis, we explored the mechanisms by which social media and content marketing strategies influence consumer behavior. Based on Lemon and Verhoef's (2016) customer experience model, the analysis demonstrates that each digital touchpoint between a consumer and a brand plays a significant role in shaping perceived value. This conclusion is based on scientific research demonstrating that customer value is a dynamic and multi-stage process.*

*Thus, although the methodological approach used is theoretical, it allows us to explain the mechanisms by which customer value is created through digital marketing strategies in a systematic and scientific manner. This methodology allows the obtained results to be used as a conceptual foundation for both academic research and practical marketing activities.*

## **3. Limitations of the study**

*This study has certain methodological and practical limitations due to its theoretical nature. Because the study is based on a systematic review of existing scientific literature rather than empirical data, the findings are not supported by statistical measurements or the results of field research conducted with specific consumer groups. While the primary benefit of theoretical research is to synthesize existing knowledge and create a conceptual framework, this approach offers limited capabilities in terms of measuring actual market behavior (Saunders, Lewis & Thornhill, 2019). For this reason, the findings presented in this article are more general and conceptual in nature.*

*Another important limitation relates to the secondary nature of the data sources used. Because the academic sources used in the study are based on research conducted at different times and in different market conditions, the full relevance of these findings to contemporary and specific market conditions may be relative. Bryman and Bell (2015) note that in studies based on secondary data, there may*

be differences between the purpose of data collection and the researcher's objective, requiring a cautious approach to interpretation.

Another limitation of the study is the multifaceted and dynamic nature of digital marketing strategies. The concept of digital marketing encompasses a wide range of tools, such as social media marketing, search engine marketing, performance marketing, artificial intelligence-based marketing, and automated communication systems. This article focuses on personalized marketing, social media marketing, and content marketing to maintain a manageable analytical framework. As a result, the role of other digital tools in the process of creating customer value was not analyzed in detail, which is one of the factors limiting the scope of the study (Kotler, Kartajaya & Setiawan, 2017). Furthermore, the subjective and multidimensional nature of the concept of customer value is another factor limiting the study. Zeithaml (1988) explains customer value as a concept formed based on individual consumer perceptions. This means that measuring and generalizing customer value may yield different results in different social, cultural, and economic contexts. Although these differences are noted in the article at a theoretical level, these variations were not confirmed by empirical measurements due to the lack of empirical measurements.

Another limitation is that the literature used is primarily based on international sources. Most of the studies used in the paper were conducted in developed countries with market economies, and directly applying these results to the characteristics of developing countries, including local markets, requires a certain cautious approach. As Lemon and Verhoef (2016) emphasize, consumer experience and value perception are closely linked to market structure and cultural factors. This may limit the applicability of the study's findings to the local context.

Finally, the rapid pace of digital technology development also creates time constraints for research. Because digital marketing strategies are changing dynamically, the theoretical approaches presented in this article may require updating in the future due to the impact of new technological trends. This factor is considered a general methodological limitation, indicating the risk of theoretical research losing its relevance over time (Saunders et al., 2019).

#### **4. Promising research directions**

The theoretical nature of this study opens up broad and multifaceted possibilities for future research. First and foremost, future research would be well-advised to examine the tangible and measurable effects of digital marketing strategies on customer value using empirical methods. Consumer responses to digital marketing activities can be more accurately measured using primary data collection methods such as surveys, interviews, and focus groups. Saunders, Lewis, and Thornhill (2019) emphasize that empirical methods are an important tool to complement theoretical research in identifying causal relationships in consumer behavior.

Future research could measure the relationship between digital marketing strategies and customer value using statistical analysis methods, including regression analysis, factor analysis, and structural equation models. In particular, separately measuring the functional, emotional, and social components of customer value could provide empirical validation of the theoretical model proposed by Zeithaml (1988). This approach would allow us to determine which value components consumers place greater emphasis on.

Furthermore, future research could yield important scientific insights by conducting cross-industry and cross-market comparative analyses. For example, comparing the digital marketing strategies of brands operating in the service and manufacturing sectors in terms of customer value creation could reveal the effectiveness of different strategies. Bryman and Bell (2015) note that comparative studies are an important method for identifying contextual differences and assessing the generalizability of theoretical findings.

Another important direction is to conduct in-depth research on consumer segments. Research literature highlights significant differences in the responses of different age groups, particularly Generation Z and Generation Y consumers, to digital marketing messages (Kotler, Kartajaya, & Setiawan, 2017). Future research could analyze the mechanisms of customer value creation separately based on demographic, psychographic, and behavioral segmentation criteria. This approach could make a practical contribution to the development of more effective targeting strategies for brands. Given the pace of technological development, future research should focus on the role of artificial intelligence, big data, and automated marketing systems in creating customer value. AI-based recommendation systems, chatbots, and predictive analytics tools contribute to increased perceived value by personalizing the customer experience. Lemon and Verhoef (2016) emphasize the strategic role of these technologies in value creation,



emphasizing that customer experiences are shaped at digital touchpoints. Future empirical research could measure the impact of these technologies on consumer satisfaction and brand loyalty.

At the same time, the influence of cultural and regional differences on customer value perceptions is also an important area for future research. Since most existing studies focus on developed markets, the perception of digital marketing strategies in developing countries has not yet been fully explored. In this regard, empirical research in local markets may be important to test the generalizability of existing theoretical models (Lemon and Verhoef, 2016). Finally, future research is recommended to examine the relationship between customer value, brand loyalty, and long-term financial performance. Empirical studies demonstrating that customer value has not only psychological but also economic consequences could more clearly reveal the true contribution of marketing strategies to business performance. This approach has both scientific and practical value for assessing the strategic significance of marketing activities.

### **5. Digital Marketing Strategies and Creating Consumer Value.**

One of the key benefits of digital marketing strategies is that they enable brands to build closer, more interactive, and more personalized relationships with consumers. While traditional marketing approaches rely on one-way communication, in the digital environment this process takes the form of interaction and continuous dialogue. This difference creates fundamental changes not only in the format of communication but also in the mechanisms for creating consumer value (Kotler, Kartajaya & Setiawan, 2017). Consumers no longer focus solely on the functional characteristics of a product or service; they also value the experience, emotional, and social value they receive through interaction with a brand.

With digital platforms, brands can collect extensive consumer information and analyze their individual behavior. Big data, analytics tools, and artificial intelligence-based marketing solutions enable them to more accurately identify consumer needs. This increases the effectiveness of personalized marketing strategies, as each consumer is presented with messages and offers tailored to their interests. This approach enhances perceived functional and emotional value for consumers and strengthens brand attachment (Lemon & Verhoef, 2016).

Social media marketing is one of the most effective elements of digital strategies and plays a significant role in developing the emotional and social components of consumer value. Social media platforms allow brands to directly communicate with users, collect their opinions, and respond in real time. This interaction allows consumers to feel a sense of belonging to the brand and build a social identity (Kaplan & Haenlein, 2010). For example, user reviews and experiences shared on social media serve as a source of trust and information for other potential consumers. As a result, social media marketing not only increases brand awareness but also strengthens the social and emotional layers of consumer value.

Content marketing is also considered a key component of digital marketing strategies. This strategy fosters long-term brand relationships by providing consumers with useful and valuable information that is not promotional in nature. Research shows that content marketing helps consumers perceive a brand not only as a product manufacturer but also as a trusted source of information. Pulizzi (2014) notes that effective content marketing attracts target audiences, builds long-term relationships, and enhances a brand's competitive advantage. This is especially important for consumers making informed decisions.

Digital marketing strategies not only enhance functional and emotional value but also comprehensively enrich the consumer experience. For example, digital advertising, push notifications, email campaigns, webinars, and interactive online games increase consumer engagement with a brand and improve decision-making (Chaffey & Ellis-Chadwick, 2019). As a result, all components of digital strategies have a multidimensional impact on creating consumer value and strengthening brands' market positions.

Therefore, the success of digital marketing strategies depends not only on the use of technology. Its effectiveness depends on adapting to consumer needs and expectations, building mutually beneficial relationships, and creating sustainable value. This approach not only provides brands with short-term sales growth but also builds long-term brand loyalty, market advantage, and sustainable competitiveness (Kotler et al., 2017; Lemon & Verhoef, 2016).

#### **1) Personalized Marketing and Consumer Value**

Personalized marketing strategies are considered one of the most fundamental and strategic components of modern digital marketing. This approach involves delivering messages and offers tailored to each consumer, taking into account their individual behavior, purchasing history, interests and priorities, demographic and psychographic characteristics (Kotler, Kartajaya & Setiawan, 2017). Personalization is not limited to product recommendations; it applies to all digital touchpoints, such as email newsletters, push notifications, social media advertising, and personalized website user experience design. Big data, analytics tools, and artificial intelligence-based technologies enable brands to deeply and systematically

analyze consumer behavior (Wedel & Kannan, 2016). This approach enables them to assess consumer interests, their shopping habits, time spent on the site, and interactive behavior, and present them with personalized and contextual content. For example, e-commerce platforms can provide customers with special discounts or recommend products based on their previous purchases and browsing history. This process is not only focused on sales but also enriches the user experience, making the relationship with the brand more meaningful.

Scientific research shows that personalized marketing plays an effective role in enhancing functional, emotional, and social value. When consumers encounter messages tailored and personalized to them, they perceive the relationship with the brand as more useful and trustworthy (Lemon & Verhoef, 2016). Functional value is associated with offers that more effectively address consumer needs and problems. Emotional value is associated with the emotional attachment and satisfaction the user feels toward the brand. Social value ensures the dissemination of personalized messages among other users and the formation of a social identity (Vargo & Lusch, 2008).

Zeithaml (1988) defines consumer value as "a subjective comparison between the benefits received by the consumer and the costs incurred." Personalized marketing shifts this balance in favor of the consumer, enhancing both material and psychological value. This approach simplifies the decision-making process, reduces time and resource waste, and strengthens consumer trust in the product and brand (Schiffman & Wisenblit, 2019).

From a practical perspective, the use of personalized marketing not only increases customer satisfaction with brands but also creates the conditions for long-term loyalty and market share. For example, platforms like Amazon and Netflix analyze users' personal data and link them to more valuable products and services. As a result, consumers engage more with the brand, maximize the benefits they receive from products and services, and strengthen the brand's competitive advantage in the market (Chaffey & Ellis-Chadwick, 2019).

Thus, personalized marketing is not only a sales tool but also a crucial mechanism for strategically enhancing consumer value. Its effective implementation deepens the relationship established with the brand, satisfying the consumer's functional, emotional, and social needs, ensuring long-term brand loyalty and market advantage.

## **2) Social media marketing and emotional-social content.**

Social media marketing is considered one of the most effective and dynamic components of modern digital marketing strategies. This approach allows brands to engage with consumers, collect their opinions, and respond in real time. While traditional marketing interactions are limited, often one-sided, and based on statistical measurements, social media platforms provide brands with the opportunity for two-way dialogue and dynamic feedback (Kaplan & Haenlein, 2010). This creates the conditions for a closer and more emotional connection between consumers and brands.

Social media marketing plays a vital role in developing not only the functional but also the emotional and social components of consumer value. Emotional value is measured by the satisfaction, trust, and moral commitment users experience in their relationship with the brand. Active brand engagement on social media, immediate response to user questions, and recognition of the content they share strengthen consumers' emotional attachment to the brand (Lemon & Verhoef, 2016). For example, if a brand improves its product or service based on a user's complaint or suggestion, the user feels the brand cares about their needs, leading to increased emotional value.

Social value, on the other hand, is associated with the user's social connections to the brand and their feelings of acceptance in the eyes of others. Sharing opinions and recommendations on social media platforms influences the decisions of other users and increases public trust in the brand (Tiago & Veríssimo, 2014). Consumers strengthen their social identity by choosing brands that are socially accepted and recommended by other users. Thus, social media marketing serves the function of creating social influence and collective value not only for individual consumers but also through social media.

Research shows that brands that actively and genuinely communicate on social media are perceived by consumers as more trustworthy, transparent, and relatable (Kaplan & Haenlein, 2010; Tuten & Solomon, 2018). Brand stories, user reviews, and social media posts enhance consumers' emotional and social engagement, fostering brand loyalty. Case studies show that global brands such as Nike, Starbucks, and Coca-Cola enhance both emotional engagement and social value by implementing interactive social media campaigns, resulting in increased sales and brand equity. Thus, social media marketing is viewed not only as a digital strategy tool but also as a strategic tool for multidimensional consumer value creation and long-term brand relationships. This approach enhances value on both the individual and

collective levels, deepens consumer engagement with the brand, and strengthens the brand's position in the competitive landscape.

### 3) **Content Marketing and Creating Long-Term Value**

Content marketing is considered one of the most strategic and long-term components of modern digital marketing strategies. This approach involves providing consumers with non-promotional, useful, educational, and engaging content (Pulizzi, 2014). The goal is not only to promote products and services but also to create value for consumers and engage them in building long-term, mutually beneficial relationships with the brand.

Blogs, videos, educational materials, interactive articles, social media posts, and e-books provided as part of content marketing increase consumer knowledge and awareness, and build brand trust. This approach leads consumers to perceive the brand not only as a provider of goods or services but also as a reliable and valuable source of information (Chaffey & Ellis-Chadwick, 2019).

As emphasized in the academic literature, content marketing plays a direct role in creating long-term value. Useful content encourages consumers to make brand-related decisions, enriches their experience with products and services, and creates an emotional connection with the brand (Lemon & Verhoef, 2016). One of the most important benefits of content marketing is increased consumer engagement. For example, interactive blog posts and webinars allow users to gain a deeper understanding of brand values, personalize the user experience by providing additional resources tailored to their interests, and enhance functional value.

Pulizzi (2014) defines content marketing as "the process of attracting and retaining target audiences through valuable and relevant content." This approach allows brands to gain an advantage in a competitive environment and maintain a sustainable market position. Over the long term, consumer trust and commitment to a brand leads to brand loyalty. This ultimately contributes to stabilizing sales, the effectiveness of customer retention strategies, and increased brand equity (Kotler, Kartajaya & Setiawan, 2017).

Case studies show that global brands like Netflix, HubSpot, and Red Bull not only promote their products through content marketing but also create long-term engagement by providing users with useful, educational, and entertaining content. For example, Red Bull's sports and adventure videos not only enhance brand equity but also expand opportunities for social sharing and foster a sense of community. Thus, content marketing demonstrates that digital strategies are a strategic tool for creating long-term consumer value and building strong brand relationships, not just for short-term sales results. Effective implementation enhances the functional, emotional, and social value of a brand, strengthens mutually beneficial relationships with consumers, and enhances the brand's market position.

**Table 1. Impact of digital marketing strategies on customer value.**

| Digital Marketing Strategy | Type of value created          | Scientific basis                         |
|----------------------------|--------------------------------|------------------------------------------|
| Personalized Marketing     | Functional and emotional value | Zeytaml (1988); Limon and Verkhov (2016) |
| Social Media Marketing     | Emotional and social value     | Kaplan and Hanlein (2010)                |
| Content Marketing          | Trust and long-term value      | Pulizzi (2014)                           |

Source: compiled by the author based on available scientific literature.

### 6. **Conclusion**

The evolution of marketing strategies in the digital age has radically changed the way brands interact with consumers and given new meaning to the concept of creating customer value. While traditional marketing approaches focus on product functionality and increasing sales, the concept of value in the digital marketing environment has become broader and more multidimensional. In this context, customer value is shaped not only by the price-performance ratio but also by the consumer experience, emotional attachment, and social interaction (Zeithaml, 1988).

Research findings show that personalized marketing strategies significantly enhance the functional and emotional value perceived by consumers. Offers presented to consumers according to their interests and needs facilitate decision-making, increase satisfaction, and improve the quality of brand relationships. As Lemon and Verhoef (2016) emphasize, in today's marketing environment, consumer experiences are formed across various digital touchpoints, and effective management of these touchpoints ensures the sustainability of customer value. Social media marketing plays a key role in shaping the emotional and social components of consumer value. Active brand engagement on social media creates conditions for two-way communication with consumers, fostering an atmosphere of trust and strengthening brand identity. Kaplan and Haenlein (2010) note that social media is an important communication tool in shaping consumer perceptions of brands. The sense of community created by



these platforms strengthens consumers' emotional attachment to the brand and lays the foundation for long-term brand loyalty.

Content marketing, on the other hand, is a key strategy for building long-term consumer value. Useful, educational, and value-creating content encourages consumers to perceive the brand not only as a product manufacturer but also as a trusted source of information. Pulizzi (2014) emphasizes that the primary goal of content marketing is to build long-term relationships with consumers, which plays a significant role in helping brands gain a competitive advantage. Overall, the study's findings demonstrate that digital marketing strategies are not simply tools focused on short-term sales results but also strategic mechanisms for fostering long-term relationships based on mutual value exchange between consumers and brands. Effective implementation of these strategies enables brands to establish a sustainable competitive position, strengthen consumer loyalty, and increase market value (Kotler, Kartajaya, & Setiawan, 2017). In conclusion, digital marketing success depends more on the use of technological tools than on their integration with the goal of creating consumer value. A consumer-focused, values-based, and ethical marketing approach is essential for the long-term development of brands in the modern era. In this regard, strategic planning and the continuous improvement of digital marketing strategies remain a relevant and important topic from both academic and practical perspectives.

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## AN ALGORITHM FOR DETERMINING FEATURE SIGNIFICANCE BASED ON ASSESSING GLOBAL AND LOCAL PROPERTIES

**Muhamediyeva Dilnoz Tulkunovna**

*"Tashkent institute of irrigation and agricultural mechanization engineers" national research university*

**Rustamov Erbol Nasimovich**

*"Tashkent institute of irrigation and agricultural mechanization engineers" national research university*

**Tagayev Farhad Abduvahabovich**

*"Tashkent institute of irrigation and agricultural mechanization engineers" national research university*

### **Abstract**

*This article examines the problem of identifying significant features in multivariate data and constructing an interpretable risk prediction algorithm. The study utilizes correlation analysis as a tool for identifying hidden relationships between features. To assess the informative value of each feature, the Pearson correlation coefficient is used, forming a vector of pairwise correlations. An integral indicator is then introduced, characterizing the overall contribution of each feature to all correlation interactions in the system. The proposed approach allows for determining the global significance of features without relying on a priori expert assessments. Based on the two most informative features, a simple relative indicator representing their ratio is constructed. Using the threshold value of this indicator, a binary risk prediction algorithm is implemented. The proposed method is characterized by its computational simplicity, transparency, and highly interpretable results. The obtained conclusions demonstrate the potential of this approach for medical diagnostics, disease recurrence risk assessment, and intelligent decision support systems.*

**Keywords:** *correlation analysis, feature significance, multivariate data, risk prediction, intelligent decision making*

### **1. Introduction**

*Modern data analysis systems, particularly in fields such as medicine, bioinformatics, and diagnostics of complex processes, operate with multivariate sets of features. Each observed object is typically described by a significant number of parameters, some of which may be uninformative or redundant. Therefore, one of the key tasks is to identify the most significant features that have a decisive influence on the final decision [1-3]. Traditional data analysis methods often rely on either expert feature selection or the use of complex machine learning models that require large training samples and have poor interpretability. In the context of medical and expert systems, such approaches are not always feasible, as they require high computational complexity and do not allow for a clear explanation of the decision-making mechanism. Correlation analysis is one of the fundamental statistical methods for studying the relationships between variables. The Pearson correlation coefficient allows for a quantitative assessment of the degree of linear dependence between features and the identification of structural patterns in the data. However, most existing approaches are limited to analyzing individual pairs of features, without considering their combined impact on the system as a whole [4-5].*

*This paper proposes a method for assessing the significance of features based on their combined contribution to correlations. This is accomplished by calculating a correlation matrix, which is used to generate an integrated indicator reflecting the global role of each feature in the system. This approach allows for the consideration of a feature not in isolation, but as an element of a complex interconnected structure. In the next step, the two most significant features are identified from a set of parameters, and a relative indicator is introduced based on these indicators, representing the ratio of the values of the selected features. The use of relative indicators is widely used in medical practice, as it allows for the mitigation of large-scale differences and increases the robustness of diagnostic criteria. A threshold value is introduced in the study; exceeding this threshold is interpreted as the presence of risk [6-9].*

*The advantages of the proposed algorithm are its simplicity, statistical validity, and high interpretability. Visualization of the correlation structure of the data, the distribution of key features, and the dynamics of the relative indicator allows not only for a quantitative risk assessment but also for a qualitative analysis of system behavior. The presented approach can be effectively used in intelligent decision*

support systems, medical diagnostic applications, and preliminary risk analysis tasks, particularly in conditions of limited data volumes and the need for explainable models [10-14].

The scientific novelty of this study lies in the development and substantiation of an integrated approach to assessing the significance of features in multivariate data. This approach is based not on a local analysis of individual correlations, but on considering the cumulative role of each feature in the entire system of relationships. Unlike traditional methods of correlation analysis, which focus on identifying individual strong correlations, this paper proposes the formation of a vector of generalized correlation activity, allowing for the quantitative characterization of the global role of each feature. This approach provides a more holistic view of the data structure and identifies features with a system-forming influence, even in the absence of extremely high pairwise correlation coefficients. The novelty also lies in the method for selecting diagnostically significant features without the use of a priori expert weights and complex optimization procedures. The proposed algorithm is based solely on the statistical properties of the data and therefore exhibits high versatility and reproducibility. An additional element of scientific novelty is the use of a relative indicator, formed as the ratio of the two most significant features, as a simple and interpretable risk prediction criterion. This combination of correlational integral analysis and relative indices expands the capabilities of classical statistical methods and forms the basis for constructing explainable predictive models [15-18].

The practical significance of the obtained results is determined by the applicability of the proposed algorithm to real-world problems of analyzing and predicting the state of complex systems, primarily in medical diagnostics. The developed approach enables the identification of the most informative features at an early stage of data processing, significantly reducing the dimensionality of the original space and mitigating the impact of noisy or redundant parameters. This is especially important in the context of limited samples, typical of clinical studies, where the use of complex machine learning models may be difficult or impractical. The risk prediction algorithm based on a relative indicator is computationally simple and does not require labor-intensive model training, allowing it to be integrated into software packages supporting medical decision-making and diagnostic information systems. The highly interpretable nature of the results facilitates their use by practitioners, as it allows not only for formal conclusions but also for understanding the reasons for classifying a patient as a risk group. Furthermore, the proposed approach can be adapted for data analysis in other applied fields, including biomedical engineering, economics, and technical diagnostics, expanding its range of practical applications and confirming its versatility [19-23].

## 2. Methods

During the study, a multidimensional observation table  $T$  was generated, consisting of 130 objects and 8 features ( $\delta_1$ – $\delta_8$ ), the values of which were normalized and fell within the interval  $[0; 1]$ . A preliminary analysis revealed the absence of missing data and a homogeneous feature distribution, which allowed for the correct application of correlation analysis methods.

In the next step, a correlation matrix of features was calculated using Pearson's coefficient. The obtained correlation coefficients ranged primarily from -0.11 to 0.16, indicating weak linear relationships between most feature pairs. However, a number of pairs demonstrated relatively more pronounced dependencies. The highest positive correlation is observed between features  $\delta_7$  and  $\delta_8$  ( $r = 0.160$ ), as well as between  $\delta_3$  and  $\delta_8$  ( $r = 0.122$ ),  $\delta_1$  and  $\delta_6$  ( $r = 0.112$ ), and  $\delta_4$  and  $\delta_5$  ( $r = 0.111$ ). These results indicate the presence of local structural relationships within the feature system.

For a more detailed assessment of the role of individual features, a vector  $R_1$  was formed, containing the absolute values of pairwise correlations for all feature combinations. Analysis of the vector  $R_1$  revealed that feature  $\delta_8$  is included in several pairs with the highest correlation values, indicating its active participation in the system of interfeature relationships.

Next, the vector  $R_2$  was calculated, characterizing the total degree of participation of each feature in all correlations. The highest  $R_2$  value was obtained for the  $\delta_8$  parameter (0.520976), with the second highest for  $\delta_2$  (0.484941). The  $\delta_1$  and  $\delta_3$  parameters demonstrated slightly lower but comparable values. This allows us to conclude that the  $\delta_8$  parameter is the most informative in the system under consideration, while  $\delta_2$  is the second most influential.

Based on the  $R_2$  vector results, the two most significant parameters— $\delta_8$  and  $\delta_2$ —were selected to construct a predictive model. The ratio of these parameter values ( $\delta_8/\delta_2$ ) was used as a simple predictive indicator. A threshold parameter of  $Q = 1$  was introduced, allowing us to divide objects into two groups: those with a normal condition and those with a risk of relapse. An analysis of the  $\delta_8/\delta_2$  ratio revealed that values below the threshold predict no risk of relapse, while values above the threshold indicate an

increased risk. The study sample identified objects for which the  $\delta_8/\delta_2$  ratio significantly exceeds unity (e.g., values of 1.8–4.9), clearly placing them in the risk group.

These results demonstrate that even with weak pairwise correlations between features, it is possible to identify the most significant characteristics due to their integral contribution to the system. The proposed approach provides an interpretable and computationally simple mechanism for preliminary prediction, which can be used in medical diagnostics and decision support.

### 3. Results

The study results are visualized in three graphs, each reflecting key stages of data analysis and predictive model construction.

The first graph shows the feature correlation matrix as a heat map. The color scale reflects the magnitude and sign of the Pearson correlation coefficient between pairs of features  $\delta_1$ – $\delta_8$ . The predominance of color shades close to neutral confirms the weak linear relationships between most features. At the same time, localized areas of increased correlation are visually distinguished, particularly between features  $\delta_7$  and  $\delta_8$ ,  $\delta_3$  and  $\delta_8$ , indicating the presence of structural relationships within the feature system (Fig. 1).

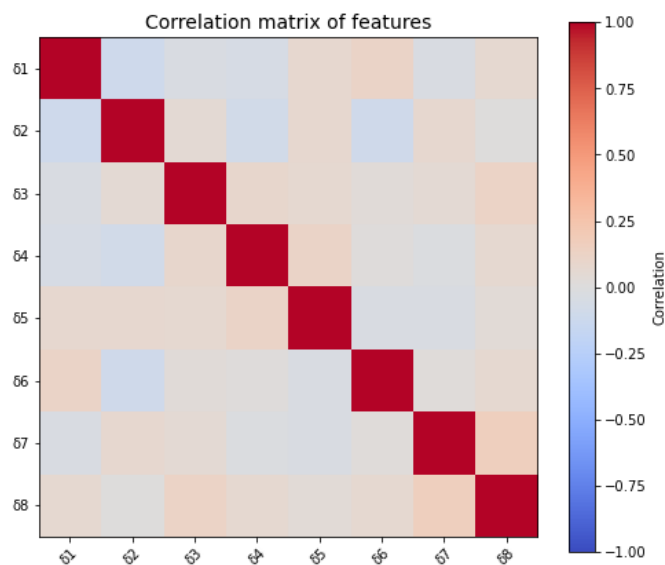


Fig. 1. Feature Correlation Matrix

The second graph is a scatterplot of the two most significant features,  $\delta_8$  and  $\delta_2$ . Each point on the graph corresponds to a separate observation. The diagram allows for a visual assessment of the distribution of objects in the feature space and the identification of instances where the  $\delta_8/\delta_2$  value sharply exceeds the  $\delta_8/\delta_2$  value. Such points potentially correspond to objects with increased risk and are visually distinguished from the bulk of observations (Fig. 2).

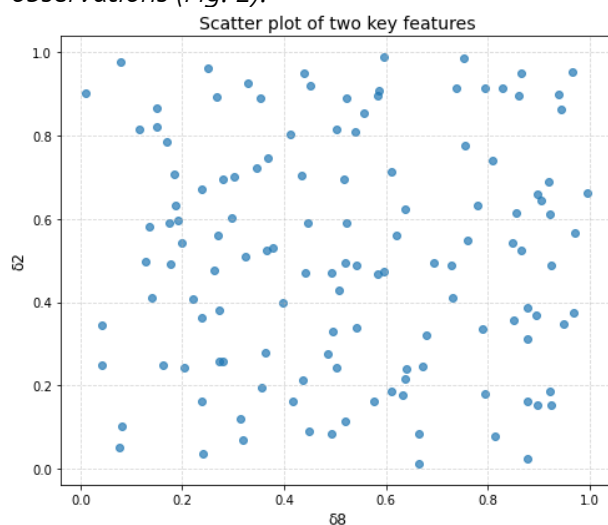


Fig. 2. Scatterplot of the two most significant features

The third graph reflects the dynamics of the  $\delta_8/\delta_2$  ratio for the entire set of objects. The graph also shows the threshold line  $Q = 1$ , used for classifying states. Individual peaks significantly exceeding the threshold are observed, indicating the presence of objects with significant deviations from the norm. This graph allows for visual tracking of transitions into the risk zone and simplifies the interpretation of forecast results.

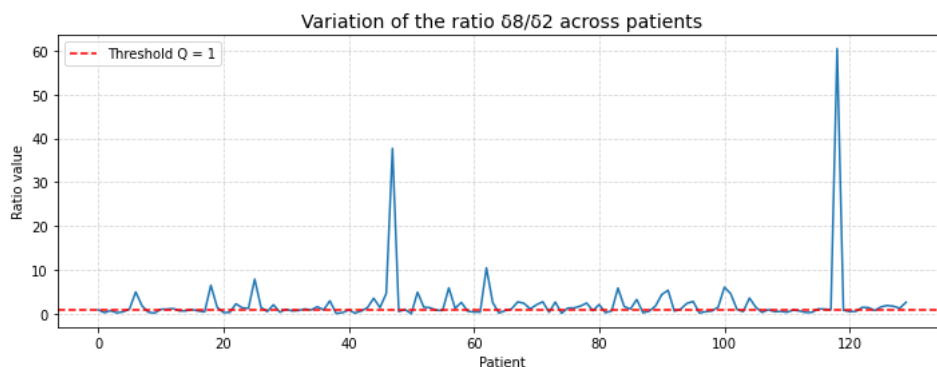


Fig. 3. Dynamics of the  $\delta_8/\delta_2$  ratio for the entire set of objects

The study confirmed that analyzing the correlation structure of features allows us to identify their relative significance even in the absence of strong linear relationships. Low pairwise correlation coefficients do not indicate a lack of informativeness of the features, but rather indicate the complex, multidimensional nature of the relationships within the system.

Using an integrated indicator of feature significance (vector  $R_2$ ), based on the total contribution to correlations, allowed us to objectively identify features  $\delta_8$  and  $\delta_2$  as the most influential. This confirms the advisability of abandoning the analysis of individual correlations in favor of a comprehensive assessment of the relationship structure.

The proposed predictive model, based on the relationship between the two most significant features, is characterized by simplicity and high interpretability. Unlike complex machine models, this approach allows for a simple explanation of the decision-making mechanism, which is especially important in medical and expert systems. However, it should be noted that the use of a fixed threshold value requires subsequent adaptation and validation on real clinical data. The results of visual analysis complement the numerical estimates and allow for an intuitive interpretation of the system's behavior. The graphs confirm the correctness of the key feature identification and clearly demonstrate the differences between normal and potentially risky conditions. In this paper, a multidimensional feature table was generated and analyzed, enabling a comprehensive correlation analysis of the data. It was established that  $\delta_8$  is the most informative feature in the system, while  $\delta_2$  is the second most important, as evidenced by the maximum values of the integral correlation index. A simple and interpretable predictive model is proposed, based on the relationship between two key features and a threshold classification rule. Visualization of the results in the form of a heat map, scatterplot, and dynamic graph provides a clear analysis of the data structure and the behavior of the predictive indicator. The obtained results demonstrate the feasibility of effective preliminary risk forecasting based on statistically sound and computationally simple methods, making the proposed approach promising for use in intelligent decision support systems.

#### 4. Discussion

The obtained results confirm the feasibility of using correlation analysis as a basic tool for assessing the significance of features in multivariate data. Analysis of the correlation matrix revealed that there were no clearly defined, extremely high correlation coefficients between individual features. However, taking all pairwise relationships into account collectively allowed us to identify features that systematically participate in a large number of relationships. This suggests that the informative value of a feature is not always determined by the presence of a single strong correlation, but rather by its role in the overall data structure. This conclusion is consistent with modern understanding of the complex nature of feature systems in medical and biological research.

The formation of an integral significance vector allowed us to rank features based on their influence on the system as a whole. Identifying the two most significant indicators and subsequently using their relative importance for prognostic purposes demonstrated that even simple statistical models can have high diagnostic value. It should be noted, however, that the chosen classification threshold is fixed and does not adapt to individual data distribution characteristics, which in certain cases may lead to borderline or ambiguous results. This aspect highlights the need for further research aimed at adaptively adjusting threshold values.



Furthermore, the use of Pearson's linear correlation assumes the presence of linear relationships between features. Real clinical data may contain nonlinear and complex interactions that are not fully reflected by this method. Nevertheless, despite these limitations, the analysis shows that the proposed approach is sufficiently robust and informative at the initial analysis and preliminary risk prediction stage, especially in conditions of limited sample size and the need for highly interpretable results.

### 5. Conclusion

In this paper, we propose and implement an algorithm for determining the significance of features based on correlation analysis and their integrated assessment, and also develop a simple and interpretable risk prediction model based on a relative indicator. The analysis showed that considering the combined contribution of features in all correlations allows us to identify the most informative indicators even in the absence of significant pairwise correlations. This confirms the effectiveness of a systems approach to multivariate data analysis. Based on the obtained results, it is demonstrated that using the ratio of the two most significant features can serve as a practical tool for assessing risk conditions. The proposed method does not require complex computational procedures, has transparent logic, and can be easily implemented in applied information systems. Overall, the study demonstrates that the combination of classical statistical methods with integrated feature selection criteria is a promising approach for constructing reliable and explainable models of analysis and forecasting in medical diagnostics and other applied areas.

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## SOFTWARE IMPLEMENTATION AND EXPERIMENTAL STUDY OF AN INTELLIGENT SYSTEM

**Rustamov Erbol Nasimovich**

*"Tashkent institute of irrigation and agricultural mechanization engineers" national research university*

**Muhamediyeva Dilnoz Tulkunovna**

*"Tashkent institute of irrigation and agricultural mechanization engineers" national research university*

### **Abstract**

*This paper examines the software implementation of an intelligent information system based on a production knowledge representation, as well as the results of experimental validation of the developed algorithms. The architecture of a software package that supports the full data processing cycle—from generating an information model to making decisions based on a knowledge base—is described. Methods for data processing, constructing production knowledge, and its use in classification problems are presented. It is demonstrated that the implemented system is robust, interpretable, and suitable for use in applied decision support tasks.*

**Keywords:** *Software implementation, intelligent system, production knowledge, experimental study, knowledge base, classification, data processing.*

### **1. Introduction**

*The practical significance of intelligent information systems is determined not only by the validity of theoretical models and algorithms but also by the feasibility of their software implementation and implementation in real-world applications. Therefore, the final stage of the study is the development of a software package and experimental verification of its functionality.*

*This work focuses on the software implementation of the algorithms discussed in the previous chapters and the evaluation of the effectiveness of the intelligent system in data processing and decision making. The primary focus is on the architecture of the software package, the implementation of modules for generating an information model, constructing production knowledge, and applying classification algorithms.*

*The relevance of this work stems from the need to confirm the practical applicability of the developed methods. Without experimental verification, theoretical results cannot be considered complete and do not provide a basis for implementing the intelligent system in real-world processes. The purpose of this chapter is to describe the software implementation of the intelligent system and analyze the results of computational experiments confirming its effectiveness and stability.*

### **2. Methods**

*The software implementation utilizes a modular architectural approach, separating the functionality of the intelligent system into logically independent components. The main modules are the data processing module, the information model generation module, the knowledge base construction module, and the decision-making module. The admissible table method is used to process the primary data, allowing the properties of domain objects to be represented in a formalized form. This method normalizes and structures data, ensuring its consistency and suitability for further processing.*

*To identify relationships between features, a correlation analysis algorithm is implemented, which calculates global and local feature characteristics. To account for data dynamics, a sliding window method is used to analyze feature changes over time. Production knowledge is generated using a fractal knowledge organization algorithm, in which production rules are structured hierarchically. To solve classification problems, a proximity function matching algorithm is used, ensuring interpretable decision making. An experimental evaluation of the system is conducted by analyzing the classification accuracy, the robustness of the results, and the computational efficiency of the algorithms. The large volume of accumulated data and information and the rapid influx of new information place increasingly stringent demands on modern information systems (IS), which prove insufficient to effectively support scientific and industrial activities. This is primarily due to the fact that in existing IS, data is presented as text documents or information resources. Naturally, for humans, the most natural form of presenting information is as a network of interconnected information, i.e., as knowledge. Solving this problem requires a transition to a qualitatively new level of information representation and processing—the semantic level—that will allow for the meaning (content) of documents to be taken into account, extracting relevant related*

information from them. The means of representing and interpreting information as interconnected information could be provided by an intelligent information system (IIS), utilizing both general knowledge about the world and knowledge about the subject area (DA) it serves. Currently, such knowledge is represented as an ontology of production knowledge, which is increasingly used not only to describe the semantics of documents and information resources but also in the construction of a wide range of IIS.

### 3. Results

As a result of the software implementation, an intelligent software package was created that enables the automated transition from data to production knowledge. The implemented system successfully generates an information model of the subject area and, based on it, builds a production knowledge base. Experimental studies have shown that the use of global and local feature properties improves classification accuracy compared to basic methods that do not consider feature semantics. The use of a sliding window allowed us to identify stable patterns in dynamic data.

It has been shown that the fractal structure of the production knowledge helps reduce knowledge base redundancy and simplifies its expansion. The classification algorithms demonstrate resilience to noisy and partially incomplete data. Furthermore, the system ensures interpretability of results due to the ability to analyze the triggered production rules, which is an important advantage for practical applications.

The purpose of selecting an athlete for the SVD is to bring the strength characteristics of specific muscle groups (during sports training) as close as possible to the characteristics of one of the "reference" classes. However, none of these classes, conventionally termed "standard," can be considered a priority or the best in the hierarchy of athlete speed-strength training levels. Firstly, each class includes highly skilled athletes who have achieved high athletic performance in high-level judo competitions. Secondly, this division into classes facilitates the identification and evaluation of the properties of dominant muscle groups in the speed-strength structure of the muscular system, which allows for the athlete's individuality to be expressed in solving motor problems when implementing technical and tactical skills in combat.

### 4. Discussion

The discussion of the obtained results confirms the feasibility of the chosen architectural and algorithmic solutions. Unlike monolithic systems, the modular architecture ensures the flexibility and extensibility of the software package. Experimental data show that formalizing the semantics of features and using production knowledge enable more robust results compared to purely statistical methods. This is especially important in conditions of limited training data. At the same time, limitations associated with increased computational costs with increasing the number of features and the size of the knowledge base were identified. This indicates the need for further optimization of the algorithms and the possible use of parallel computing. The discussion results also confirm the potential for integrating the developed system with other intelligent technologies, including hybrid and adaptive models.

### 5. Conclusion

This paper presents a software implementation of an intelligent information system based on a production representation of knowledge, and an experimental study was conducted. It is demonstrated that the implemented software suite supports the full cycle of intelligent data processing—from information model generation to decision making. The experimental results confirm the effectiveness, stability, and interpretability of the proposed algorithms. The developed system can be used in applied decision support tasks and serves as practical confirmation of its theoretical propositions. The obtained conclusions complete the study and provide a basis for the further development of intelligent systems focused on semantic knowledge processing.

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# CHALLENGING ISSUES OF DIGITALIZATION IN INDUSTRY, TAKING INTO ACCOUNT THE GOALS OF SUSTAINABLE DEVELOPMENT, IN THE DRYING OF DISPERSED MATERIALS IN A SUSPENDED BED

**Sazhin Victor**

*Doctor of Technical Sciences, Distinguished Professor, Director of the Fund,  
Russian investment and innovation Fund "Scientific Perspective",  
Moscow, Russian Federation*

## ПРОБЛЕМНЫЕ ВОПРОСЫ ЦИФРОВИЗАЦИИ В ПРОМЫШЛЕННОСТИ С УЧЁТОМ ЦЕЛЕЙ УСТОЙЧИВОГО РАЗВИТИЯ ПРИ ПРОВЕДЕНИИ СУШКИ ДИСПЕРСНЫХ МАТЕРИА- ЛОВ ВО ВЗВЕШЕННОМ СЛОЕ

**Сажин Виктор Борисович**

*доктор технических наук, профессор, академик, директор Фонда,  
Российский инвестиционно-инновационный Фонд «Научная Перспектива»,  
г. Москва, Российская Федерация*

### Abstract

*Global sanctions weaken Russia and hinder its ability to meet sustainable development goals and objectives, as well as contribute to climate adaptation and net-zero emissions. Given Russia's size and population, achieving global results without Russia's participation is impossible. The Russian Engineering Academy, which has the largest talent pool and is capable of providing comprehensive scientific and engineering support for production innovations, is recommended as the executor and coordinator of this work. It is proposed that improved drying process efficiency could significantly reduce man-made emissions from chemical plants without significant cost.*

### Аннотация

*Мировые санкции ослабляют Россию и мешают ей следовать целям и задачам устойчивого развития, а также вносить свой вклад в достижение климатической адаптации и чистых нулевых выбросов. Учитывая площадь России и её населённость, достижение глобальных результатов без участия России невозможно. В качестве исполнителя и координатора работ рекомендуется Российская инженерная академия, имеющая наибольший кадровый резерв, способный обеспечить полноценное научно-инженерное сопровождение новаций в производстве. Предложено за счёт повышения эффективности процессов сушки без существенных затрат обеспечить серьёзное снижение техногенных выбросов химических предприятий.*

**Keywords:** ecology, drying, hydrodynamics, fluidization, efficiency, exergy

**Ключевые слова:** экология, сушка, гидродинамика, псевдоожижение, эффективность, эксергия

*В обществе есть понимание того, что техногенную нагрузку на природу надо снижать даже в интересах нынешнего поколения людей, поэтому вопросы устойчивого развития, сводящиеся к формуле «обеспечить детям стартовые возможности для жизни не хуже тех, что имеешь сегодня сам» приобрели межнациональный характер и поддержаны всеми государствами планеты [1-2]. Однако, прямые социологические опросы в России свидетельствуют, что за исключением финансово мотивированных реакционных «защитников природы». (удовлетворяющих под флагом «зелёных» возрастную пассионарность незаконным перфомансом), широкую публику мало смущают неизбежные экологические риски при развитии космической программы или разработке новых изделий оборонной промышленности, ведь открывающиеся новые возможности перекрывают экономические затраты и возможный экологический ущерб [3]. Иное отношение к российским промышленным предприятиям. В условиях сбалансированной экономики потребитель заинтересован в доступной цене товара, а значит и в снижении себестоимости производства. Жёсткие требования в части промышленных выбросов и прогрессивная система наказания вынуждают производителя либо согласиться со снижением рентабельности (а значит - и финансовой стабильности) предприятия, либо экономить на системах очистки промышленных выбросов. Недостаточные, в силу объективных причин, бюджетные ассигнования регионов заставляют муниципальные власти проявлять (даже в части законных требований)*

предельную тактичность в отношениях с руководством предприятий, существенная часть которых ранее имело статус «градообразующих».

Цивилизация стоит на пороге шестого технологического уклада, контуры которого только начинают складываться в развитых странах мира, в первую очередь в США, Японии и КНР, и характеризуются нацеленностью на развитие и применение наукоёмких, или «высоких технологий» (развитие робототехники, биотехнологий, основанных на достижениях молекулярной биологии и геномной инженерии, нанотехнологии, систем искусственного интеллекта, глобальных информационных сетей, интегрированных высокоскоростных транспортных систем). Россия занимает 60-е место в Глобальном инновационном индексе-2025 (ГИИ-2025), составленном Всемирной организацией интеллектуальной собственности в партнерстве с Институтом Портуланса (в 2024 г. РФ занимала 59-ю позицию в ГИИ). ГИИ-2025 вновь возглавила Швейцария, закрепив свое лидерство благодаря сильным институтам и высокому уровню коммерциализации науки, за ней следуют Швеция и США. В первую десятку еще вошли Южная Корея, Сингапур, Великобритания, Финляндия, Нидерланды, Дания и Китай [4; 5].

Экономисты, оценивающие перспективы России с позиции широко известной в мире волновой теории русского экономиста Николая Кондратьева (который в 1920-х годах установил, что происходит чередование периодов подъема и спада в мировой экономике длительностью примерно 40–60 лет, и каждый цикл состоит из трех фаз: расширения, стагнации и падения), оптимистично отмечают, что, в отличие от других ведущих стран мира, находящихся в краткосрочной волне в фазе спада, в России в 2023 году не было полноценного подъема и пика, а значит в период 2024-2025 годов не будет полноценного спада и дна [6].

Ещё раз заметим, что до дедлайна Повестки ООН-2030 по проблеме устойчивого развития осталось лишь около 4 лет, а мероприятия весьма далеки до завершения, мировые экономические санкции против России подрывают общие усилия по достижению принятых мировым сообществом целей [7]. Так, отстранив Россию от возможности использования её зарубежных финансовых средств, а также получения современных технологий, мировое сообщество тормозит переоснащение российской промышленности для минимизации техногенных выбросов. И тем самым способствует ухудшению жизни миллионов людей, ведь в России значительная часть городов и посёлков городского типа изначально создавалась как инфраструктура градообразующего промышленного предприятия. Значит, непродуманные действия в отношении таких предприятий могут пагубно сказаться на социальной сфере (которая определяет суть значительного числа глобальных целей устойчивого развития (ЦУР) составляющих Повестку ООН-2030). Подчеркнём особо, что численность постоянного населения Российской Федерации (по состоянию на 1 января 2023 г.) составляет 146,4 млн человек (девятое место в мире), а по своей территории (17, 125 млн. км<sup>2</sup>) Российская Федерация занимает первое место в мире (идущие по размеру территорий следом Канада, США и Китай имеют территорию до 10 млн. км<sup>2</sup>). В порядке частного мнения, поделимся опасением, что несбалансированные и весьма финансово затратные для стран мирового сообщества действия политического и экономического давления на Россию могут усилить имеющиеся последствия мирового финансового кризиса (эти последствия уже проявились эскалацией напряжения в ряде регионов мира). Ведь в рамках Повестки-2030 предлагается, не больше и ни меньше, сменить мировой уклад хозяйствования с природопреобразовательного на природоподобный. Понятно, что это желание должно быть подкреплено (кроме политической воли государств-членов ООН) формированием международного фонда под эгидой ООН с филиалами в странах «преобразовательного пула», а значит, для успеха общего дела полезно не только прекратить давление на одного из ключевых партнёров, но и оказать ему сильное содействие.

Мы уже отмечали [8], что на пороге шестого технологического уклада развитие искусственного интеллекта предвосхищается повсеместным внедрением цифровизации, что предполагает существенное повышение эффективности цифровизированных объектов и систем. При этом системная интеграция должна стать весьма полезным инструментом для гармонизации инновационных мероприятий с имеющимися прежними объектами и системами. В промышленности важно проводить новации в интересах концепции устойчивого развития в части всемерного уменьшения техногенного влияния на среду обитания. Понятно, что процесс это – длительный и весьма затратный. Развитие промышленности всегда определялось удовлетворением растущих потребностей людей и никогда (до последних десятилетий) не предполагало необходимости природоохранных мероприятий. Очевидно, что внедрение природоподобных технологий (как и возобновляемых источников энергии) в современной парадигме удовлетворения

потребностей принципиально невозможно. Природоподобные технологии - крайне мало интенсивны, а повсеместное внедрение возобновляемых источников энергии невозможно в силу безальтернативности (на сегодня) углеводородной энергетике (вследствие тотальной зависимости от неё). Применительно к реалиям отечественной промышленности требование скорейшего перехода к полностью безотходному производству столь же сомнительно, как и недавнее повсеместное «развитие и внедрение нанотехнологий». Тогда многие известные учёные химики-технологи (Л.П. Холпанов, Б.С. Сажин, М.Б. Генералов, В.С. Тимофеев, А.И. Родионов, В.С. Бесков и др.) неоднократно отмечали, что технологии в химии пока принципиально не могут выйти на молекулярный уровень (например, в части наблюдения за химическим превращением), поэтому само понятие «наноинженерия» пока бессмысленно и даже провокативно.

Цифровизация промышленности [9-11] предполагает создание цифровых двойников (упрощённо – математических моделей, наиболее адекватных анализируемому объекту). В отличие от привычных математических моделей цифровой двойник постоянно обновляется, получая в режиме реального времени (за счёт постоянного мониторинга) полный набор параметров, характеризующих состояние объекта (или, как говорят, «старая вместе с объектом»). Глубокая цифровизация может проводиться силами самих производителей, причем, не только специалистами в сфере IT, но и обычными технологами (на рынке существует целый ряд соответствующих программных обеспечений (ПО) с визуализацией процесса создания своего собственного прикладного ПО (путём «перетягивания» картинок на мониторе) с применением технологии «низкого кодирования». Другая возможность – обратиться к услугам специализированных компаний в области IT: к компаниям-посредникам (что дешевле) или к компаниям-системным интеграторам, которые не только цифровизируют объект или систему, но и обеспечивают гармонизацию нового оборудования с «унаследованным».

Однако, представляется наиболее важной проблема естественного сокращения (без воспроизводства) кадров производителей-технологов с опытом научно-исследовательской и опытно-конструкторской работы (НИР и ОКР). Ранее формированию подобных кадров способствовала система подготовки специалистов в инженерно-технических вузах, наличие в отраслях промышленности прикладных научно-исследовательских институтов, системы лабораторий с конструкторскими бюро и центральных заводских лабораторий (ЦЗЛ) на местах. Ныне отсутствует сам институт прикладной науки в интересах производства. Встаёт закономерный вопрос о выборе объекта цифровизации: либо повышать эффективность «унаследованных» технологий и оборудования, либо внедрять (на перспективу) новые более эффективные промышленные технологии и оборудование. Ответ на него могут дать только опытные производители-технологи. Пока не воссоздана прежняя система подготовки инженеров-технологов и инженеров-конструкторов оставшиеся научно-производственные специалисты «старой школы» консолидированы под эгидой Российской инженерной академии (создатель и бессменный президент РИА – лауреат семи государственных премий СССР и РФ, доктор технических наук, профессор и академик Б.В. Гусев).

Проблема цифровизации в России заключается не в недостатке средств контроля и автоматизации, низком уровне компьютеризации и приёма-передачи данных или отсутствии достаточного числа компетентных программистов, а в исчезающе малом количестве профессионалов, до тонкостей знающих проблематику, имеющих производственный опыт и могущих квалифицированно поставить задачу. Совершенно недостаточно разработать процедуру алгоритмизации даже самых сложных производственных процессов. Важно выбрать правильное научно-техническое решение, позволяющее организовать процессы эффективно с точки зрения задач устойчивого развития.

Функционирование предприятий предполагает регулярные мероприятия по модернизации производственных линий, и обновление парка промышленного оборудования. На российском вторичном рынке промышленного оборудования предлагаются практически не использованные сушильные установки (со средствами КИПиА) из запасников промышленных объединений, машиностроительных заводов и складов российской системы Госрезерва. Для модернизации промышленных процессов можно воспользоваться разработанной нами с. Б.С. Сажиним. (при участии наших сотрудников и учеников) авторской стратегией выбора эффективной сушильной установки.

Нами с Б.С. Сажиним предложена современная стратегия выбора рационального состава промышленных сушилок взвешенного слоя. Внимание к процессу сушки оправдано. Сушка – наиболее энергозатратный из производственных процессов (покрывающий до 85% энергозатрат



химического предприятия и до 15% суммарных энергозатрат всей промышленности России в целом). Номенклатура подлежащих сушке материалов включает до 200 тысяч наименований, большую часть которых составляют дисперсные материалы (порядка 80%). Нами с Б.С. Сажиным установлено и доказано, что мощное средство для повышения эффективности сушки дисперсных материалов – проведение процесса во взвешенном слое. Предложена авторская классификация гидродинамических режимов, включающая новые, неизвестные ранее режимы, впервые обнаруженные и изученные нами. Предложенная авторская классификация дисперсных материалов как объектов сушки, не противоречащая известным, но дающая пользователям существенно более широкие возможности [7-8; 12-37]. (По мнению ведущих российских специалистов в области процессов и аппаратов химической технологии, удобство пользования и прогностические возможности классификации для сушильщиков страны позволяют сравнивать её с классификацией химических элементов Д.И. Менделеева)

Нами показано, что определяющими характеристиками для любого материала как объекта сушки являются критический радиус пор (размер самых мелких пор поровой структуры материала) и ранг адгезионно-аутогезионного взаимодействия (характеризующий способность материала к комкованию и налипанию на стенки аппарата). Путём многолетних исследований на специально подобранных модельных материалах для каждого местоположения внутри классификационной таблицы подобраны наиболее эффективные гидродинамические режимы и реализующие их аппараты. На основании практического производственного опыта, экспериментальных и теоретических исследований для каждого местоположения в классификационной таблице выбран наиболее оптимальный состав вспомогательной аппаратуры, включая воздуховоды, нагреватели, теплообменники, питатели-дозаторы и т.д.). Доказано, что, определив для любого (включая неизвестные ранее) материала значения критического радиуса пор и ранга адгезионно-аутогезионного взаимодействия, находим место материала в классификационной таблице, а значит и полную информацию для формирования наиболее оптимальной установки для сушки данного материала. Использование нашей с Б.С. Сажиним стратегии рационального выбора состава сушильной установки позволяет сократить стандартную процедуру подбора оптимальной установки для сушки данного материала с 7-9 месяцев до 3-5 дней (что многократно доказано на практике) [14-21; 29-48].

Для использования предлагаемого нами метода выбора сушилок весьма важным является вопрос об области рационального использования основных гидродинамических режимов взвешенного слоя применительно к процессам сушки дисперсных материалов. Как было показано нами [14-21; 47-68], в области рационального применения эти режимы являются активными (подразумеваем - эффективными). Как известно, рациональной областью применения любого режима будет та, в которой недостатки, присущие режиму, не важны для решения соответствующей технологической задачи, а достоинства - весьма существенны.

Режим кипящего слоя (КС) имеет ряд существенных недостатков (недостаточная гидродинамическая устойчивость, неудовлетворительная гидродинамическая модель - аппарат по твердой фазе близок к аппаратам идеального смешения и др.), ограничивающих область его рационального применения. Поэтому КС нерационально применять для несыпучих, плохо ожижающихся дисперсных материалов. Его также не следует применять, если к высушенному материалу предъявляются повышенные требования по равномерности остаточной влажности, т.к. КС по твердой фазе близок к идеальному смешению (как следует из С-кривых отклика, у КС  $\pi$  до  $1,5 \div 2,0$ ) и, следовательно, время пребывания частиц высушиваемого материала в сушилке КС неодинаково, что, естественно, приводит к неравномерности по остаточной влажности высушиваемого материала. К этому надо добавить жесткие ограничения по показателю полидисперсности, т.к. область существования КС ограничена снизу скоростью псевдооживления частиц крупной фракции и сверху - скоростью витания частиц мелкой фракции.

Существенные проблемы возникают при сушке в КС (особенно до низкой остаточной влажности) с отводом статического электричества, т.к. игнорирование этого при наличии взрывоопасной концентрации пылевоздушной смеси в аппарате может привести к взрыву, что и имело место в ряде случаев на производстве. Наконец, КС имеет ограниченные возможности по тепловой мощности из-за пределов допустимой скорости теплоносителя (во избежание уноса высушиваемого материала из аппарата). В то же время КС имеет ряд преимуществ, одним из которых является возможность регулирования весьма в широких пределах среднего времени пребывания частиц в аппарате, что, к сожалению, не свойственно большинству других режимов взвешенного слоя.

Режим проходящего кипящего слоя (ПКС) - не имеет большинства недостатков КС. Например, при сушке (а тем более при подсушке) в этом режиме создаются идеальные условия для отвода зарядов статического электричества, так как при повышенном насыщении воздуха (что свойственно режиму ПКС) накопления зарядов статического электричества, как правило, не происходит. Сушка в ПКС более равномерная, чем в КС, но средняя продолжительность нахождения материала составляет не более 10-20 секунд, что ограничивает область его применения. Главным ограничением по области применения режима ПКС является то, что условия его существования связаны с обязательным уменьшением скорости витания частиц в процессе обработки. Именно поэтому ПКС применяется для комкующихся, плохо ожижающихся и высоковлажных дисперсных материалов. Разбиванию комков способствует наличие высокооборотной мешалки. В качестве типового режим ПКС может быть рекомендован для липких (с повышенным адгезионно-аутогезионным рангом Ка-к) высоковлажных материалов (по новой, предложенной нами, классификации влажных дисперсных материалов как объектов сушки, это - материалы второго и третьего классов – непористые со свободной влагой и широкопористые со слабосвязанной влагой). Он успешно используется и в качестве подсушителя комбинированных циклонных (КЦС) и комбинированных аэрофонтанных (КАС) сушилок.

Режим виброкипящего слоя (ВКС) отличается хорошей гидродинамической моделью. Число Пекле  $Pe$  достигает 200, а  $пя$  - до 100 (в оптимальном режимно-конструктивном варианте). Вместе с тем, сушилки виброкипящего слоя (СВКС) имеют, как минимум, два существенных недостатка, резко ограничивающих область их применения. Во-первых, это - ограниченная тепловая мощность сушилок, связанная с малыми допустимыми (даже меньшими, чем у КС) скоростями теплоносителя из-за известного эффекта «подбрасывания» частиц, вызванного направленной механической вибрацией. Вследствие этого ограничена удельная производительность сушилок ВКС по испаренной влаге. В обычном варианте режим ВКС и сушилки СВКС целесообразно применять в случае жестких требований по равномерности высушивания материала в условиях смешанной задачи массообмена. (Это соответствует пятому классу влажных материалов по нашей новой классификации – микропористым материалам со связанной влагой).

В отличие от КС режим ВКС не может обеспечить длительного пребывания материала в аппарате (более 20 минут), т.к. это связано с ограничениями по удерживающей способности вследствие низкой предельной высоты слоя (не более 200 мм) из-за быстрого снижения эффекта по высоте слоя от вибрационных воздействий на слой. Поэтому, например, для материалов с ультрамикropорами, соизмеримыми с размерами молекул (шестой класс по нашей классификации) режим ВКС (в отличие от КС) в обычной форме использован быть не может. В связи с этим нами был проведен комплекс работ по исследованию модификации СВКС, а именно, исследована гидродинамика, теплообмен и сушка в сушилках кипящего слоя с вибрирующими поверхностями нагрева, погруженными в слой. В результате в качестве типовой сушилки для шестого класса влажных дисперсных материалов мы рекомендуем сушилку кипящего слоя с вибрирующими поверхностями нагрева, погружёнными в слой (КСВПН) [14-17; 29-37].

Во второй группе режимов взвешенного слоя [14-21] базовыми являются гидродинамические режимы фонтанирующего слоя и свободного фонтанирования. Режим фонтанирующего слоя (ФС) отличается устойчивостью и способностью к обработке материалов с ярко выраженными адгезионно-аутогезионными свойствами, вплоть до пастообразных материалов с наивысшим рангом Ка-к = 5, что не может сделать никакой другой режим взвешенного слоя. Заметим, что сверхлипкие материалы (типа солидола и дёгтя) с рангом Ка-к = 5 поддаются сушке во взвешенном слое только при дополнительном использовании механических побудителей, например ПКС (проходящий кипящий слой) с высокооборотной мешалкой и ВС (вихревой слой) с дисмембратором.

Однако режим ФС не обеспечивает равномерности сушки ( $пя = 1,5 \div 2,5$ ). Поэтому его целесообразно применять для так называемой «неквалифицированной» сушки (например, сушка осадков сточных вод) высоковлажных, в том числе пастообразных материалов

Режим свободного фонтанирования (СФ). Если режим ФС является аналогом режима КС в конических аппаратах, то режим СФ - аналог режима ПКС, но воспроизводится только в конических и цилиндро-конических аппаратах. Он используется на второй ступени типовых комбинированных аэрофонтанных сушилок (КАС).

Режим пневмотранспорта (ПТ) наиболее близок к режиму идеального вытеснения как по твердой, так и по газовой фазе. Его главный недостаток состоит в малом времени пребывания материала в сушильном тракте (от долей секунды до 2-3 секунд). Поэтому он эффективен

только при сушке непористых и широкопористых материалов (первый и второй класс материалов по авторской классификации материалов как объектов сушки Б.С. и В.Б. Сажиных). Вторым недостатком режима ПТ является полный вынос из аппарата высушенного продукта, что во всех случаях делает необходимым установку после трубы-сушилки (ТС) системы улавливания высушенного продукта [14-20].

С целью преодоления ограничений, присущих режиму пневмотранспорта, используются закрученные потоки (циклонный режим, режим вихревого слоя, режим встречных закрученных потоков и др.). Циклонный режим реализуется в циклонных сушилках (ЦС), которые также как и трубы-сушилки работают на полный вынос высушенного продукта из аппарата, но отличаются большей компактностью и интенсивностью процесса. Вместе с тем, они применяются только для хорошо сыпучих продуктов (Ка-к не более 2, в то время как у ТС предельный Ка-к = 3). Поэтому циклонный режим целесообразно применять для первого класса влажных дисперсных материалов, а также для второго класса в качестве второй ступени в комбинированных циклонных сушилках КЦС. Этот режим также хорошо изучен многочисленными исследователями, в том числе изучавшими циклонные пылеуловители, циклонные топки и т.д.

Весьма эффективным для материалов четвертого класса нашей классификации материалов является режим вихревого слоя (ВС), реализуемый в дисковых вихревых камерах (ВК), а также в качестве первой ступени в комбинированной безуносной сушилке со встречными закрученными потоками и дисковой вихревой камерой СВЗП-ВК.

Проведенное нами детальное исследование гидродинамики и сушки в указанных аппаратах позволило разработать методы расчета и управления процессом для решения спектра технологических задач.

Особое значение имеют режимы встречных закрученных потоков (ВЗП) и других вариантов взаимодействия закрученных струй, которые используются и как безуносные сушилки, и как высокоэффективные пылеуловители. Режим ВЗП целесообразно использовать для сушки высоковлажных материалов третьего класса - с переходными порами со свободной и связанной влагой (сушилки СВЗП), а в сочетании с вихревыми камерами также и для четвертого класса – тонкопористых материалов со свободной и связанной влагой (безуносные комбинированные сушилки СВЗП-ВК) [15; 16-20; 33-34].

Важнейшим параметром, определяющим область рационального применения режимов взвешенного слоя для сушки дисперсных материалов, является предельное время пребывания материала в зоне обработки при реализации данного режима. Если это время соответствует расчетному времени сушки данного материала, то гидродинамический режим можно считать эффективным, т.е. обеспечивающим интенсификацию процесса, качество высушенного материала, хорошие экологические и экономические показатели сушилки.

Нами с Б.С. Сажиным впервые в мире установлено, что аппараты ВЗП можно использовать не только как пылеуловитель, но и как высокоэффективную сушилку, позволяющую совмещать сушку с пылеулавливанием дисперсной фазы. Также впервые нами показано, что на базе аппарата ВЗП можно создать целую линейку эффективных многофункциональных аппаратов (с регулируемой гидродинамикой), позволяющих совмещать в одном аппарате сушку с пылеулавливанием, с грануляцией, с измельчением и/или классификацией дисперсной фазы и т.д. [12-20; 39; 61].

Нами доказано, что существовавшие до нас традиционные способы оценки энергоэффективности аппаратов по балансовым соотношениям дают ошибку до 40% и не учитывают целый ряд статей. Нами с Б.С. Сажиным разработан авторский метод расчёта эффективности на основании эксергетического анализа с формированием целевого критерия, названного нами «эксергетическим к.п.д.». Указанный метод позволяет не только выбирать наиболее эффективный гидродинамический режим (и аппарат для его осуществления), но и рассчитывать энергоэффективность (и обоснованность ресурсозатрат) для химико-технологических систем, включая уровень химических производств и уровень химических предприятий. Причём, наш подход доказал свою эффективность при сравнении альтернативных решений при модернизации действующих, а также проектировании новых химических предприятий [12-20; 33; 34; 43].

Приняв к использованию изложенную стратегию создания эффективных сушильных установок можно кроме экономии финансовых средств за счёт повышения эффективности процесса (учитывая составные части понятия «эффективности»: интенсивность, цена, качество), также получить сокращение производственных площадей, выделенных под отделение сушки, и



снижение ресурсо-энергозатрат, а значит – существенно уменьшить техногенное воздействие на природу [7-8; 12-20; 40-42; 44; 51; 54; 57; 61-68].

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