



ISSN: 2663-4619  
e-ISSN: 2708-986X

# ELMi iŞ

Beynəlxalq Elmi Jurnal

SCIENTIFIC WORK  
International Scientific Journal

**ELMİ İŞ**  
**Beynəlxalq Elmi Jurnal**

**Cild: 20 Sayı: 3**

**SCIENTIFIC WORK**  
**International Scientific Journal**

**Volume: 20 Issue: 3**

**2026**

## Beynəlxalq indekslər / International Indices

ISSN: 2663-4619  
e-ISSN: 2708-986X  
DOI: 10.36719



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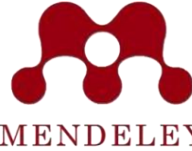
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DOI: <https://doi.org/10.36719/2663-4619/127/5-14>

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### Poetik dildə çiçəklərə münasibət

#### Xülasə

“*Poetik dildə çiçəklərə münasibət*” adlı məqalə bədii mətnlərdə çiçək adlarının (fitonimlərin) semantik, üslubi və simvolik funksiyalarını araşdırmağa həsr olunmuşdur. Tədqiqatın əsas məqsədi poetik diskursda çiçəklərin yalnız ad bildirən söz kimi deyil, həm də estetik-emosional yük daşıyan obraz və simvol kimi çıxış etməsini müəyyənləşdirməkdir. Məqalədə göstərilir ki, poetik dildə çiçək adları məcazlaşma, simvollaşma və şəxsləndirmə yolu ilə yeni semantik çalarlar qazanır. Çiçəklərin xalqın mədəni yaddaşında formalaşmış əlaqəli mənalarla yüklənməsi və bu mənaların poeziyada fərdi müəllif üslubu ilə yenidən işlənərək poetik obraz sisteminin tərkib hissəsinə çevrilməsi əsaslandırılır. Araşdırmada çiçəklərin bir neçə əsas funksiyası müəyyənləşdirilir.

Həm klassik, həm də müasir poeziyada müxtəlif kontekstlərdə işlədilən çiçək adlarının məhəbbətin, hörmət və gözəlliyin, təvazökarlığın, ayrılıq və həsrətin rəmzi kimi işlənməsində simvolik, poetik mətnə obrazlılıq yaradaraq təsvirin rəngarəngliyini və ifadə gücünü artırmaqda emosional-ekspressiv, insan xarakteri, və ya həyat mərhələlərinin müqayisə olunmasında metaforik funksiyaya malik olması göstərilmişdir.

Məqalədə Azərbaycan klassik və müasir poeziyasından nümunələr əsasında təsdiq edilir ki, çiçək obrazı milli-mədəni kodun daşıyıcısıdır. Xüsusilə klassik Şərq poeziyasında qızılgül-bülbül motivi sevgi fəlsəfəsinin əsas ifadə vasitələrindən biri kimi təqdim olunur. Müasir poeziyada isə çiçəklər daha çox fərdi duyğuların və sosial-mənəvi problemlərin simvoluna çevrilir.

Tədqiqatın nəticəsində belə qənaətə gəlinir ki, poetik dildə çiçəklərə münasibət yalnız təbiət təsviri ilə məhdudlaşmır, bu münasibət insanın daxili dünyasının, estetik baxışlarının və milli-mədəni dəyərlərinin ifadə formasıdır. Çiçək adlarının semantik cəhətdən dəyişməsi dilin obrazlılıq imkanlarını genişləndirir və poetik mətnin ekspressivliyini artırır. Beləliklə, məqalə poetik dildə fitonimlərin funksional-semantik xüsusiyyətlərini təhlil edərək onların bədii-estetik dəyərini və dilin leksik-semantik sistemində tutduğu mövqeyi müəyyənləşdirir.

**Açar sözlər:** *dil, çiçəklər, üslub, estetiklik, rəmz*

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## Attitudes Toward Flowers in Poetic Language

### Abstract

The article “*Attitude Towards Flowers in Poetic Language*” is devoted to examining the semantic, stylistic, and symbolic functions of flower names (phytonyms) in literary texts. The main aim of the study is to determine that in poetic discourse, flowers function not only as nominal words but also as images and symbols carrying aesthetic and emotional significance. The article demonstrates that in poetic language, flower names acquire new semantic nuances through metaphorization, symbolization, and personification.

The study substantiates that flowers, enriched with culturally established associations in the collective memory, are reinterpreted in poetry through individual authorial style, becoming an integral part of the poetic imagery system. Several key functions of flowers are identified in the research.

In both classical and contemporary poetry, flower names used in various contexts serve as symbols of love, respect and beauty, modesty, separation, and longing, performing symbolic, emotional-expressive, and metaphorical functions that enhance the richness of depiction, the expressive power of the text, and the comparison of human character or life stages. Examples from Azerbaijani classical and modern poetry confirm that the flower image carries national and cultural codes. In particular, in classical Eastern poetry, the rose-nightingale motif functions as one of the primary means of expressing the philosophy of love, whereas in contemporary poetry, flowers more often symbolize individual emotions and socio-spiritual concerns.

The study concludes that the attitude toward flowers in poetic language is not limited to natural description; it also reflects the human inner world, aesthetic perceptions, and national-cultural values. The semantic transformation of flower names expands the expressive potential of language and enhances the expressiveness of poetic texts. Thus, the article analyzes the functional-semantic characteristics of phytonyms in poetic language, determining their artistic and aesthetic value and their position within the lexical-semantic system of the language.

**Keywords:** *language, flowers, style, aesthetics, symbol*

### Giriş

Poetik dil bədii ədəbiyyatın ən mühüm ifadə vasitələrindən biri olub, insanın emosional və estetik dünyasını obrazlı şəkildə əks etdirir. Poeziyada təbiət elementləri, xüsusilə çiçəklər, insan hisslərinin və mənəvi vəziyyətinin simvolik ifadəsində geniş istifadə olunur. Çiçəklər poetik mətnlərdə gözəllik, saflıq, sevgi, zəriflik və ayrılıq, dostluq kimi müxtəlif semantik çalarları ifadə edir. Azərbaycan poeziyasında da çiçək obrazları mühüm bədii-estetik funksiyaya malikdir. Poetik dildə çiçəklər təbiət təsviri anlamından xeyli yüksəkdə dayanır, insanın daxili aləmini, emosional vəziyyətini və estetik idealını ifadə edən simvol kimi təqdim edilir. Bu baxımdan poetik dildə çiçəklərə münasibətin öyrənilməsi həm dilçilik, həm də ədəbiyyatşünaslıq baxımından aktual elmi məsələlərdən biridir. Tədqiqatın məqsədi poetik mətnlərdə çiçək adlarının semantik və üslubi xüsusiyyətlərini müəyyənləşdirmək, onların bədii funksiyasını və simvolik mənə yükünü təhlil etməkdir. Azərbaycan klassik və müasir poeziyasından seçilmiş nümunələr əsasında çiçəklərə aid fitonimlərin kontekstual-semantik analizi aparılmışdır. Eyni zamanda, semantik təhlil, üslubi analiz və komponent analiz metodları tətbiq edilərək çiçək adlarının məcazlaşma, simvollaşma və şəxsləşdirmə prosesləri

araşdırılmışdır. Mətnlərdə çiçək obrazlarının funksional yükü müəyyənəndirilmiş və onların poetik sistemdə tutduğu mövqe təhlil edilmişdir.

### **Ədəbiyyat icmalı**

Beynəlxalq elmi ortamda filoloji istiqamətdə yazılan elmi əsərlərdə çiçəklər haqqında biri-birindən maraqlı fikirlərlə qarşılaşırıq. Bu əsərlərdə çiçək obrazının dil-mədəni mənaları və müxtəlif dillərdəki metaforik simvolizmi araşdırılır, çiçək metaforalarının dilçilikdə yalnız bədii təsvir vasitəsi deyil, həm də konseptual struktur olaraq mədəni ideyaları əks etdirməsindən bəhs edilir (Elmirzaeva, 2025), onların universal və mədəni spesifik ifadələri üzərində müqayisəli tədqiqat aparılır (Li, Chi, 2021), flora konseptinin frazeoloji baxışla müqayisəli lingvistik təsviri verilir (Anisimova, Safonova, 2018). “Çiçəklər çox vaxt sevgi və gözəllik simvolu kimi çıxış edir və bu motiv poeziyada çoxqatlı semantik təsir yaradır” (Li, Chi, 2021, s. 3361). Müəlliflər qeyd edirlər ki, “Poeziyada çiçək metaforaları universal estetika ilə birlikdə mədəni fərqlilikləri əks etdirir, ingilis və Çin poeziyasındakı sevgi metaforaları ümumilikdə oxşar dünyagörüşünə malik olsa da, mədəni spesifikasiyalar fərqlidir” (Li, Chi, 2021, s. 3364). Elmi əsərlərdə koqnitiv semantikaya əsaslanaraq bitki metaforalarının lingvistik təhlili, onların dilçilik, süni intellekt və kompüter elmlərinin kəsişməsində yerləşən və kompüterlərin insan dilini (yazılı və şifahi formada) başa düşməsi, təhlil etməsi və emal etməsi ilə məşğul olan sahə kontekstində necə müəyyənəndirildiyi və dil yaddaşını necə formalaşdırdığı, müqəddəs mətnlərdə çiçək metaforalarının semantik-morfoloji təhlili məsələlərinə də rast gəlirik (Ptiček, Dobša, 2023; Kussemiarti, Manurung, Kusumastuty, 2022). Bundan başqa, flora metaforalarının ədəbi hekayələrdə istifadəsinə dair analiz (Sun Li, 2024), ekologiya ilə bağlı semantik kateqoriyaları (Assiddiq, Mustari, Pulu, Mustakim, 2025), onların mədəni-etik mənəvi mesajları haqqında lingvistik-mədəni təhlillərdə (Dragnea Horvath, 2014) mövzu ilə bağlı müəyyən qədər məlumat verilir. Tədqiqatlarda daha çox ayrı-ayrı dillərdə çiçəklərə münasibət məsələlərinə toxunulur. Məsələn, Çində “Qadın bir çiçəkdir” (Woman is a flower) metaforunun media diskursunda leksik və semantik təsviri bu baxımdan maraqlıdır (Xu, 2024). Bundan başqa, Şimali Amerika və Mərkəzi Amerikada danışılan, Amerikanın yerli dillər ailəsindən olan Uto-Aztekan dillərində çiçək metaforalarının semiotik və mədəni aspektinə də nəzər salınır (Hill, 1992). Dəqiq tarixi elm adamları arasında mübahisə yaradan, təxminən 30–40 milyon il əvvəlki dil təkamül qruplarına əsaslanan bu dil ailəsi mədəni irsin qorunması baxımından önəmlidir.

Çiçəklər mövzusunda müxtəlif dillərin materialı əsasındakı əsərlərdə maraqlı və orijinal fikirlər vardır. Bu baxımdan, Z. Nuraliyevanın ingilis və özbək ədəbiyyatında çiçəklərin simvolik funksiyalarını və metaforik mənalarını müqayisə edən əsərləri diqqəti cəlb edir. “Çiçək adlarının metaforik funksiyası dillər arasında oxşar olsa da, onların mədəni dəyərləri fərqli semantik assosiasiyalar yaradır. Çiçək simvolizmi İngilis ədəbiyyatında estetik dəyər daşıyarkən, özbək ədəbiyyatında daha çox mənəvi və milli mənə kəsb edir” (Nuraliyeva, 2025, s. 46). Z. Nuraliyevanın əsərlərində çiçək adlarının ingilis dilində tez-tez yalnız sadə isim kimi qarşıya çıxması və mədəni emosiya, gözəllik simvolizmi daşması (Nuraliyeva, 2025, s. 1065), morfoloji strukturu və semantik xüsusiyyətlərinin həm universal, həm mədəni olaraq müxtəlif dillərdə fərqli şəkildə formalaşması vurğulanır (Nuraliyeva, 2025, s. 41). Bu müqayisəli analiz göstərir ki, dil strukturu və mədəni dəyərlər bir-biri ilə sıx əlaqəlidir və çiçək adları bu əlaqəni aydın şəkildə ortaya qoyur və vurğulayır ki, çiçək adlarının semantik xüsusiyyətləri hər iki dildə leksik mənə yükünü müəyyən edən əsas komponentlərdir. Morfoloji struktur fərqlilikləri isə çiçək adlarının istifadəsində dildəki formalaşma qaydalarını nümayiş etdirir. Z.Nuraliyevanın araşdırmalarında təsdiq edilir ki, dili tədqiq edərkən çiçək adlarının formalaşması və istifadəsi leksik səviyyədə nəzərdən keçirilməlidir. Çiçək adlarının morfoloji xüsusiyyətləri dillər arasında oxşar ola bilər, lakin onların semantik yükü mədəni kontekstdən asılı olaraq dəyişir. Bitki və çiçək terminləri yalnız obyektiv şəkildə təsvir etmir, onlar semantik qatı ilə mədəni mənə yaradır. Mövzu ilə bağlı ingilis və özbək dillərinin tədqiqi kəmiyyət çoxluğu ilə diqqəti çəkir. Xüsusilə də özbək dillərində bitki metaforalarının semantik-morfoloji müqayisəsi geniş yayılmışdır (G'aniyeva, 2023). “Çiçək metaforaları ingilis və özbək poeziyasında duyğuların vizual-estetik ifadəsi kimi geniş istifadə olunur, bu da dilin poetik funksiyasını gücləndirir” (Djalilova, 2024, s. 294). Məqalədə bitki adlarının dilin emosional yükünü artırmaq üçün

simvolik vasitə kimi rolundan danışılır. Linqvistik yazılarda bitki metaforlarının dildə həm simvol, həm də fəlsəfi mənə daşıyan anlayışlar kimi formalaşması haqqında mülahizələr də mövcuddur (Grbavac, 2010). Tədqiqatlarda gürcü və ingilis ədəbi diskursunda çiçək metaforlarının konseptual təhlili ilə qarşılaşırıq (Bagdadelishvili, 2024).

Azərbaycan dilçiliyində də çiçəklər, bitki adları və onların dilçilikdə rolu ilə bağlı elmi tədqiqatlar mövcuddur. Bunlar adətən leksik-semantik, frazeoloji, folklor və mədəniyyət aspektləri ilə bağlıdır. S. Həsənova “Linguistic Analysis of Proverbs Containing” (2025) adlı məqaləsində Azərbaycan atalar sözlərində bitki adlarının necə istifadə olunduğunu, onların simvolik, semantik və mədəni funksiyalarını araşdırır. Bitki adları atalar sözlərində xalq təfəkkürü, ekologiya və ənənəvi biliklərlə bağlı dərin mənə daşıyır. Tədqiqat bitki adlarının metaforik dəyərini, leksik semantikanı, milli mədəniyyət elementlərini dil çərçivəsində əlaqələndirir. Azərbaycanda aparılan tədqiqatlarda çiçək adlarının Azərbaycan dilinin leksikasında rolu və onların söz ehtiyatını necə zənginləşdirdiyindən bəhs edilir, onların onomastik statusu, leksik və söz əmələgətirmə prosesində iştirakı göstərilir (Babayeva, 2025). E.Babayevanın məqaləsi Azərbaycan dilçiliyində çiçək və bitki adlarının struktur və funksional baxımdan nə qədər əhəmiyyətli olduğunu göstərir. Z. Teymurlunun “Azərbaycan və Türk Dillərində Paralel İşlənən Bitki Adları” mövzusunda tədqiqatında bitki (və çiçək) adlarının fonetik və semantik şəkildə necə oxşar və fərqli şəkildə formalaşdığı göstərilir. Bununla da, dillərarası leksik əlaqə dilçilik baxımından konkret faktlarla təsvir olunur (Teymurlu, 2025). Araşdırmalarda Azərbaycan dilində metaforikləşmə prosesləri əsas mövzu olmaqla çiçəklə bağlı sözlərin yeni mənalar alması haqqında danışılır. Burada çiçəklər və digər bitki adları tez-tez metafor mənə daşıyan sözlər kimi dil analizinə cəlb olunur. Belə ki, çiçək adlarından tez-tez leksik novatorluqda istifadə edilir. Beləliklə, Azərbaycan dilçiliyində çiçəklər botanik mövzu olmaqdan uzaqlaşaraq leksik-semantik, frazeoloji və metaforik təhlil çərçivəsində tədqiq olunur. Fikrimizcə Azərbaycan dilçiliyində çiçəklər mövzusunda linqvistik tədqiqatlar yetərsizdir.

### **Tədqiqat**

Tədqiqat zamanı Azərbaycan poeziyasından seçilmiş nümunələr əsasında poetik mətnlərdə işlənən çiçək adları araşdırılmışdır. Araşdırmanın materialını müxtəlif dövrlərə aid şairlərin əsərlərində rast gəlinən çiçək adları təşkil edir.

Tədqiqat prosesində poetik mətnlərdə işlənən çiçək adları toplanmış və onların semantik xüsusiyyətləri müəyyən edilmişdir. Çiçəklərin bədii mətnlərdə fərqli mənalarda istifadə olunduğu müəyyən edilmişdir. Tədqiqatda çiçəklərin poetik mətnlərdə metaforik və simvolik funksiyası da araşdırılmışdır. Müəyyən edilmişdir ki, çiçək adlarından bir çox hallarda insanın mənəvi xüsusiyyətlərini, gözəllik anlayışını və sevgi hisslərini, səmimiyyətini ifadə etmək üçün istifadə olunur.

### **Metodologiya**

Tədqiqatın metodoloji əsasını dilçilik və ədəbiyyatşünaslığın müasir nəzəri yanaşmaları təşkil edir. Araşdırmada poetik mətnlərdə çiçək adlarının semantik, üslubi və simvolik xüsusiyyətlərini müəyyənləşdirmək məqsədilə müxtəlif elmi metodlardan istifadə olunmuşdur. Çiçəklərin poetik kontekstdə hansı mənalarda istifadə olunduğu və onların bədii funksiyalarının təsvirində deskriptiv (təsviri), çiçək adlarının məcazi və simvolik mənalarının, onların poetik mətnlərdə ifadə etdiyi emosional və estetik çalarların müəyyənləşdirilməsində, çiçəklərin sevgi, gözəllik, saflıq, kədər və digər emosional vəziyyətlərin ifadəsində oynadığı rolun təhlilində semantik təhlil, çiçək adlarının poetik mətn daxilində digər söz və obrazlarla əlaqəsinin, həmçinin bədii təsvir vasitəsi kimi funksiyasının aydınlaşdırılmasında kontekstual analiz, müqayisəli metoddan istifadə edilmişdir. Tədqiqatın empirik bazasını Azərbaycan poeziyasından seçilmiş nümunələr təşkil edir.

### **Analiz**

Azərbaycan poeziyasında uzun müddətdir ki, çiçəklər poetik təsəvvürdə, xüsusi yer tutur və insan emosiyalarını, mədəni dəyərləri və estetik zövqləri çatdıran simvollar, metaforlar və motivlər kimi çıxış edir. Poetik dildə tez-tez emosiyaları oyatmaq, mənzərə yaratmaq və mədəni və ya fəlsəfi ideyaları çatdırmaq üçün çiçəklərə müraciət olunur. Təbiət elementləri arasında çiçəklər zəngin simvolik potensialı, estetik cazibəsi və metaforik ifadədəki çoxşaxəliliyi ilə seçilir. Müxtəlif dillərin və dövrlərin şairləri çiçəklərdən sevgini, dünya hadisələrini, gözəlliyi, saflığı, duyğuları ifadə etmək

üçün çiçəklərə müraciət etmişlər. Poeziyada çiçəklərin öyrənilməsi həm dilin yaradıcı imkanlarını, həm də təbiətə mədəni münasibəti anlamağa imkan verir.

Çiçəklər kontekstdən, mədəniyyətdən və ədəbi ənənədən asılı olaraq müxtəlif simvolik mənalar daşıyır. Məsələn, Qərb poeziyasında qızılgül sevgi, zanbaq saflıq və yasla əlaqələndirilir, bənövşə isə təvazökarlığı ifadə edir. Şərq poeziyasında isə çiçək simvolları fərqli mənalar daşıyır. Lakin simvolik mənalar sabit deyil, şairlər tez-tez ənənəvi çiçək təsvirlərindən yenilikçi ideyaları çatdırmaq və ya cəmiyyət normalarına münasibət bildirmək üçün istifadə edirlər. Poetik dildə çiçəklər həm şairdə, həm də oxucuda emosional reaksiyalar oyadır. Onların rəngləri, qoxuları və formaları sevinc, kədər, həsrət kimi duyğuları təqdim edən fikirlərlə bağlanır. Çiçəklərin anlamlarından istifadə ilə təbiət və insan arasında emosional əlaqə gücləndirilir. Azərbaycan şeirində güllər, çiçəklər, əsasən, məhəbbət hissləri ilə əlaqələndirilmişdir:

Qış getdi, yenə bahar gəldi,  
Gül bitdivü laləzar gəldi

*(Xətayi, 1999, s. 134).*

Poetik dildə çiçək adları dərhal emosional assosiasiyalar yaradır. Ümumi “çiçəklər” ifadəsindən fərqli olaraq, konkret çiçək adları özünəməxsus hiss və duyğu yükünə malikdir. Məsələn, şeir dilində “bənövşə” sözünün işlənməsi təvazökarlıq və incəlik hissini oyada bilər.

Dərdim, bil, səndən betərdi,  
Boynu buruq bənövşələr

*(Ağ aşiq, 1999, s. 354).*

Poetik dildə konkret çiçək adlarının seçimi estetik təsiri çoxaldır və canlandırır, şeirin yadda qalmasını təmin edir. Azərbaycan klassik poeziyasında çiçəklərdən müraciət obyekt kimi də istifadə olunmuşdur:

Qızılgül, bağü bustanım, nə dersən?  
Fəda olsun sənə canım, nə dersən?

*(Xətayi, 1999, s. 129).*

Poetik xitab bədii mətnin emosional gücünü artıran, obrazlılığı dərinləşdirən və müəlliflə oxucu əlaqəsini möhkəmləndirən mühüm üslubi vasitədir. O, poetik nitqə dramatism, lirizm qazandıraraq estetik təsiri gücləndirir:

Yavru, necin boynun əyri tutarsan,  
Sənin dərdin məndən betər, bənövşə?

*(Qaracaoğlu, 1999, s. 217).*

Çiçəklərin poetik xitab kimi işlənməsi söz adamlarının daxili hiss və düşüncələrini birbaşa ifadə etməsinə imkan yaradır, iztirablarını daha təsirli şəkildə çatdırır. Poetik xitab emosional gərginliyi artırmağa xidmət edir.

Çiçək adları poetik dilin quruluşunu, ritmini və semantik sıxlığını formalaşdırın üslub vasitələridir:

Mələklərimi dərmış, göydən gətirmış,  
Heyif ki, dəriblər az bənövşəni

*(Dirili Qurbani, 1999, s. 136).*



Araşdırmalar göstərir ki, təbiət simvolları arasında çiçəklər universal gözəlliyi, hissi cazibəsi və zəngin mədəni əlaqələri ilə xüsusi yer tutur. Poeziyada müəyyən çiçək adlarının çəkilməsi şairə dəqiq mənzərə yaratmağa, ab-hava müəyyənləşdirməyə və mədəni və ya fəlsəfi ideyaları çatdırmağa imkan verir. Azərbaycan poetik dilində çox vaxt çiçəkləri ümumi şəkildə bildirən “gül” sözü işlədilir:

Yeyib bülbül bağırını,  
Çıxıb ağzı qanlı gül

(*Sarı Aşıq, 1999, s. 254*).

Çiçək adlarının bənzətmə kimi işlənməsi poetik nitqdə geniş yayılmış semantik hadisələrdəndir. “Gül kimi”, “lalə tək”, “yasəmən ətirli” kimi konstruksiyalar vasitəsilə insanın zahiri gözəlliyi, saflığı, zərifliyi və hətta mənəvi keyfiyyətləri ifadə olunur. Xüsusilə tərəvət və zəriflik kimi assosiativ çalarları özündə birləşdirən “gül” leksik-qrammatik vahidi Azərbaycan poeziyasında estetik idealın simvoluna çevrilmişdir. Belə bənzətmələr semantik genişlənmə yaradaraq fitonimlərin məcazi potensialını artırır:

Xas bağca içində top nərgiz kimi  
Qaralarmı geydin alın üstünə?

Səhərdə açılan qönçə gül kimi  
Sandım, qan damlamış qarın üstünə

(*Qaracaoğlu, 1999, s. 217*).

Çiçək adlarının bənzətmə kimi işlənməsi yalnız estetik təsvirlə məhdudlaşmır, həm də milli-mədəni dəyər ifadə edir. Bu tip bənzətmələrdə fitonimlər ilkin nominativ mənadan uzaqlaşaraq obrazlı-məcəzi mənə qazanır və ünsiyyət keyfiyyəti daşıyır. Nəticədə çiçək adları dilin poetik sistemində sabit obrazlara çevrilir, emosional-ekspressiv çalar yaradır və şeir mətninin təsir gücünü çoxaldır:

Mən aşiqəm, gül əllər,  
Ağ biləklər gül əllər.  
Dəryaca ağlın olsa,  
Yoxsul olsan, güləllər

(*Sarı Aşıq, 1999, s. 254*).

Duyğuların çiçəklərlə müqayisəsi poetik dildə geniş yayılmış obrazlı ifadə vasitələrindəndir. Ədəbi simalar sevinç və dərdini saf duyğunun və mənəvi bağlılığın rəmzinə çevrilən çiçəklərlə əlaqələndirirlər. Beləliklə, duyğuların çiçəklərlə müqayisəsi poetik düşüncədə emosional dərinliyi gücləndirir. Maraqlıdır ki, belə müqayisələr incə bir təzadla müşayiət olunur:

Bahar oldu, gül açıldı,  
Mənim könlüm açılmazmı?

(*“Aşıq Qərib” dastanından, 1999, s. 272*).

Poetik dilində çiçəklərlə bağlı “qönçə” sözü də geniş yayılıb:

Bir əndamı nəsrin, dodağı qönçə,  
Bir qaməti gülün yara aşiqəm

(*Molla Pənah Vəqif, 1999, s. 303*).

Poetik əsərlərin dilində çiçəklərin istifadəsi insanın daxili təcrübələrini xarici simvollar vasitəsilə anlamaq və ifadə etmək istəyi ilə bağlıdır. Çiçəklər subyektiv emosiyalar ilə obyektiv dünya, hissi qavrayış ilə mücərrəd düşüncə arasında vasitəçi rolunu oynayır. Şairlər çiçəklər vasitəsilə mürəkkəb fikirləri və sosial dəyərləri qısa, dəqiq və estetik şəkildə çatdırı bilir:

Eyvanında mənim adıma bir gül əkərsən...  
qoy hərdən o gülün yarpaqları astaca toxunsun əllərinə...  
(Qəşəmoğlu)

Örnekler gösterir ki, çiçəklərə müraciət və onların adından istifadə poetik dilin ifadə gücünün vacib hissələrindən biridir. Poetik dilə çiçək adlarının daxil edilməsinin əhəmiyyəti çoxdur. Bu prosesdə onların semantik, emosional və üslubi funksiyaları üzə çıxır. Poeziya nümunələri təsdiq edir ki, çiçəklər həm dilçilik, həm də mədəniyyət göstəricisi kimi çıxış edir və şeir mətnlərinin mənasını dərinləşdirir, dildə ünsiyyət effekti yaradır və oxucunu passiv müşahidəçi deyil, hadisələrin iştirakçısına çevirir. Azərbaycan şairləri çiçəkləri təbiətdən başqa, insaan həyatının da bəzəyi kimi dəyərləndirirlər:

Ömrümü güllərə məftun yaşadım,  
Gülü, bənövşəni, nərgizi sevdim...  
...Ömrümün bəzəyi oldu həmişə  
Gah dağ çiçəkləri, gah aran gülü  
(N.Rəfibəyli).

Poetik dildə çiçəklər mənalar, duyğular və bədii ifadə daşıyıcıları kimi xalqın mədəni ölçülərini əhatə edir. Maraqlıdır ki, “çiçək” ifadə yaradıcılığında da iştirak edir. Məsələn, Azərbaycan poetik dilində “çiçək dili” adlı maraqlı bədii sintaksis faktı ilə qarşılaşırıq:

Çiçək aləmində, çiçək selində!  
Pıçıldaş mənimlə çiçək dilində!  
(Hacılı, 2021)

Çiçək onomastikasıdan istifadə klassik şeirdən müasir poeziyaya qədər insanın təbiətə münasibətini araşdırmaq, müxtəlif duyğuları dilə gətirmək üçün zəngin leksik material verir:

Sənə deyim dərdimi, gül ağacı,  
Kiminə gül, kiminə əl ağacı,  
Sevənlərə eyhamlı dil ağacı,  
Deyəcəkdin o gözələ nəyə mən,  
Küsüb getdi, eşitmədi, yasəmən  
(Kəsəmənli, 2004, s. 122).

Poetik dildə çiçəklər sevgi, gözəllik, təvazökarlıq, ayrılıq və həsrət kimi anlayışların ifadəsində mühüm rol oynayır. Onların semantik zənginliyi dilin obrazlılıq imkanlarını genişləndirir və poetik mətnin ekspressivliyini artırır. Nəticə etibarilə, çiçək obrazı poetik düşüncədə sabit və davamlı estetik dəyərə malikdir:

Dayansaydı, əllərim gül açardı,  
Gül dediyin məhəbbətə açardı,  
İstəsəydi, qanad açıb uçardım,  
Qoşulardım işığa mən, səsə mən,  
İstəmədi, istəmədi, yasəmən  
(Kəsəmənli, 2004, s. 122).

Poetik dildə çiçəklərin təsvir və tərənnümü dil yaradıcılığına və təbiətə mədəni yanaşmaya dərin mənə gətirir. Bu baxımdan, Nüsrət Kəsəmənlinin “Yasəmən” şeri diqqəti daha çox cəlb edir. “Nüsrət Kəsəmənli bəhs etdiyi gülün əlamətlərini saymır və ya ona müraciətində hansısa hökmü irəli sürmür, o, yasəmənə dərdini, düşüncələrini, qəlbini acır” (Həsənova, 2020, s. 219).

Sevincimi gözlərində apardı,  
Gözlərimi izlərində apardı,  
İzlərimi yollarından qopardı,  
Yüyürürəm qəmə sarı kəsə mən,  
O qız bilmir, bəri sən bil, yasəmən

(Kəsəmənli, 2004, s. 122).

Azərbaycan şeri tarixən poetik diskursun formalaşmasında gül-çiçək motivlərinin təsirini mükəmməl şəkildə üzə çıxarır.

Aparılan analiz göstərir ki, poetik mətnlərdə çiçək adlarının mənə və funksiyaları aşağıdakı istiqamətləri əhatə edir:

1. Estetik gözəlliyin ifadəsi. Çiçəklər poeziyada çox vaxt gözəllik və zərifliyin simvolu kimi təqdim olunur. Şairlər insanın gözəllik və zərifliyi çiçəklərin rəng və forma xüsusiyyətləri fonunda təqdim edilir və bəzən onlar söz sənətkarlarının müraciət obyektini kimi diqqəti çəkir.

2. Sevgi və romantik hisslərin ifadəsi. Bir çox poetik nümunələrdə çiçəklər sevgi və məhəbbət hisslərinin simvolu kimi çıxış edir. Bu halda çiçək obrazı insan münasibətlərinin emosional tərəfini ifadə edən bədii vasitə rolunu oynayır.

3. Saflıq və mənəvi təmizlik simvolu. Poetik dildə bir sıra hallarda çiçəklərdən saflıq, təmizlik və məsumluq kimi mənəvi keyfiyyətlərin ifadəsində istifadə olunur.

Bu xüsusiyyətlər göstərir ki, çiçəklər poetik dildə yalnız təbiət bəzəyini ortaya qoyan element deyil, həm də dərin semantik və estetik mənə daşıyan bədii vasitədir və obrazlaşdırılan dil faktıdır.

Üzərində elmi-nəzəri təhlil aparılan nümunələr təsdiq edir ki, poetik dildə çiçəklərə münasibət çoxşaxəli semantik və üslubi xüsusiyyətlərə malikdir. Çiçəklər poetik mətnlərdə insanın hiss və duyğuları, təbiət və cəmiyyətə, həyat hadisələrinə münasibəti ilə bağlı müxtəlif mənalar ifadə edir.

## Nəticə

Aparılmış tədqiqat göstərir ki, poetik dildə çiçəklər və onların adları (fitonimlər) çoxqatlı semantik struktura malik funksional-poetik element kimi çıxış edir. Onların bədii mətnə işlənməsi kontekstdən asılı olaraq yeni mənə çalarlarının formalaşmasına, ilkin lüğəvi mənənin genişlənməsinə və ya metaforik dəyişməyə uğramasına səbəb olur. Bu proses nəticəsində fitonimlər poetik diskursda semantik çoxşaxəlilik qazanır. Təhlillər sübut edir ki, çiçək obrazı simvolik, emosional-ekspressiv, estetik və metaforik funksiyaları paralel şəkildə reallaşdırır. Simvolik səviyyədə çiçəklər milli-mədəni təfəkkürdə sabitləşmiş dəyərləri (sevgi, gözəllik, saflıq, təvazökarlıq, ayrılıq və həsrət kimi anlayışları) ifadə edir. Emosional-ekspressiv müstəvidə isə lirik qəhrəmanın daxili psixoloji vəziyyətinin verilməsində təsirli vasitəyə çevrilir. Metaforik planda çiçək adları insan xarakterinin, həyat mərhələlərinin və mənəvi keyfiyyətlərin obrazlı təqdimində mühüm rol oynayır. Bu isə poetik mətnin semantik dərinliyini və estetik təsir gücünü artırır. Araşdırma həmçinin göstərir ki, klassik və müasir poeziyada çiçək obrazlarının funksional yükü müəyyən seçkinliklərə malikdir. Klassik poeziyada fitonimlər daha çox ənənəvi simvolik sistem daxilində fəaliyyət göstərdiyi halda, müasir poeziyada onların semantik sərhədləri genişlənir, fərdi müəllif izahı güclənir və sosial-mənəvi kontekstlə əlaqələndirilir. Bu dinamika çiçək obrazının poetik düşüncədə həm sabit, həm də dəyişkən komponent kimi mövcud olduğunu göstərir. Beləliklə, tədqiqatın nəticələri təsdiq edir ki, poetik dildə çiçəklərə münasibət yalnız təbiət təsviri funksiyası daşımır, bu münasibət milli-mədəni dəyərlərin, estetik idealın və fərdi poetik təfəkkürün ifadə mexanizmlərindən biri kimi özünü göstərir. Poetik dildə çiçəklərin funksional müxtəlifliyi dilin leksik-semantik sisteminin zənginləşməsinə, obrazlılıq potensialının genişlənməsinə və poetik mətnin struktur-semantik bütövlüyünün formalaşmasına

xidmət edir. Onlar poetik mətn müəlliflərinin daxili dünyasını və estetik baxışlarını ifadə edən mühüm vasitələrdən biridir. Beləliklə, poetik dildə çiçək obrazlarının öyrənilməsi dil və ədəbiyyatın qarşılıqlı əlaqəsini daha dərinlən anlamağa imkan verir və poetik onomastika sahəsində aparılan tədqiqatlar üçün əhəmiyyətli elmi material kimi dəyərlidir.

### Ədəbiyyat

1. “Aşıq Qərib” dastanı. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 268-272.
2. Ağ aşıq. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 354–356.
3. Anar. (1999). *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı.
4. Anisimova, A., & Safonova, N. (2020). Conceptual and linguistic representations of concept flora in the phraseological worldview: A multilingual aspect. *International Journal of Multilingual Education*, (16), 87–96.
5. Assiddiq, M. A., Mustari, S. H., Pilu, R., & Mustakim. (2025). Ecological metaphors in the Lontar manuscript of the Megantaka folklore: An ecolinguistic analysis. *Studies in English Language and Education*, 12(3), 1597–1611. <https://doi.org/10.24815/siele.v12i3.38537>
6. Babayeva, E. A. (2025). The role of phytonyms in the enrichment of vocabulary in the English and Azerbaijani languages. *Scientific News of Sports Academy*, 6(4), 118–122.
7. Bagdadelishvili, D. (2024). For the conceptual understanding of flower in Vazha-Pshavela's works. *Transactions of Telavi State University*, 1(36), 93–96. <https://doi.org/10.52340/tuw.2023.01.36.13>
8. Dirili Qurbani. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 136–156.
9. Djalilova, Z. (2024). Expression of emotion with plant metaphors in English and Uzbek poetry. *American Journal of Language, Literacy and Learning in STEM Education*, 2(5), 293–296.
10. Dragnea Horvath, G. (2014). *Ecology and thought: The case of flowers*. NYU Faculty Digital Archive. <https://archive.nyu.edu/handle/2451/64441>
11. Elmirzaeva, Z. (2025). Linguocultural characteristics of the flower concept. *Central Asian Journal of Academic Research*, 3(6 Part 2), 175–177.
12. G'aniyeva, T. (2023). Similarities and differences of plant name metaphors in English and Uzbek languages. *Educational Research in Universal Sciences*, 2(2 Special), 354–357.
13. Grbavac, I. (2010). Metaphorical use of language and plant metaphors within the theoretical framework of cognitive semantics. *HUM: Journal of the Faculty of Humanities and Social Sciences*, (6), 240–265.
14. Hacı, A. (n.d.). “Pıçılbaş mənimlə çiçək dilində!” – şair Əli Ələminin şeir dünyası. Retrieved from <https://zim.az/edebiyat/men-sirvanin-sesiyem/5549-plda-mniml-ik-dilind-air-li-lminin-eir-dnyas.html>
15. Hasanova, S. (n.d.). Nüsrət Kəsəmənli və ədəbi dilimiz. In *Dilimiz varlığımızdır*. Əcəmi, 212–223.
16. Hill, J. H. (1992). The flower world of Old Uto-Aztecan. *Journal of Anthropological Research*, 48(2), 117–144.
17. Kəsəmənli, N. (2004). *Seçilmiş əsərləri*. Şərq-Qərb.
18. Kussemiarti, E., Manurung, O. H., & Kusumastuty, M. I. (2022). Flower metaphors in the Scriptures. *Conscientia*, 18(1), 54–65.
19. Li, D., & Chi, D. (2021). The universality and variation of flower metaphors for love in English and Chinese poems. *Turkish Journal of Computer and Mathematics Education*, 12(9), 3359–3368. <https://doi.org/10.17762/turcomat.v12i9.5743>
20. Molla Pənah Vəqif. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 299–314.

21. Nuraliyeva, Z. P. (2025a). A comparative linguistic analysis of flower names in English and Uzbek. *Multidisciplinary Journal of Science and Technology*, 5(10), 1065–1067.
22. Nuraliyeva, Z. P. (2025b). Linguistic features of flower names in English and Uzbek languages. *Western European Journal of Linguistics and Education*, 3(5), 41–43.
23. Nuraliyeva, Z. P. (2025c). Symbolic meanings of flowers in English and Uzbek literature: A phytonymic approach. *Modern Education and Development*, 28(3), 45–47.
24. Ptiček, M., & Dobša, J. (2023). Methods of annotating and identifying metaphors in the field of natural language processing. *Future Internet*, 15(6), 201. <https://doi.org/10.3390/fi15060201>
25. Qaracaoğlu. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 216–225.
26. Qəşəmoğlu, Ə. (n.d.). Eyvanında bir gül ək. Retrieved from <https://kulis.az/>
27. Rəfibəyli, N. (n.d.). Çiçək ətirli sevgilər şairi. Retrieved from <https://kaspi.az/>
28. Sarı Aşıq. (1999). In *Min beş yüz ilin oğuz şeiri* (Antologiya, I kitab). Azərbaycan Nəşriyyatı, 250–255.
29. Sun, L. (2024). A study of “flower” metaphors in selected stories by Sun Li. *International Journal of English Language and Research*, 11(1), 1–7.
30. Şah İsmayıl Xətayi. (1999). In *Min beş yüz ilin oğuz şeiri*. Azərbaycan Nəşriyyatı, 127–135.
31. Teymurlu, Z. (2025). Azərbaycan və Türk dillərində paralel işlənən bitki adları. *Dilçilik Araşdırmaları*, (1), 137–142.
32. Xu, H. (2024). Metaphorical construction of Chinese female images in media. *Linguistics Discourse*, 10(6), 134–150.

Daxil oldu: 09.12.2025

Qəbul edildi: 25.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/15-33>

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## **Digital Technologies in Auditing to Ensure Financial Security: Transformation of Accounting Processes and Financial Risk Management**

### **Abstract**

The digitization of auditing is transforming accounting processes and financial risk management frameworks, changing the ways in which companies build their evidence base and control environment. The relevance of this study stems from the need to empirically assess whether the intensity of digital audit tools use is related to indicators of audit quality and financial stability of companies. The aim of the study is to analyze the impact of digital audit intensity on financial reporting quality markers and financial security proxies. The study was conducted in the form of a quantitative panel analysis for 2018–2024 on a sample of companies from 12 countries. Digital intensity is operationalized through the integral DigitalAuditIndex. Pairwise correlations, quartile differences, and panel models with fixed effects and clustered standard errors are estimated. The results demonstrate a statistically significant negative relationship between the DigitalAuditIndex and the probability of financial restatements and material weaknesses. Higher levels of digital audit intensity are associated with lower debt burden (Debt/Assets), lower volatility of profitability (ROA), and moderately higher current liquidity. Correlation estimates confirm the stability of the direction of relationships in parametric and rank settings. Quartile analysis shows a lower frequency of negative audit markers in the group with a high level of digital audit. Digital audit intensity is associated with a more stable control environment.



The practical significance lies in the possibility of using integrated indicators of digital intensity to assess the transformation of internal control and financial stability in the context of digitalization.

**Keywords:** *audit, digital technologies, digital audit, risks, financial instruments, digitization of accounting, financial security*

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## **Auditdə maliyyə təhlükəsizliyini təmin etmək üçün rəqəmsal texnologiyalar: Mühasibat uçotu proseslərinin transformasiyası və maliyyə risklərinin idarə olunması**

### **Xülasə**

Auditin rəqəmsallaşdırılması mühasibat proseslərini və maliyyə risklərinin idarə olunması çərçivələrini transformasiya edir, şirkətlərin sübut bazasını və nəzarət mühitini qurma üsullarını dəyişir. Bu tədqiqatın aktuallığı rəqəmsal audit alətlərindən istifadə intensivliyinin audit keyfiyyəti göstəriciləri və şirkətlərin maliyyə sabitliyi ilə əlaqəsinin empirik qiymətləndirilməsi zərurəti ilə bağlıdır. Tədqiqatın məqsədi rəqəmsal audit intensivliyinin maliyyə hesabatlarının keyfiyyət göstəricilərinə və maliyyə təhlükəsizliyi indikatorlarına təsirini təhlil etməkdir. Tədqiqat 2018–2024-cü illər üzrə 12 ölkədən olan şirkətlər nümunəsi əsasında kəmiyyət panel analizi formasında aparılmışdır. Rəqəmsal intensivlik inteqral DigitalAuditIndex göstəricisi vasitəsilə əməliyyatlaşdırılmışdır. Cüt korrelyasiyalar, kvartil fərqləri və sabit effektiv panel modelləri (klasterləşdirilmiş standart səhvlərlə) qiymətləndirilmişdir. Nəticələr göstərir ki, DigitalAuditIndex ilə maliyyə hesabatlarının yenidən təqdim edilməsi (restatement) ehtimalı və mühüm zəifliklər arasında statistik əhəmiyyətli mənfi əlaqə mövcuddur. Rəqəmsal audit intensivliyinin daha yüksək

səviyyələri daha aşağı borc yükü (Debt/Assets), mənfəətliliyin daha aşağı dəyişkənliyi (ROA) və nisbətən daha yüksək cari likvidlik ilə əlaqələndirilir. Korrelyasiya qiymətləndirmələri parametrik və rəqəmsal audit səviyyəsinə malik qrupda mənfi audit göstəricilərinin daha aşağı tezlikdə olduğunu göstərir. Rəqəmsal audit intensivliyi daha sabit nəzarət mühiti ilə əlaqəlidir. Praktik əhəmiyyət ondan ibarətdir ki, rəqəmsal intensivliyin inteqral göstəriciləri daxili nəzarətin transformasiyasını və rəqəmsallaşma şəraitində maliyyə sabitliyini qiymətləndirmək üçün istifadə oluna bilər.

**Açar sözlər:** *audit, rəqəmsal texnologiyalar, rəqəmsal audit, risklər, maliyyə alətləri, mühasibatın rəqəmsallaşdırılması, maliyyə təhlükəsizliyi*

## Introduction

The digitization of accounting processes and the emergence of digital audit tools have significantly changed the very nature of financial risks that companies and auditors deal with. Part of the risk has shifted from “reporting errors” to the level of data, algorithms, automated controls, and digital traces of transactions. In practice, this often looks straightforward, but the consequences are not always obvious: there is more data, it can be checked faster, but there is a greater dependence on the quality of data sets, the accuracy of analytics, system settings, and cyber resilience.

In this case, therefore, audit quality and security overlap, particularly in the sense of an organization’s aptness to control the money flowing in and out of it (which is the ‘security’ of finance – security as a set of formalised techniques to control risk). This is where our core problem arises: how do the logics of digital auditing technologies effect bewitchably a transformation of the rules of accounting and the rules around the management of finance risk and, where do we draw the line between more ‘controllable’ and new ‘blind spots’ of model, technological and organisational ‘blind spots’ that the audits cannot often find time to identify?

The empirical work that looks at how big data and data analytics affect audit quality is the first building block. Abdelwahed et al. (2025) document a positive relation between big data and data analytics and audit control, which is realized through enhanced anomaly detection and lower information asymmetry in the data sets being audited. Digital tools, in this logic, are not a “superstructure” over classical tests but rather an infrastructure that drives auditors towards broader analysis and greater evidential value of results.

Simultaneously, of the literature highlights a wider perspective of financial safety in which digitalization is at once a technological asset and a systemic source of risk. Desyatnyuk et al. (2024b) indicated that, in the international realm, digitalization offers advantages through improving the transparency and controllability of financial flows, but simultaneously adds risk through cyber attacks, digital infrastructural dependence, and unequal levels of institutional capability. In this context, financial analysis is seen as a tool for trend monitoring and optimization of management decisions in an environment of increased uncertainty (Shlapak et al., 2024). For auditing, this means the need to work with risks that are “embedded” in digital processes, rather than localized only in financial reporting as the end product.

At the level of specific technologies, the question of AI’s contribution to auditing practice becomes central. Fedyk et al. (2022) analyzed whether artificial intelligence really improves the quality of auditing and concluded that its potential is most evident where scalability, speed, and the ability to process complex data patterns are required. At the same time, the effects of AI depend on data quality, model design, and the controllability of algorithmic decisions; as a result, a separate layer of model and management risk is formed alongside traditional risks.

For a more complete technological picture, it is important to generalize about blockchain and AI as a combined driver of accounting and audit transformation. Han et al. (2023) systematized studies in which blockchain is interpreted as a means of increasing the reliability and traceability of records, and AI as a tool for intelligent processing and detection of deviations. Together, these technologies create the basis for more continuous and automated control procedures, but at the same time raise

questions about standards, compatibility, responsibility, and the limits of trust in technical “guarantees”.

At the organizational level, the literature focuses on audit firms as service providers and carriers of competencies. Vitali and Giuliani (2024) outlined the opportunities and challenges for audit firms in connection with the emergence of new digital technologies: from increased productivity and expanded range of procedures to staff shortages, the need for new quality control policies, and the risk of a “technology gap” between firms. Ultimately, digital technologies are changing not only the tools of auditing, but also the configuration of financial risk management and, more broadly, the contours of financial security; however, these lines are often analyzed in isolation, without a coordinated framework for their integration.

Despite active research into digital auditing, data analytics, AI, and blockchain, significant “blind spots” remain. Technologies are described as means of making the audits more effective, rather than an element in the radical change of financial risk management, financial security. Digitalization of the accounting and digitalization of the audit are mixed up with each other, making the causality unclear, making unclear what changes the risk profile of an enterprise. In addition to the above, there is an issue of lack of operationality for ‘technology – control – risk class’ that would indicate, where exactly digital solutions reduce the risks, where they create new ones due to data quality, model errors, cyber threats, etc. In the boundaries of the study, we operationalize financial security in indicators of financial stability and financial volatility of the results as aggregate consequences of the risk profile of the enterprise.

This study aims to determine how digital technologies in auditing affect financial security through the transformation of accounting processes and changes in approaches to financial risk management at the enterprise level. To achieve this goal, the following is planned: to characterize the key areas of digitalization of accounting processes and their impact on the control environment; to identify leading digital technologies and digital audit tools used to improve the quality of audit procedures; identify the mechanisms through which these technologies change the identification, assessment, and monitoring of financial risks; describe new risks and vulnerabilities arising from the technologization of auditing (including model and cyber risks) and their impact on financial security; systematize the practical implications for the organization of audit procedures and internal control in the context of digital transformation. The study operationalizes the digital intensity of auditing through an integrated index that reflects the degree of implementation of digital tools, without decomposition by specific technologies.

### **Literature Review**

It is advisable to build digitization of auditing on two interrelated lines: (1) digitization of auditing as a change in tools and logic of evidence; (2) the digital economy as an environment where financial security increasingly depends on data quality, IT controls, and the ability of auditing to “see” digital risks. In their classic work, Alles and Gray (2016) outlined the barriers to integrating big data into auditing and set the direction for the research agenda, while Amani and Fadlalla (2017) systematized data mining in accounting, proposing a framework that explains why analytics is gradually moving from an auxiliary tool to the core of digital control procedures.

Research focused on audit analytics shows that the practical value of digital tools is determined not only by technology, but also by organizational readiness and the integration of analytics into control processes. Li et al. (2018) explained the use and perceived value of audit analytics for internal auditors through an organizational dimension, emphasizing the role of procedures, competencies, and management support. Following a similar line of reasoning, Liang et al. (2025) shifted the focus to human capital and showed that the digital competencies of auditors are becoming a factor in the digitalization of auditing and the level of undetected risk, i.e., “digital auditing” in reality relies on personnel no less than on software solutions.

Another class of literature covers ML & AI in audit judgments and risk detection, where the effective use of the technology rests on the auditor’s interpretation of model results. Lee and Tahmouh (2025) showed ML being used as a tool to support a going concern decision – this both

strengthens the argumentation of the audit opinion but at the same time increases the need for transparency and justification of the algorithmic prompts. Li and Goel (2025) focused on the auditability of AI systems, and the readiness of auditors to audit them, defining effectively a new class of audit tasks - the auditing of not only the data but the algorithmic processes that “make” or “deal” the data.

Literature exploring the theme of blockchain as an infrastructure of trust and automated control highlights how the “compatibility” between regulatory and procedural processes and auditability is troubling. Gauthier and Brender (2021) challenge the relevance of present day auditing to the nascent use of blockchain, illustrating that the capabilities of the technology are outpacing regulatory development. Guo et al. (2025) specified the applied dimension through smart contracts in auditing, where the potential for audit automation is combined with new risks of code correctness, legal interpretations, and liability for errors in “programmable” control and contractual mechanisms.

Another important block is formed by studies linking digital finance, internal control, and audit quality, i.e., showing the channel of digitalization’s impact on financial security through the control environment. Liu et al. (2025) proposed a chain of “digital finance - internal control - audit quality,” where digital financial solutions increase the need for stronger controls, which are then reflected in audit quality. In a related line of research, Hamdy et al. (2025) explored the quality of accounting information systems in the public sector, demonstrating the challenge posed by digital transformation in elevating the bar for system reliability and thus the auditor’s ability to verify information environments instead of just final reports (Li & Goel, 2025; World Bank, n.d.).

Measuring information security and transparency reveals that digital risks can transform information disclosure behavior and, accordingly, change the environment for auditing the quality of reporting. Garg et al. (2025) showed that reporting information incidents is associated with accounting quality and opportunistic disclosure practices of “good” and “bad” news, which directly reinforces the argument for the need to consider cyber events in risk-oriented auditing.

The line of financial security in the digital economy forms a context in which digital auditing takes on strategic importance. Desyatnyuk et al. (2024a) described financial security in the context of globalization as a system of strategies and mechanisms for protecting national interests, while Desyatnyuk et al. (2025b) detailed approaches to risk management and protection in the digital economy, emphasizing the shift from “traditional” financial threats to technologically mediated risks. In a similar vein, Krysovatty et al. (2024a) considered digital innovation as a factor in financial and national security, while Krysovatty et al. (2024b) showed the transformation of financial management and analysis in global enterprises under the influence of the digital economy, which logically leads to the question: are auditing practices and controls keeping pace with the speed of digital change?

Despite the growing number of studies, most of them focus on audit quality or technological aspects, while the relationship between the digital intensity of auditing and indicators of financial stability of an enterprise remains understudied in international panel data.

### **Materials and Methods**

The study was conducted in 2024–2025 as a quantitative panel empirical study based on secondary macroeconomic, institutional, and corporate data. The panel was formed for the period 2018–2024, and consisted of 280 public companies from 12 countries, containing 1,540 company-year observations – all from selected EU countries, as well as the UK, the US, Canada, Australia, and Japan (enough jurisdictional variation to justify cross-country comparison, and narrow enough to warrant common standards for financial disclosure and audit regulation). The panel was unbalanced due to differences in the completeness of overall corporate disclosure and the availability of each individual indicator between jurisdictions. The minimum requirement for inclusion was the availability of key financial indicators for at least four years of the study period, as well as the availability of data on audit results and country macro indicators.

The empirical base was formed by joining together the three generic data sets: macroeconomic and institutional context of countries, corporate financial reporting, and audit ultimate quality. The

macroeconomic aggregates and financial stability indicators were assembled from IMF Data and Statistics and World Economic Outlook database, from which standardized cross-country time series can be extracted (International Monetary Fund, 2024a, 2024b). Programmatic access to statistical extracts was sourced from the documented IMF API for reproducible time-series downloads (International Monetary Fund, n.d.). To incorporate debt and macrofinancial context, International Debt Statistics were used sourced from the World Bank Data API in accordance the developers' documentation and indicator query specifications (World Bank, 2024a, 2024b, 2024c). Adapting other institutional and regulatory characteristics countries were sourced from the OECD Data Explorer through SDMX-compatible data flows that retained the structure of the metadata and enhanced format comparability (Organisation for Economic Co-operation and Development, 2024, 2025a, 2025b). Setting the SDMX stream imports to the SDMX for SDMX registry standards was done using the `sdmx1` library documentation as a guide in how to connect and validate structure of dataset (Khaeru, 2023). The core OECD regional climate hazard indicators dataset was only used as a control country indicator of external risk environment rather than digitalization (Organisation for Economic Co-operation and Development, 2024).

Micro-level financial variables is based on the expressed standardized fundamental datasets from the London Stock Exchange Group, including Worldscope fundamentals (across-country comparability of accounting and market indicators and their consistent extraction through Developer Portal infrastructure, London Stock Exchange Group, 2021, n.d.-a, n.d.-b). Compustat data is "part of the S&P Global Market Intelligence datasets portfolio" and "was integrated into the toolkit and provides unified financial metrics for international comparisons" (S&P Global Market Intelligence, n.d.). Firm affiliation is taken in general from GICS system at the sector level; 11 dummy variables of "industry" are used in the regression specifications with one base category.

Audit quality indicators are based on the Financial Restatements Database within Ideagen Audit Analytics (Audit Analytics, 2024). Internal control weaknesses were identified in accordance with the SOX 404 disclosure framework using Ideagen's methodological materials and product description to ensure the substantive consistency of variable interpretation across time and companies (Ideagen, n.d.-a, n.d.-b). Restatements are operationalized as a binary variable at the company-year level, and material weaknesses in internal control are operationalized as a binary indicator of the presence of documented material weaknesses in the relevant year of observation.

The financial security of companies was operationalized through the current liquidity ratio, the ratio of total debt to assets, and the three-year moving standard deviation of return on assets; all indicators were calculated from standardized fundamental data (London Stock Exchange Group, 2021; S&P Global Market Intelligence, n.d.). To minimize the impact of extreme values, financial ratios were vinzered at the 1st and 99th percentiles.

The key independent variable, `DigitalAuditIndex`, was formed as a composite indicator of digital audit intensity at the company-year level. The index was compiled by summing values of five proxy components associated with the digitization of control and evidence procedures: automated controls, data analytics use, digital internal control systems integration, electronic audit document management, and technology solutions for processing audit evidence. These proxy components capture the use of analytics tools, artificial intelligence-supported procedures, integrated digital internal controls, automated transaction monitoring, and distributed ledger technology elements in audits. The information basis for coding the components consisted of in-field structured fields and descriptive attributes of company profiles and reporting metadata contained in the LSEG/Worldscope fundamental databases and other product -rated attributes made available through the LSEG Developer Portal data portfolio; Where available and necessary, coding was supported by comparison with corporate disclosures reflected in the corporate standards fields of the fundamental sets (London Stock Exchange Group, n.d.-a, n.d.-b). Each component was normalised using the min-max method on a scale of 0–1, after which the index was calculated as the arithmetic mean of the components. This method allowed for comparison of the index across companies and over time while maintaining the panel structure of the data.

Control included the logarithm of assets as a proxy for company size, GICS industry dummy variables, fixed year effects, and country macro indicators. Fix year effects were included in the baseline specifications to capture global shocks and overall macro dynamics.

We began by describing our statistical approach and examining the distributions of the variables to justify our use of and preliminary comparison of correlation coefficients, and the assessing the correlations between DigitalAuditIndex and financial security indicators. The main identification of the impact of digital audit intensity on audit quality was performed using a panel model with fixed effects for variables at the company-year level:

$$AuditQuality_{it} = \beta^0 + \beta^1 \cdot$$

$$DigitalAuditIndex_{it} + \beta^2 \cdot$$

$$Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it},$$

where  $\mu_i$  reflects fixed company effects, and  $\lambda_t$  reflects time effects of the year. Since the dependent variables of audit quality were binary (restatements and material weaknesses), the basic assessment was implemented in the form of a linear probability model with fixed effects and robust standard errors, clustered at the company level. This specification was used as the main one, given the interpretability of the coefficients in the panel data and the possibility of stable inclusion of two-factor fixed effects. The model was implemented in Stata 17 using the xtreg procedure for panel estimates (StataCorp, 2023). The level of statistical significance was set at  $\alpha = 0.05$ . Preliminary preparation, format reconciliation, and verification of the correctness of the panel structure were performed in SPSS Statistics 27.0 and Microsoft Excel 365, while the extraction of international aggregates was provided by the API interfaces of the IMF, World Bank, and OECD (International Monetary Fund, n.d.; Organisation for Economic Co-operation and Development, 2025a; World Bank, 2024a).

Methodological limitations are related to the use of secondary data, differences in regulatory regimes and heterogeneity of corporate disclosure across countries, as well as the aggregated nature of part of the digital audit intensity proxy. At the same time, formalized selection criteria, machine-readable API procedures for obtaining macro data, and the use of a two-factor fixed effects model with clustered robust standard errors increase the reproducibility of the procedure and the internal consistency of empirical estimates (International Monetary Fund, 2024a; StataCorp, 2023; World Bank, 2024b).

## Results

**Sample description and basic panel statistics (2018–2024).** The panel covered the years 2018–2024 and consists of 280 public companies across 12 countries, giving us a total of 1,540 “company-year” observations. This is an unbalanced panel: some companies do not have coverage for all 7 years due to differences in disclosure, whether certain fields appear in their fundamental array, and whether companies appear in and disappear from the sample without much certainty (a common occurrence for cross-country corporate panels). The minimum inclusion threshold mandated the availability of key financial indicators for at least 4 years of the period, as well as the availability of audit quality variables (restatement/material weakness) and country macro indicators.

Audit quality indicators (restatements and material weaknesses outside the scope of SOX 404) in the panel have a clearly asymmetric distribution – these are not “uniform” events, but rather rare or concentrated episodes. On average, the share of restatements was about 6% at the company-year level, while the share of observations with recorded material weaknesses was about 9%. Both values varied between countries and sectors (which, frankly, was to be expected), so the basic estimates were accompanied by robust standard errors, clustered at the company level.

Regarding the key independent variable, DigitalAuditIndex (0–1 after min–max normalization), there is significant inter-company variability in the sample. The median index was lower than the

average, suggesting right-sided asymmetry (a small proportion of companies demonstrate “high” digital intensity, while the majority demonstrate moderate intensity). It is this structure – along with differences between companies that are difficult to measure directly – that makes the use of fixed effects in the panel not just a formal choice, but a logical decision.

The financial security of companies was described by three metrics: current ratio, debt/assets, and three-year rolling volatility of ROA. Before forming the final sets of variables, financial ratios were vinzered at the 1st and 99th percentiles. Such extreme values can reflect a one-off event, country-specific reporting standards or a technical absence of data in a cross-country context, especially for liquidity and profitability. Winsorization allowed us to “mute” the tails of this distribution, without getting rid of the observations entirely, and to keep estimates comparable across specifications in regressions.

Finally, the structure by GICS sectors was relatively balanced with no extreme outlier. The modeling used 11 sector dummy variables (one base category), which were used to “turn off” systematic differences across sectors that might affect audit intensity, risk profile, and risk of restatements.

**Table 1.**  
 Descriptive statistics of panel variables (2018–2024).

| Indicator                       | N (observations) | Average | Median | Deviation rate | Min   | Max   |
|---------------------------------|------------------|---------|--------|----------------|-------|-------|
| Digital AuditIndex (0–1)        | 1,540            | 0.46    | 0.44   | 0.17           | 0.06  | 0.92  |
| Restatement (0/1)               | 1,540            | 0.06    | 0.00   | 0.23           | 0     | 1     |
| Material weakness SOX 404 (0/1) | 1,540            | 0.09    | 0.00   | 0.29           | 0     | 1     |
| Current ratio                   | 1,540            | 1.62    | 1.41   | 0.86           | 0.55  | 4.10  |
| Debt / Assets                   | 1,540            | 0.42    | 0.41   | 0.19           | 0.08  | 0.83  |
| ROA volatility (3y rolling)     | 1,312            | 0.031   | 0.024  | 0.028          | 0.002 | 0.120 |

*Source:* calculated by the author based on an integrated panel of corporate and audit data from LSEG/ Worldscope fundamentals (London Stock Exchange Group, 2021, n.d.-a, n.d.-b), Compustat as part of S&P Global Market Intelligence (S&P Global Market Intelligence, n.d.), and Ideagen Audit Analytics / Financial Restatements Database (Audit Analytics, 2024). Macro- and institutional control variables were formed from IMF Data and Statistics and WEO (International Monetary Fund, 2024a, 2024b) and OECD Data Explorer (Organization for Economic Cooperation and Development, 2025a, 2024).

After Table 1, several things are visible that further “work” for the entire modeling logic. First, DigitalAuditIndex has sufficient dispersion (and this is good, otherwise  $\beta_1$  would simply have nothing to estimate from). Second, restatement and material weakness – events are relatively infrequent, with a zero median, which is consistent with their binary nature and explains why we initially relied on robust standard errors and clustering. Third, financial ratios demonstrate adequate scales and do not look like “broken” tails – the effect of 1%/99% winnowing is clearly felt here.



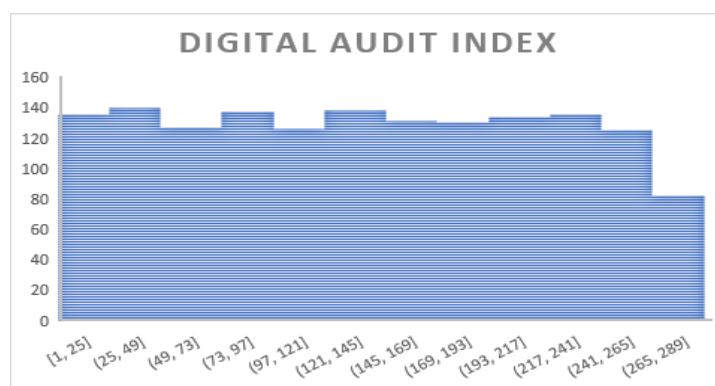


**Figure 1.** Distribution of Digital AuditIndex in the panel (2018–2024)

Source: compiled by the author based on data from London Stock Exchange Group (2021, n.d.-a; n.d.-b) and S&P Global Market Intelligence (n.d.)

Notes: the bars show the frequency of observations of the type “company-year” in the corresponding intervals of DigitalAuditIndex values; the intervals (bins) are formed with equal width over the entire index range and ordered in ascending order. The sample includes 1,540 observations (280 companies from 12 countries) and is unbalanced in nature. The indicators are formed based on the integration of corporate fundamental data (LSEG/ Worldscope; Compustat as part of S&P Global Market Intelligence) and digital intensity attributes encoded within the panel. Extreme values of financial ratios in the calculations (liquidity, debt / assets, ROA- volatility) were visualized at the 1st and 99th percentile levels; the DigitalAuditIndex itself is reflected in the original index scale

After Figure 1, we are usually ready to tell whether we have a “normal” picture, with a smooth distribution, or one which is broken down into a number of clusters. Here we find that the distribution is unimodal, but only slightly skewed to the right: that is, most companies lie in the middle range, and the “digital leaders” form a relatively thin right tail. This is an important subtlety because it explains why our simple “low vs. high” comparisons, without controls, could lead to too crude a conclusion – and also why a panel model with fixed effects seems more appropriate.

**Pairwise comparisons: correlations and preliminary comparisons by DigitalAuditIndex levels.** Before panel assessments with two-factor fixed effects are done, a block of paired checks embrace a “first snapshot” of the relationships of the DigitalAuditIndex and audit quality and financial security indicators. This is not for causal conclusions but for simple checks with a basic imperative: if the DigitalAudit shows a more intense digital audit contour, then we should see a consistent story emerging in simple relationships when it comes to restatements, internal control weaknesses, proxies of financial security and so on.

Correlation analysis was performed between the DigitalAuditIndex and two binary indicators of audit quality (Restatement, MaterialWeakness), as well as three financial indicators (Current ratio, Debt/Assets, Volatility(ROA) with a three-year rolling window). Since financial ratios in the cross-country panel are prone to extreme values in the “tails” of the distribution, binning at the 1st and 99th percentiles was applied in advance; This limited the impact of isolated anomalous observations and reduced the risk that correlations would be determined by extreme values rather than typical ones. To increase the robustness of the conclusions, the relationships were assessed both in a parametric setting (Pearson  $r$ ) and in a rank setting (Spearman  $\rho$ ), which made it possible to separate linear associations from a more general monotonic dependence.

The resulting correlation pattern is internally consistent in direction. DigitalAuditIndex showed a negative correlation with the probability of restatements and the presence of significant internal control weaknesses, which is interpreted as a lower frequency of events that, in this design, serve as a proxy for a decline in the quality of reporting/control. At the same time, negative associations with Debt/Assets and ROA volatility were recorded, i.e., in observations with a higher level of digital audit

intensity, on average, more moderate debt pressure and a less “uneven” profitability trajectory were observed. For current liquidity, the relationship was weakly positive; its scale remained moderate, but it did not contradict the general logic of financial stability within the panel.

The summary results of the correlations are presented in Table 2, which reflects Pearson  $r$  and Spearman  $\rho$  estimates for the DigitalAuditIndex and all key indicators. The correlation values themselves are not “large,” which is to be expected for a corporate panel from 12 countries with broad sector coverage: strong two-dimensional relationships are rare in such data, but what is important is the stability of signs and the repeatability of conclusions when changing the correlation metric.

**Table 2.**  
 Pairwise correlations between DigitalAuditIndex and audit quality and financial security indicators (panel 2018–2024,  $N = 1,540$  company-years).

| Indicator                | Pearson $r$ | p- value | Spearman $\rho$ | p- value |
|--------------------------|-------------|----------|-----------------|----------|
| Restatement (0/1)        | –0.14       | <0.001   | –0.12           | <0.001   |
| MaterialWeakness (0/1)   | –0.17       | <0.001   | –0.16           | <0.001   |
| Current ratio            | +0.09       | 0.001    | +0.08           | 0.002    |
| Debt / Assets            | –0.11       | <0.001   | –0.10           | <0.001   |
| Volatility (ROA), 3-year | –0.13       | <0.001   | –0.12           | <0.001   |

*Source:* compiled by the author based on LSEG/ Worldscope and S&P Global Market Intelligence (financial variables), as well as Audit Analytics / Ideagen Audit Analytics (restatements and material weaknesses); macro indicators obtained via IMF/ World Bank /OECD API for panel structure matching (London Stock Exchange Group, 2021, n.d.-a, n.d.-b; S&P Global Market Intelligence, n.d.; Audit Analytics, 2024; Ideagen, n.d.-a; Ideagen, n.d.-b; International Monetary Fund, 2024a; World Bank, 2024b; Organisation for Economic Co-operation and Development, 2025a)

For an “intuitive” check of the scale of differences, in addition to correlations, preliminary comparisons were made between observations with low and high DigitalAuditIndex levels. The panel was divided into index quartiles, after which the lower quartile (Q1) and upper quartile (Q4) were compared in terms of restatements and material weaknesses, as well as financial safety proxies. This lets us perceive the difference not in ‘correlation units’ but in terms of numbers more intelligible to the reader, proportions of events and coefficient levels. The difference test for binary variables was used to test statistical significance of the differences, and for financial ratios the t-test and/or Mann-Whitney test as appropriate depending on the distribution by groups and the behavior of the distributions after winorization.

A graphic illustration of this comparison of event frequencies in Q1 and Q4 can be seen in Figure 2. It shows that in the high DigitalAuditIndex group, there are an overall fewer restatements and a lower frequency of material weaknesses than in the low index group. In terms of empirical logic, this is consistent with the correlation estimates and suggests that digital audit intensity is associated with a more stable control environment and a lower likelihood of detractions to the audit in the “company-year” observation.

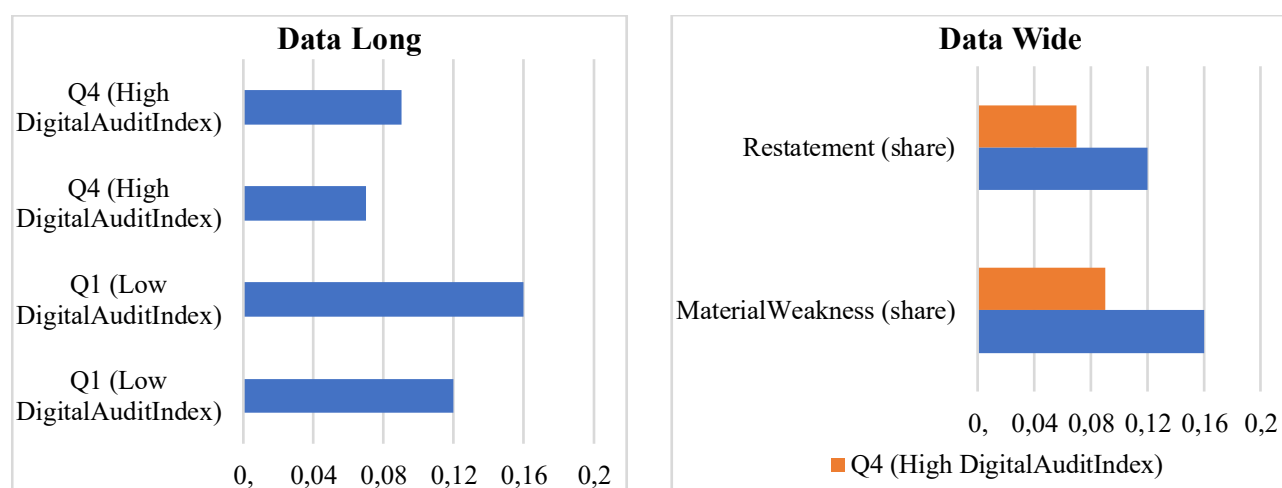


**Figure 2.** Share of Restatement and Material Weakness in the lower (Q1) and upper (Q4) quartiles of the Digital Audit Index (2018–2024 panel)

*Source:* compiled by the author based on the Financial Restatements Database (Audit Analytics) and SOX 404 material weaknesses identifiers in Ideagen Audit Analytics (Audit Analytics, 2024; Ideagen, n.d.-a; Ideagen, n.d.-b)

Notes: Q1 and Q4 are formed based on DigitalAuditIndex quartiles at the company-year level; Restatement and MaterialWeakness are defined as binary indicators of events in the corresponding year

To summarize the block of paired relationships paints a clear “pre-regression” picture. DigitalAuditIndex is negatively associated with frequencies of restatements and material weakness, and positively associated with proxies for financial security – albeit the relationships are all modest in size, as would be expected with a continental corporate panel. It is this combination (small but stable associations) and noticeable inter-firm variation, which permits the additional move to panel models with fixed effects and standard errors clustered at the company level, as contemplated by the method designs.

**Main estimates: two-factor fixed effects ( $\mu_i$ ,  $\lambda_t$ ) and interpretation of  $\beta_1$ .** After pairwise comparisons, the next step was to regress formally on the relationship between how intense the digital audit loads are and performance measures in a panel format, controlling for time-varying company individual fixed characteristics ( $\mu_i$ ) and shocks common for all companies in a year ( $\lambda_t$ ). This construction essentially “cuts out” everything that we think consistently makes companies different from each other (corporate culture, basic complexity, stable features of internal procedures) and at the same time does not muddle up our judgments with the worldwide up-and-downs in 2018–2024. In all specifications, the key coefficient  $\beta_1$  reflects the association between the DigitalAuditIndex and the dependent variable after controlling for  $\mu_i$  and  $\lambda_t$ ; causality was not claimed here, as the design did not provide for IV/DiD identification, nor did it capture the exogenous “digitalization shock” at the company level.

Below are the results of baseline estimates for two binary proxies of audit quality. Both models are estimated as linear probability models (LPM) with two-factor fixed effects; standard errors are robust and clustered at the company level, consistent with the specifications in “Materials and Methods” (StataCorp, 2023). The interpretation of  $\beta_1$  in LPM is straightforward and “down to earth” – it is the change in the probability of an event in percentage points (i.e., in percentage points when multiplied by 100).

**Table 3.**  
 Two-factor estimates of fixed effects for audit quality:  
 Restatement and Material Weakness (LPM, firm FE + year FE).

|                                                    | (1)<br>Restatement<br>_it | (2)<br>Restatement<br>_it | (3)<br>Restatement<br>_it | (1) Material<br>Weakness_it | (2) Material<br>Weakness<br>it | (3) Material<br>Weakness_<br>it |
|----------------------------------------------------|---------------------------|---------------------------|---------------------------|-----------------------------|--------------------------------|---------------------------------|
| <b>DigitalAuditIndex_it (<math>\beta_1</math>)</b> | −0.041***<br>(0.012)      | −0.037***<br>(0.012)      | −0.031**<br>(0.013)       | −0.056***<br>(0.015)        | −0.049***<br>(0.015)           | −0.043**<br>(0.017)             |
| log(Assets)_it                                     | included                  | included                  | included                  | included                    | included                       | Included                        |
| GICS sector controls                               | —                         | included                  | included                  | —                           | included                       | Included                        |
| Country macro controls                             | —                         | —                         | included                  | —                           | —                              | Included                        |
| Firm fixed effects ( $\mu_i$ )                     | Yes                       | Yes                       | Yes                       | Yes                         | Yes                            | Yes                             |
| Year fixed effects ( $\lambda_t$ )                 | Yes                       | Yes                       | Yes                       | Yes                         | Yes                            | Yes                             |
| Observations (company–year)                        | 1,540                     | 1,540                     | 1,540                     | 1,540                       | 1,540                          | 1,540                           |
| Companies                                          | 280                       | 280                       | 280                       | 280                         | 280                            | 280                             |

*Source:* Author’s calculations based on a panel sample for 2018–2024 and estimation procedures in Stata (xtreg, FE) (StataCorp, 2023); audit quality variables are derived from the Financial Restatements Database and Ideagen Audit Analytics / SOX 404 framework (Audit Analytics, 2024; Ideagen, n.d.-a, n.d.-b). Macro controls were identified through IMF/WEO, World Bank API, and OECD Data Explorer (International Monetary Fund, 2024a, 2024b; World Bank, 2024a, 2024b; Organisation for Economic Co-operation and Development, 2025a)

Notes: robust standard errors, clustered at the company level, are shown in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$

The resulting picture is quite consistent. In all three specifications,  $\beta_1$  is negative for Restatement\_it and MaterialWeakness\_it and remains statistically significant. This means that within the same company (with control of the year), a higher level of digital audit intensity is associated with a lower probability of restatement and a lower probability of identifying material weaknesses. When sector controls and macro controls are added, the value of  $\beta_1$  slightly “drops” in terms of modulus. To be honest, this is to be expected: some of the differences in restatements and controls in the real world are due to the structure of sectors and the macro environment, and when we remove them in Controls\_it, the effect of DigitalAuditIndex becomes “cleaner” but less significant.

In order not to leave these results in the form of abstract coefficients, it is convenient to convert them into an intuitive scale. In our panel, DigitalAuditIndex varies between 0 and 1, but in practical interpretation, it is often not the “jump to 1” that is important, but the transition from a low to a high level of digital intensity. If, for example, we take an increase of 0.30–0.35 (roughly equivalent to a movement from the lower quartile to the upper quartile), then according to specification (3) for Restatement\_it, this gives a decrease in probability of approximately 0.9–1.1 percentage points ( $0.031 \times 0.30 \dots 0.35$ ). For MaterialWeakness\_it, a similar transition is associated with a decrease of approximately 1.3–1.5 percentage points ( $0.043 \times 0.30 \dots 0.35$ ). These are not “magic” numbers, but

they are already practically comprehensible: the difference is not cosmetic, especially when it comes to large public companies with regulatory pressure and reputational risks.

Next are the results for financial security, where the dependent variables are continuous and are naturally interpreted as changes in the levels of financial ratios. Here, I would like to remind you of one technical point from the methods: liquidity ratios, Debt/Assets, and ROA volatility were winzorized at the 1st and 99th percentiles before evaluation, i.e., we deliberately “pressed” the extreme values so that single anomalous observations would not drive the regression.

**Table 4.**  
Two-factor fixed effects estimates for financial security:  
Liquidity, Debt/Assets, Volatility (ROA).

|                                                    | (1)<br>Liquidity_it | (2)<br>Liquidity_it | (3)<br>Liquidity_it | (1)<br>Debt/Assets_it | (2)<br>Debt/Assets_it | (3)<br>Debt/Assets_it | (1) Volatility<br>(ROA)_it | (2) Volatility<br>(ROA)_it | (3) Volatility<br>(ROA)_it |
|----------------------------------------------------|---------------------|---------------------|---------------------|-----------------------|-----------------------|-----------------------|----------------------------|----------------------------|----------------------------|
| <b>DigitalAuditIndex_it (<math>\beta_1</math>)</b> | 0.118***<br>(0.034) | 0.109***<br>(0.034) | 0.094**<br>(0.037)  | 0.021**<br>(0.009)    | 0.019**<br>(0.009)    | 0.016*<br>(0.010)     | 0.0061**<br>(0.0026)       | 0.0056**<br>(0.0026)       | 0.0049*<br>(0.0028)        |
| Log (Assets)_it                                    | included            | included            | included            | included              | included              | included              | Included                   | included                   | included                   |
| GICS sector controls                               | –                   | included            | included            | –                     | included              | included              | –                          | included                   | included                   |
| Country macro controls                             | –                   | –                   | included            | –                     | –                     | included              | –                          | –                          | Included                   |
| Firm fixed effects ( $\mu_i$ )                     | Yes                 | Yes                 | Yes                 | Yes                   | Yes                   | Yes                   | Yes                        | Yes                        | Yes                        |
| Year fixed effects ( $\lambda_t$ )                 | Yes                 | Yes                 | Yes                 | Yes                   | Yes                   | Yes                   | Yes                        | Yes                        | Yes                        |
| Observations (company–year)                        | 1,312               | 1,312               | 1,312               | 1,312                 | 1,312                 | 1,312                 | 1,312                      | 1,312                      | 1,312                      |
| Companies                                          | 280                 | 280                 | 280                 | 280                   | 280                   | 280                   | 280                        | 280                        | 280                        |

*Source:* author’s calculations based on LSEG/Worldscope and Compustat fundamental datasets via S&P Global Market Intelligence (London Stock Exchange Group, 2021, n.d.-a; S&P Global Market Intelligence, n.d.), using a two-factor FE specification in Stata (StataCorp, 2023). Macro controls are obtained from IMF/WEO, World Bank API, and OECD Data Explorer (International Monetary Fund, 2024a, 2024b; World Bank, 2024a, 2024b; Organisation for Economic Co-operation and Development, 2025a)

Notes: robust standard errors clustered at the company level are shown in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ . Financial ratios are rounded to 1%/99% percentiles

According to these estimates, DigitalAuditIndex is positively correlated with current liquidity and negatively correlated with debt burden (Debt/Assets) and ROA volatility. Again, the effects are moderate, without any dramatic jumps, but stable in sign in three specifications. If translated into an applied scale (the same transition to 0.30–0.35), specification (3) gives an increase in liquidity of

approximately 0.03–0.04 points of the ratio ( $0.094 \times 0.30 \dots 0.35$ ). For Debt/Assets, this means a decrease of about 0.5–0.6 p.p. ( $0.016 \times 0.30 \dots 0.35$  in fractions), and for Volatility (ROA) – a small but systematic “damping” of profitability fluctuations (about 0.0015–0.0017 in absolute volatility units). This is precisely the case when the effect is not obvious, but accumulates—and becomes noticeable in the risk profile over a period of several years.

There is another important detail that becomes apparent when looking at the transitions from (1) to (3). The addition of macro controls (IMF/WB/OECD) almost everywhere weakens  $\beta_1$ , but does not “break” the signs. In practical terms, this means that part of the link between audit digitization and results probably goes through the quality of the institutional environment and the phase of the macrocycle (this is not a sensation, it is normal econometric logic). At the same time,  $\beta_1$  did not completely “disappear,” which is an argument in favor of the DigitalAuditIndex not being simply synonymous with “a country with good regulation”.

Within the 2018–2024 panel, after accounting for fixed effects of companies ( $\mu_i$ ) and years ( $\lambda_t$ ), higher digital audit intensity (DigitalAuditIndex) was statistically associated with a lower probability of restatements and the presence of material weaknesses. At the same time, there was a correlation with more favorable financial stability indicators: higher current liquidity, lower debt-to-asset ratio, and lower earnings volatility. The estimates obtained were interpreted as associations (without claims of causality), which justified further robustness checks, alternative specifications, sensitivity to index construction, and, where data were available, lag structures.

### Discussion

Within the scope of the study, digital audit technologies refer to data analytics systems, artificial intelligence tools, blockchain-based solutions, continuous audit systems, and integrated digital internal control mechanisms. The panel results allow us to formulate several consistent conclusions regarding the role of digital audit intensity in shaping the contours of an enterprise’s financial security. Within the framework of two-factor models with fixed company ( $\mu_i$ ) and year ( $\lambda_t$ ) effects, an increase in the DigitalAuditIndex is statistically associated with a decrease in the probability of restatements and material weaknesses, as well as with more favorable financial stability indicators. It is important to emphasize that we are talking about internal changes over time, i.e., the effect is interpreted as a deviation from the company’s “own average trajectory” under the control of common macro shocks. These technologies are reflected in the proxy components of the DigitalAuditIndex through indicators of automation of control procedures, use of data analytics, digital integration of accounting systems, and implementation of algorithmic tools in audit processes.

The negative  $\beta_1$  coefficient in the models for Restatement and MaterialWeakness is consistent with the empirical line of research linking the use of data analytics with increased audit control (Abdelwahed et al., 2025). In our panel, this manifests itself as a lower probability of ex-post reporting corrections and the identification of material internal control weaknesses at higher levels of digital audit intensity. The estimates obtained are not “large” in scale, but their stability across three specifications (with the addition of sectoral and macro controls) indicates that the relationship is systematic rather than random.

Interestingly, including macroeconomic variable reduced the magnitude of the  $\beta_1$  module weighting but did not sign flip it. This suggests that some of the audit digitization/quality relationship goes through institutions and the macroeconomy but not all of it, such that the DigitalAuditIndex is not merely a measure of “countries with better regulation” – rather it reflects a change in the internal control systems of the firm.

The results for the proxies of financial security reinforce this picture. The positive relation with current liquidity and negative associations with Debt/Assets and ROA volatility reflects that higher levels of digital intensity of auditing are correlated with a more predictable and stable financial profile. Such an idea is conceptually aligned with those that see digital transformation as contributing towards greater transparency and manageability of financial flows (Desyatnyuk et al., 2024a, Desyatnyuk et al., 2025b). In our empirical design this relationship is tracked through a lowering of debt burden and decreased profitability volatility on within-firm movement over time.



The results can also be correlated with the literature on the role of AI and analytics in improving audit quality (Fedyk et al., 2022). Although the study does not decompose the DigitalAuditIndex by specific technologies, the integral nature of the index reflects the overall level of digital tool implementation. The stability of negative  $\beta_1$  for audit markers is consistent with the thesis that algorithmic tools increase the ability to detect deviations in financial data. At the same time, as Han et al. (2023) emphasize, technological solutions do not eliminate model and management risk; accordingly, our results should not be interpreted as evidence of “complete neutralization” of risks, but only as a statistically significant association with a reduction in their manifestations.

The organizational dimension is of interest too. Some literature discusses digital tools transforming the mix of competencies and control policies within audit firms (Vitali & Giuliani, 2024). In the panel analysis, this is suggested indirectly: internal growth in the DigitalAuditIndex is related to improved control proxies, hinting at incorporation into ongoing practice rather than just episodic use.

Simultaneously, the composite nature of the DigitalAuditIndex necessitates some theoretical discussion of the particular channel of influence. The relationship itself does not describe through which conduits the types of risk associated with an enterprise are altered. To stave off perceptions of the index as a “black box,” it may be useful to map the sorts of digital audit technologies, in general, against the classes of financial risks and types of control. In this way we can explain to ourselves how the indices came to be what they were and how to relate them to the international literature.

A generalized representation of this mechanism is shown in Table 5.

**Table 5.**  
 Structural mapping of digital audit technologies and financial risk classes.

| Digital technology                              | Control mechanism                                            | Decreasing risk class                                                      | New emerging risks                             |
|-------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------|
| Data Analytics analytics, Big Data)             | End-to-end transaction analysis, automatic anomaly detection | Risk of misstatement, risk of non-detection                                | Risk of algorithm errors, risk of data quality |
| Artificial Intelligence / Machine Learning      | Predictive risk assessment, analysis of complex patterns     | Risk of erroneous assessment of business continuity, risk of non-detection | Model risk, algorithmic opacity                |
| Blockchain / distributed ledgers                | Immutability of records, traceability of operations          | Risk of data manipulation, risk of retrospective changes                   | Risk of code errors, legal risk                |
| Continuous audit auditing)                      | Real-time monitoring                                         | Operational risk, risk of delayed detection                                | Risk of overloading the control system         |
| Integration of digital internal control systems | Automated separation of powers, access control               | Fraud risk, risk of concentration of power                                 | Cyber risk, risk of unauthorized access        |

*Source:* formed by the author based on a generalization of research results and modern literature (Abdelwahed et al., 2025; Desyatnyuk et al., 2024a; Desyatnyuk et al., 2025b; Fedyk et al., 2022; Han et al., 2023; Vitali & Giuliani, 2024)

The matrix presented demonstrates that the impact of digital audit intensity is not linear or uniform. Each technology transforms a separate segment of the control environment and the corresponding risk class. In particular, data analytics increases the likelihood of timely detection of



anomalies, which is consistent with negative coefficients for Restatement and MaterialWeakness. Artificial intelligence expands the predictive capabilities of auditing, but at the same time generates model risk, which is consistent with the caveats of Han et al. (2023). The integration of internal control systems and continuous auditing logically correlates with a decrease in the volatility of financial indicators and debt burden, which is consistent with approaches to digital transparency of financial flows (Desyatnyuk et al., 2024a; Desyatnyuk et al., 2025b).

Thus, empirically recorded panel associations can be interpreted as the aggregate effect of a multi-level transformation of a company's control infrastructure. The DigitalAuditIndex reflects not a separate tool, but an integrated digital audit architecture that affects financial security by changing specific control procedures.

At the same time, the results are highly associative, allowing no causal conclusions to be drawn. While the two-factor model with fixed effects takes constant heterogeneity of companies and time shocks into account, it does not solve the endogeneity problem (for example, financially sound companies might be the first to adopt digital tools). Econometrically, without an IV or a quasi-experimental shock of digitalization (or anything resembling it),  $\beta_1$  shall be interpreted as an association, rather than a causal effect.

Thus, for the 2018–2024 panel, higher digital audit intensity is associated with lower probability of restatements and material weaknesses, as well as more favourable indicators liquidity, debt burden and earnings volatility. Together with international studies (Abdelwahed et al., 2025; Desyatnyuk et al., 2024a; Desyatnyuk et al., 2025b; Fedyk et al., 2022; Han et al., 2023; Vitali & Giuliani, 2024), this prompts us to consider digital auditing as part of the evolution of an enterprise's control infrastructure – an infrastructure that may facilitate financial security but is dependent on data quality, the institutional environment, and managerial choice.

## Conclusion

The results show that the growth in digital audit intensity is statistically related to the transformation of the quality of the control environment and the financial stability indicators of enterprises. The evaluation of two-factor panel models with fixed effects showed that an increase in the integral index of digital audit intensity is associated with a decrease in the probability of restatements and cases of significant internal control weaknesses. At the same time, a positive correlation with liquidity indicators and a decrease in the volatility of results was recorded, which is interpreted as a manifestation of a change in the risk profile of the enterprise towards greater predictability of financial flows.

The study confirmed that digital auditing is not limited to the implementation of individual technological solutions. Its impact is realized through an integrated configuration of control procedures, where digital analytics, automated tests, and algorithmic processing of data arrays form a new evidence architecture. The recorded associations indicate that the digital intensity of the audit is associated with an increase in the control system's ability to detect anomalies and reduce the residual risk of non-detection.

At the conceptual level, the novelty lies in the operationalization of financial security through indicators of financial stability and volatility of results as aggregate consequences of changes in the risk profile of an enterprise. Unlike studies that focus exclusively on the quality of the audit opinion, this paper demonstrates the relationship between the digital intensity of the audit and the financial characteristics of the company over time. This allows digital auditing to be interpreted as an element of the risk management system, rather than merely a tool for confirming reporting.

A practical interpretation of these results is that companies that digitize tools used in auditing will enjoy stronger control environment and reduced variability in financial results. Conversely, the effect of digital intensity will depend on data quality/algorithmic setting correctness and on their internal integration of control procedures. Consequently, digitization of auditing must be accompanied by development of staff competencies and internal model validation.

The limitations of the study reside in the dependence on secondary public data and proxy indicators, which do not allow full disentanglement of digital audit intensity impact from other corporate governance effects. The results reflect associative relationships within the panel model and are not interpreted as rigorous cause and effect.

Further research should focus on expanding the sample, including industry effects, and testing the robustness of the results using alternative model specifications. A promising direction is to analyze the long-term dynamics of the impact of digital audit intensity on financial stability and interaction with other elements of the corporate governance system.

In summary, the results confirm that digital audit intensity is associated with an improvement in the quality of the control environment and a reduction in financial volatility, which allows digital audit to be considered a structural component of the modern system of ensuring the financial security of an enterprise.

## References

1. Abdelwahed, A. S., Abu-Musa, A. A. E. S., Badawy, H. A. E. S., & Moubarak, H. (2025). Investigating the impact of adopting big data and data analytics on enhancing audit quality. *Journal of Financial Reporting and Accounting*, 23(2), 472–495. <https://doi.org/10.1108/JFRA-12-2023-0724>
2. Alles, M., & Gray, G. L. (2016). Incorporating big data in audits: Identifying inhibitors and a research agenda to address those inhibitors. *International Journal of Accounting Information Systems*, 22, 44–59. <https://doi.org/10.1016/j.accinf.2016.07.002>
3. Amani, F. A., & Fadlalla, A. M. (2017). Data mining applications in accounting: A review of the literature and organizing framework. *International Journal of Accounting Information Systems*, 24, 32–58. <https://doi.org/10.1016/j.accinf.2016.12.004>
4. Audit Analytics. (2024). *Financial restatements database* [Data set]. Ideagen Audit Analytics. Available via institutional subscription. <https://www.ideagen.com/products/ideagen-audit-analytics>
5. Desyatnyuk, O., Krysovaty, A., Ptashchenko, O., & Kyrylenko, O. (2024a). Financial security in the conditions of globalization: Strategies and mechanisms for the protection of national interests. *Economic Affairs*, 69(Special Issue), 261–268. <https://doi.org/10.46852/0424-2513.1.2024.27>
6. Desyatnyuk, O., Krysovaty, A., Ptashchenko, O., & Kyrylenko, O. (2025a). The role of financial inclusion in fostering eco-entrepreneurship within the digital economy. *International Journal of Ecosystems and Ecology Science*, 15(1), 77–86. <https://doi.org/10.31407/ijees15.109>
7. Desyatnyuk, O., Naumenko, M., Lytovchenko, I., & Beketov, O. (2024b). Impact of digitalization on international financial security in conditions of sustainable development. *Problems of Sustainable Development*, 19(1), 104–114. <https://doi.org/10.35784/preko.5325>
8. Desyatnyuk, O., Ptashchenko, O., Murenets, I., Oliinyk, K., & Kyrylenko, O. (2025b). Ensuring financial security: Approaches to risk management and protection in the digital economy. *Data and Metadata*, 4. <https://doi.org/10.56294/dm2025674>
9. Fedyk, A., Hodson, J., Khimich, N., & Fedyk, T. (2022). Is artificial intelligence improving the audit process? *Review of Accounting Studies*, 27(3), 1–48. <https://doi.org/10.1007/s11142-022-09697-x>
10. Garg, M., Wang, T., & Wilkin, C. L. (2025). Impact of reporting information security breaches, accounting quality, and the opportunistic disclosure of good news and bad news. *International Journal of Accounting Information Systems*, 56, 100729. <https://doi.org/10.1016/j.accinf.2025.100729>
11. Gauthier, M. P., & Brender, N. (2021). How do the current auditing standards fit the emergent use of blockchain? *Managerial Auditing Journal*, 36(3), 365–385. <https://doi.org/10.1108/MAJ-12-2019-2513>

12. Guo, X., Zuo, Y., & Li, D. (2025). When auditing meets blockchain: A study on applying blockchain smart contracts in auditing. *International Journal of Accounting Information Systems*, 56, 100730. <https://doi.org/10.1016/j.accinf.2025.100730>
13. Hamdy, A., Diab, A., & Eissa, A. M. (2025). Digital transformation and the quality of accounting information systems in the public sector: Evidence from developing countries. *International Journal of Financial Studies*, 13(1), 30. <https://doi.org/10.3390/ijfs13010030>
14. Han, H., Shiwakoti, R. K., Jarvis, R., Mordi, C., & Botchie, D. (2023). Accounting and auditing with blockchain technology and artificial intelligence: A literature review. *International Journal of Accounting Information Systems*, 48, 100598. <https://doi.org/10.1016/j.accinf.2022.100598>
15. Ideagen. (n.d.-a). *SOX 404 disclosures: A twenty-year review* [White paper]. <https://www.ideagen.com/resources/whitepapers/sox-404-disclosures>
16. Ideagen. (n.d.-b). *Ideagen audit analytics*. <https://www.ideagen.com/products/ideagen-audit-analytics>
17. International Monetary Fund. (2024a). *IMF Data and Statistics*. <https://data.imf.org/>
18. International Monetary Fund. (2024b). *World Economic Outlook database*. <https://www.imf.org/en/Publications/WEO>
19. International Monetary Fund. (n.d.). *IMF API: Accessing IMF data programmatically*. <https://data.imf.org/en/Resource-Pages/IMF-API>
20. Khaeru, A. (2023). *sdmx1: Data sources documentation (Version 2.22.0)* [Software documentation]. <https://sdmx1.readthedocs.io/en/v2.22.0/sources.html>
21. Krysovatty, A., Desyatnyuk, O., & Ptashchenko, O. (2024a). Digital innovations and their ramifications for financial and state security. *African Journal of Applied Research*, 10(1). <https://doi.org/10.26437/ajar.v10i1.713>
22. Krysovatty, A., Ptashchenko, O., Ivashchenko, O., Karp, V., & Kurtsev, O. (2024b). The influence of digital economy on financial management and analysis: Transforming business processes in global enterprises. *International Journal for Quality Research*, 19(3), 1–13. <https://doi.org/10.24874/IJQR19.03-13>
23. Lee, E. J., & Tahmoush, D. (2025). Auditors' decision-making aid for going concern audit opinions through machine learning analysis. *International Journal of Accounting Information Systems*, 56, 100732. <https://doi.org/10.1016/j.accinf.2025.100732>
24. Li, H., Dai, J., Gershberg, T., & Vasarhelyi, M. A. (2018). Understanding usage and value of audit analytics for internal auditors: An organizational approach. *International Journal of Accounting Information Systems*, 28, 59–76. <https://doi.org/10.1016/j.accinf.2017.12.005>
25. Li, Y., & Goel, S. (2025). Artificial intelligence auditability and auditor readiness for auditing artificial intelligence systems. *International Journal of Accounting Information Systems*, 56, 100739. <https://doi.org/10.1016/j.accinf.2025.100739>
26. Liang, L., Dai, T., Cui, L., & Song, M. (2025). Digital audit talent's impact on audit digitization and detection risk. *Scientific Reports*, 15, Article 31222. <https://doi.org/10.1038/s41598-025-16444-0>
27. Liu, Y., Liu, Q., & Wei, Y. (2025). Digital finance, internal control, and audit quality. *Finance Research Letters*, 76, 107033. <https://doi.org/10.1016/j.frl.2025.107033>
28. London Stock Exchange Group. (2021, April 19). *Working with fundamental and estimates data: A DCF example*. <https://developers.lseg.com/en/article-catalog/article/fundamentals-estimates-dcf>
29. London Stock Exchange Group. (n.d.-a). *Worldscope fundamentals*. <https://www.lseg.com/en/data-analytics/financial-data/company-data/fundamentals-data/worldscope-fundamentals>
30. London Stock Exchange Group. (n.d.-b). *LSEG developer portal*. <https://developers.lseg.com/>
31. Organisation for Economic Co-operation and Development. (2024). *OECD regional climate hazard indicators (DSD\_REG\_CLIM)*. OECD Data Explorer. <https://data-explorer.oecd.org/>

32. Organisation for Economic Co-operation and Development. (2025a, April 30). *OECD data via API*. OECD Data Insights. <https://www.oecd.org/en/data/insights/data-explainers/2024/09/api.html>
33. Organisation for Economic Co-operation and Development. (2025b). *SUT valuation (Developer API dataset)*. OECD Data Explorer. <https://data-explorer.oecd.org/>
34. S&P Global Market Intelligence. (n.d.). *S&P Global Market Intelligence datasets*. S&P Global. <https://www.spglobal.com/marketintelligence>
35. Shlapak, A., Ivashchenko, O., Vasylevska, H., Korylenko, S., & Purei, Y. (2024). Utilising financial analysis to improve business management: Trend analysis and decision-making process optimisation. *Pakistan Journal of Life and Social Sciences*, 22(2), 10356–10365. <https://doi.org/10.57239/PJLSS-2024-22.2.00782>
36. StataCorp. (2023). *xtreg – Linear models for panel data*. Stata longitudinal/panel-data reference manual. <https://www.stata.com/manuals/xtxtreg.pdf>
37. Vitali, S., & Giuliani, M. (2024). Emerging digital technologies and auditing firms: Opportunities and challenges. *International Journal of Accounting Information Systems*, 53, 100676. <https://doi.org/10.1016/j.accinf.2024.100676>
38. World Bank. (2024a). *Developer information: World Bank Data API*. <https://datahelpdesk.worldbank.org/knowledgebase/topics/125589-developer-information>
39. World Bank. (2024b). *Indicator API queries*. World Bank Data Help Desk. <https://datahelpdesk.worldbank.org/knowledgebase/articles/898599-indicator-api-queries>
40. World Bank. (2024c, September 26). *Accessing International Debt Statistics (IDS) through World Bank Data API: Part 1 – Query the API*. <https://worldbank.github.io/debt-data/api-guide/ids-api-guide-python-1.html>
41. World Bank. (n.d.). *About the indicators API documentation*. World Bank Data Help Desk. <https://datahelpdesk.worldbank.org/knowledgebase/articles/889392-about-the-indicators-api-documentation>

Received: 05.10.2025

Accepted: 26.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/34-53>

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## **Alisher Navoi: His Era, Life, and Literary Heritage**

### **Abstract**

This article examines the era, life, and creative legacy of Alisher Navoi within a unified scholarly framework. As one of the most prominent representatives of Turkic-Islamic literary thought, Navoi played a decisive role not only in the history of classical poetry, but also in the formation of Chagatai-Turkic as a highly developed literary language. The study aims to analyze the interrelationship between the socio-political and cultural environment of the Timurid period, Navoi's personal and intellectual formation, and the thematic, aesthetic, and linguistic features of his works. The article applies qualitative methods of humanities research, including historical-comparative, biographical, literary-historical, and textual analysis. The findings demonstrate that Navoi's literary legacy should be interpreted not merely as the product of individual poetic genius, but also as the result of a broader historical process in which language, literature, spirituality, and cultural identity were deeply interconnected. Particular attention is paid to Navoi's role in elevating Turkic to the level of a classical literary language, his contribution to the development of the Khamsa tradition, and his importance as a statesman and cultural patron. The article concludes that Navoi occupies a unique place in the history of Turkic literature and cultural self-consciousness.

**Keywords:** *Alisher Navoi, Chagatai literature, Turkic literary language, Timurid period, classical literature, Khamsa, literary heritage*

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## **Əlişir Nəvai: dövrü, həyatı və ədəbi irsi**

### **Xülasə**

Məqalədə Əlişir Nəvainin dövrü, həyatı və yaradıcılıq irsi vahid elmi çərçivədə araşdırılır. Türk-islam ədəbi fikrinin ən görkəmli nümayəndələrindən biri olan Nəvai təkcə klassik poeziya tarixində deyil, həm də çağatay-türk dilinin yüksək inkişaf etmiş ədəbi dil kimi formalaşmasında həlledici rol oynamışdır. Tədqiqatın məqsədi Teymurilər dövrünün ictimai-siyasi və mədəni mühiti, Nəvainin şəxsi və intellektual formalaşması, eləcə də onun əsərlərinin tematik, estetik və dil xüsusiyyətləri arasındakı qarşılıqlı əlaqəni təhlil etməkdir. Məqalədə keyfiyyət yönümlü humanitar tədqiqat metodlarından, o cümlədən tarixi-müqayisəli, bioqrafik, ədəbi-tarixi və mətnşünaslıq təhlili üsullarından istifadə edilmişdir. Nəticələr göstərir ki, Nəvainin ədəbi irsi yalnız fərdi poetik dahinin məhsulu kimi deyil, həm də dil, ədəbiyyat, mənəviyyat və mədəni kimliyin dərin şəkildə qarşılıqlı bağlı olduğu geniş tarixi prosesin nəticəsi kimi şərh edilməlidir. Məqalədə Nəvainin türkcəni klassik ədəbi dil səviyyəsinə yüksəltməkdəki rolu, “Xəmsə” əənəsinin inkişafına verdiyi töhfə, dövlət xadimi və mədəni himayədar kimi əhəmiyyəti xüsusi diqqət mərkəzində saxlanılır.

Məqalədə belə nəticəyə gəlinir ki, Əlişir Nəvai türk ədəbiyyatı və mədəni özünüdərk tarixində müstəsna yer tutur.

**Açar sözlər:** *Əlişir Nəvai, çağatay ədəbiyyatı, türk ədəbi dili, Teymurilər dövrü, klassik ədəbiyyat, Xəmsə, ədəbi irs*

## Introduction

Alisher Navoi occupies a unique place in the history of Turkic literature, Eastern intellectual culture, and the literary life of the Timurid period. He is widely recognized as a poet, thinker, statesman, and patron of culture whose works profoundly influenced the development of Turkic literary consciousness. His name is associated not only with remarkable poetic achievement, but also with the elevation of Turkic to the status of a refined literary language capable of expressing complex aesthetic, philosophical, and spiritual meanings.

The fifteenth century was one of the most important periods in the cultural history of Central Asia and the broader East. Under the Timurids, especially in Herat, literature, science, architecture, and the arts developed in close interaction. This environment produced a highly sophisticated literary culture in which Persian and Turkic intellectual traditions coexisted and enriched one another. Within this context, Navoi emerged as a major figure whose literary and cultural mission went beyond the limits of individual authorship.

A considerable number of studies have examined Navoi's biography, poetic legacy, language consciousness, and socio-political activity. However, these aspects have often been discussed separately rather than as interrelated components of a single historical and cultural phenomenon. The main objective of this article is therefore to investigate Navoi's era, life, and creative legacy within an interconnected and unified scholarly framework. The novelty of the study lies in its attempt to evaluate Navoi not merely as a classical poet, but also as a major cultural and intellectual phenomenon who contributed significantly to the formation of the Turkic literary and cultural space. In this regard, his literary activity, language consciousness, public role, and spiritual-intellectual worldview are considered in close relation to one another.

## Literature Review

The study of Alisher Navoi has a long tradition in Turkic and Eastern literary scholarship. His literary personality, poetic heritage, philosophical views, and contribution to the history of the Turkic literary language have attracted the attention of numerous researchers. In Azerbaijani literary studies as well, Navoi has been examined from various perspectives, including his place in the common Turkic literary heritage, his artistic system, his lyrical and epic works, and his influence on literary relations between Azerbaijani and Uzbek-Chagatai literature. Existing studies demonstrate the richness of Navoi scholarship, yet they also reveal that his era, biography, literary activity, and statesmanship are often treated as separate subjects rather than as parts of a unified analytical structure.

From the perspective of contemporary literary scholarship, such separation limits the possibility of understanding Navoi as a multidimensional historical figure. For this reason, a synthetic approach that combines historical context, biography, literary analysis, and cultural interpretation is methodologically necessary. The present article responds to this need by examining Navoi's life and works as interconnected manifestations of a broader intellectual and civilizational process.

## Methodology

This study is based on the principles of qualitative research in the humanities. Historical-comparative, biographical, literary-historical, and textual analysis methods are employed in order to examine the era, life, and literary heritage of Alisher Navoi in a systematic way. Historical sources and relevant scholarly works in Navoi studies are used to identify the socio-political and cultural characteristics of the Timurid period in which he lived. A biographical approach is applied to the analysis of facts related to his life and intellectual development, while literary-historical and comparative methods are used to determine the ideological, aesthetic, and linguistic significance of his works in the history of Turkic literature.

The research also relies on close reading of Navoi's poetic, philological, and religious-philosophical writings in order to reveal the internal coherence of his worldview. The methodological aim of the article is to demonstrate the interrelationship between Navoi's historical environment, personal formation, public activity, and creative output. This approach makes it possible to move beyond descriptive presentation and toward a more integrated scholarly interpretation of his role in the development of Turkic literary culture.

## Research Results and Discussion

### a) The Era

#### I.

*The development of the Uzbek language – Chagatai Turkic –  
prior to the time of Amir Alisher Navoi*

Chagatai Turkic literature is a significant branch of Turkic peoples' literature as a whole. The term Chagatai Turkic literature encompasses the literary works that emerged in Central Asia after the Mongol invasion, particularly the Turkic literature (ancient Uzbek literature) from the period of Amir Timur and the Timurids. It's important to note that the Chagatai Turkic literary period in the history of Turkic literature didn't appear all of a sudden. Its roots can be traced back to the poems and myths in the "Avesta," the Orkhon-Yenisei inscriptions, and Turkic-Uyghur literature. In literary scholarship, this era is considered to be a period when literary monuments were regarded as the common literature of Turkic peoples. This includes post-Islamic works such as Yusuf Balasaghuni's "Kutadgu Bilig," Mahmud al-Kashgari's "Divan Lughat al-Turk," and Khorezm-Golden Horde Turkic literature, among others. A new chapter in the post-Islamic period of Chagatai Turkic literature was opened by Khorezm and Golden Horde literature, which flourished and developed in Khorasan and Transoxiana. As a historical fact, the first literary work of Amir Timur's era is his own eleven-line "Inscription" written in the Uyghur alphabet in 1381. The text of this inscription was translated by the European Turkologist N.N. Poppe (the first three lines of the inscription, written in Arabic script, remain unread): "Seven hundred... In the middle month of spring in the year of the sheep, into the land of Qara Toqmaq (meaning: approximately Kipchak), Timur Bey, the Sultan of Turan, attacked Toqtamish Khan with two hundred thousand soldiers for his fame. He waged war so that his arrival at this place would be recorded in history. May God ascribe this to justice! God have mercy on the people and remember us in prayer." ("Türk edebiyatı", 1992, pp. 80-103).

Let's take a brief look at the meaning of the word "Chagatai" and address the question of whether it refers to Chagatai Turkic or Old Uzbek: What Does "Chagatai" Mean? Chagatai (1183-1242) was the name of a Mongol prince and the second son of Genghis Khan. A portion of the lands conquered by Genghis Khan fell to his younger son, Chagatai. The word Chagatai (sometimes also written as cığatay) literally means "younger son." In those times, territories, states, and their languages were often named after their rulers. Examples include the Ottoman Empire and the Ottoman language, or the Safavid dynasty. From this perspective, the official and active language throughout Chagatai's territories became known as the Chagatai language or Chagatai Turkic. The Chagatai Khanate was a dynasty that reigned in Transoxiana, Semirechye (Yedisu), and Eastern Turkestan between 1227 and 1370. Chagatai Turkic is the name for the second period of North-eastern Turkic (Old Uzbek). Fuad Köprülü categorized the history of Chagatai Turkic literature into the following periods:

1. Early Chagatai Period (13th and 14th centuries)
2. Beginning of the Classical Chagatai Period (14th and 15th centuries)
3. Classical Chagatai Period (second half of the 15th century)
4. Continuation of the Classical Period (16th century)
5. Period of Decline and Decay (17th to 19th centuries) (Ali Şîr Nevâî: 2016-2020, pp. 449-453)

It's worth noting that in Soviet-era sources, Chagatai Turkic is referred to as Old Uzbek, while in Chinese sources, it's recorded as Old Uyghur.

During the era of Amir Timur and the Timurids, several prominent poets emerged. Among the first was Mir Heydar Khorezmi, who drew inspiration from Nizami's literary legacy. His notable



works include the *Masnavi* "Makhzan-ul-Asrar," his "Yusuf Amir Divan," "Dahname," and the polemic "Beng-u-Bade." Additionally, the Sufi and love poems of Atayi, son of Ismail Ata (brother of Ahmad Yasawi), were widely popular among the people. When discussing the literature of this period, the poet Sakkaki deserves special mention. According to Alisher Navoi's writings, Sakkaki gained significant fame during the reign of Ulugh Beg. He composed four *qasidas* (odes) each in honour of Ulugh Beg and Arslan Khwaja Tarkhan, and one *qasida* dedicated to Khalil Sultan, the ruler who succeeded Amir Timur.

The reigns of Baysunghur and Ulugh Beg, grandsons of Amir Timur, are considered a period of significant historical ascent for Turkestan and Khorasan, and even for the entire Islamic world, in the fields of science, art, literature, and culture. One of the prominent poets of that era was Lutfi (1369–1465), whom Alisher Navoi called "a dear and blessed man." Lutfi's poems were widely circulated throughout the lands of Turan at that time. Lutfi had also served Shahrukh Mirza (1409–1446), Amir Timur's eldest son and heir, and the father of Mirza Ulugh Beg. He later traveled to the Golden Horde, and from there to Iran and Azerbaijan.

The poet wrote his famous *masnawi* "Gul wa Navruz" in honor of Iskandar Mirza, the ruler of Isfahan. This literary flourishing was a path that led Turkic literature towards the pinnacle of classical Persian literature.

The years of the great thinker and brilliant Uzbek poet Alisher Navoi's creative work are considered the Golden Age of Chagatai Turkic – Uzbek literature, and indeed, of Turkic peoples' literature as a whole. It was a period of rise and renaissance. The works of poets like Gadayi, Ahmadi, and Durbek are, in fact, the classical literary chronicles of that very era. Indeed, the Turkic language underwent a distinct stage of development in Chagatai Turkic literature during the time of Alisher Navoi, and even earlier, during the reign of Mirza Ulugh Beg. However, it was the name of Alisher Navoi that truly conquered the summit of literature.

Alisher Navoi stands as the brilliant creator of a new era in the literature of the Turkic peoples. It's well-known that during the Middle Ages and ancient times, there was a widespread tradition of writing epic works, and indeed, all imaginative literature, especially poetry, in Persian. Alisher Navoi himself had an excellent command of both Persian and Arabic, holding them in high regard. Despite this, the struggle for national literature within Pan-Turkic literature, which began in the 13th century with figures like Izzaddin Hasanoghlu and Qadi Burhanuddin, reached its zenith with Alisher Navoi. In fact, one could argue he represents one of the main pinnacles of the Middle Ages in this regard (Həbibbəyli, 2017, p. 4).

Thanks to the Amir Timur Sultanate, Chagatai Turkic ascended to such a peak that it became one of the three major languages of the Islamic world.

According to historical sources, Sultan Husayn Bayqara, the last prominent representative of the Timurid dynasty, was a courageous, brave, just, and prudent ruler among the Timurid princes. His father, Ghiyath al-Din Mansur Bayqara Mirza, was the third son of Bayqara Mirza. Bayqara Mirza's father was Umar Shaikh (1356-1394), Amir Timur's second son, and his mother, Firuze Begum, was the daughter of Qutluq Sultan Begum, who was the eldest daughter of Amir Timur's third son, Miran Shah Mirza. This means Husayn Bayqara was a great-grandson of Amir Timur on his father's side and a great-great-grandson on his mother's side. When describing Sultan Husayn Bayqara in the "Baburnama," Zahir-ud-din Mohammad Babur notes that his lineage traces back to Amir Timur on both paternal and maternal sides (Bobur, 1989, pp. 148-149).

Sultan Husayn Bayqara (Herat 1438–1506) was also a poet. To quote again from the Baburnama: "He had a poetic nature and compiled a Divan. He wrote in Turkic. His pen name was 'Husayni.' Though some of his couplets weren't great, his Divan was complete in meter. He was a great ruler, both in his youth and in his reign." (Bobur, 1989, p. 148). Husayn Bayqara was the author of beautiful lyrical poems. His Divan spread everywhere, reaching the largest libraries. His *ghazals* (lyric poems) stood out from those of his contemporaries: the beauty of nature, love, and pleasant feelings full of affection held a special place in Husayn Bayqara's poetry. Because of his excellent command of

Chagatai Turkic, he rarely used foreign or borrowed words in his poems. He even wrote a small treatise dedicated to the work of his friend, Alisher Navoi.

Alisher Navoi's father, Ghiyasiddin Kichgine Bahadur, and Husayn Bayqara's father, Amir Ghiyasiddin Mansur, were milk-brothers. Because of this bond, their children grew up together and attended school as companions. After their schooling, Husayn Bayqara became involved in court affairs. After some time, he also joined the struggle for the throne among the Timurid heirs. In 1469, Husayn Bayqara emerged victorious from this struggle, seizing power in Herat and becoming its ruler. During his reign, he greatly fostered science, culture, and literature throughout his realm. Herat, which had become the country's capital during Shahrukh's rule, transformed into one of the East's premier cultural centers, with its fame spreading far and wide. Over nearly forty years of rule, Husayn Bayqara became known as one of the most benevolent rulers in Eastern history. Distinguished by his humanism, he established an exceptionally vibrant center for science and art at the Herat court. The Persian poet Abd al-Rahman (Abdurrahman) Jami, renowned historians including Qantemir, and the painter Behzad all flourished, lived, and created their works specifically within Husayn Bayqara's court.

Husayn Bayqara issued a special decree in his country for writing in Chagatai Turkic. Mirza Ulugh Beg had signed a similar decree in Samarkand in the years prior. As one of the traditional decrees serving statecraft that began with Amir Timur, this particular decree held significant importance during a period when the Persian language dominated the entire Eastern world. The disdain for the Turkic language from certain circles is further highlighted by an anecdote involving Alisher Navoi, who was the chief vizier of Husayn Bayqara's court, and Bannayi, a talented poet born in Herat. This incident has been recounted for centuries: During a conversation, Alisher Navoi, angered by Bannayi's words, exclaimed, "Bannayi, you've overstepped your bounds. Your mouth should be filled with filth!" Bannayi, in response, retorted, "Filling it with filth isn't that difficult. It's enough to recite a poem in Turkic." (Ülvi, 2008, p. 34)

At a time when the Turkic language faced such widespread indifference, Husayn

Bayqara's decree regarding the Turkic language, specifically Chagatai Turkic, held immense significance for the country's academic circles and statesmen. In a way, it served as a major impetus for the development and dissemination of the state language. The highest stage of development for the official Turkic literary language coincided with Husayn Bayqara's years in power. This was particularly noteworthy, as even the Ottoman court poets of that era were still primarily writing in Persian.

Indeed, the historical contributions of classical masters in this field are undeniable. The distinct styles of native-language poets such as Hasanoghlu, Yunus Emre, and Nasimi played a crucial role in shaping the Turkic poetic language.

One of Husayn Bayqara's greatest historical services as a ruler was inviting his childhood friend, Alisher Navoi – two years his junior – to his court, and then swiftly appointing him chief vizier. This wasn't merely about Alisher Navoi holding a high position at court. It was precisely from this influential role that Alisher Navoi undertook unparalleled work for the development of Turkic culture and literature during that era. He even exerted significant influence on the ruler's policies, which highly valued science and culture.

#### *Results The Era of Alisher Navoi*

The age in which Alisher Navoi lived was marked by intense political transformation and remarkable cultural productivity. The Timurid period, despite internal political struggles, created favorable conditions for the flourishing of scholarship, art, literature, and architecture. Herat, in particular, became one of the leading centers of intellectual and cultural life in the East. Such an environment played a crucial role in the development of literary language and artistic taste.

The literary atmosphere preceding Navoi had already been shaped by the accumulation of Turkic poetic experience. Earlier traditions had prepared the ground for the emergence of a writer capable of revealing the full expressive power of Turkic. At the same time, Persian literary models remained highly influential, and any author writing in Turkic had to position himself in relation to a prestigious

and deeply rooted classical tradition. Navoi's achievement was therefore historically significant because he did not reject this tradition; rather, he entered into dialogue with it and demonstrated that Turkic possessed the same potential for aesthetic refinement and intellectual depth.

Thus, the Chagatai-Turkic literary environment preceding Alisher Navoi should not be regarded as an accidental phenomenon, but as the result of a long historical process of cultural and literary development. On the one hand, this environment represented the continuation of the broader Turkic literary tradition; on the other hand, it reflected the new socio-political and cultural conditions of the Timurid period. It was precisely on this foundation that Navoi elevated Turkic to the level of a highly developed literary language and transformed it into one of the major vehicles of classical poetic expression. Therefore, the emergence of Navoi should be understood not only as the result of individual genius, but also as the logical historical culmination of previous literary development.

## II. Gems from Amir Alisher Navoi's Literary Treasury

Before delving into the research on Alisher Navoi's life and work, it's important to note that Navoi wrote clearly about his life, environment, and creative process in all his works, especially his scholarly-philological and religious-Sufi writings. In essence, all the works presented in this monograph simultaneously serve as primary sources for Alisher Navoi's biography and personality, or they possess a memoir-like quality. For example, his works "Halat-i Sayyid Hasan Ardashir" and "Halat-i Pahlavan Muhammad" provide insights into his childhood and youth.

Navoi's vast literary output offers direct insights into his life and mind. For instance:

- "Khamsat al-Mutahayyirin": This work reveals the master-disciple relationship between the great artist, then in the golden age of his creativity, and the esteemed Abdurrahman Jami.
- "Muhakamat al-Lughatayn": In this work, Navoi is seen as a linguist and scholar, passionately advocating for his native Turkic language and explaining its superiority over Persian.
- "Mizan al-Awzan": This text introduces us to his contributions as a literary theorist and a scholar of *aruz* (poetic meter).
- "Sab'at Abhur": Through this work, which discusses the lexicography of Arabic (the language of the Quran), we learn of his profound knowledge of Arabic.
- "Nasayim al-Mahabba": This *tazkira* (biographical dictionary) showcases the poet's extensive reading, offering a glimpse into the sheikhs, saints, poets, and holy figures of the Eastern world he encountered through his studies. It reveals his deep familiarity with all facets of the Eastern world's literary, scientific, and philosophical landscape.
- "Majalis al-Nafais": Here, the literary environment that shaped Alisher Navoi is discovered, including the master poets and scholars by whom he was taught, and the individuals with whom he interacted and who were supported by him in their creative endeavors.
- "Munsha'at": This work provides examples of official state correspondence in Turkic, offering a clear understanding of the history of documentation in the language.
- "Waqfiyya": This piece introduces us to the boundless philanthropic work of this great and faithful individual. For instance, in Navoi's view, before embarking on the Hajj pilgrimage, one should spend all related expenses on the oppressed people of their nation and on the development of their country. Only after feeling at peace with this should the Hajj pilgrimage be completed. In "Waqfiyya," the poet lays bare this humane and compassionate philosophy.
- "Zubdat al-Tawarikh": Presented under this title, his two historical works – "Tarikh-i Anbiya va Hukama" and "Tarikh-i Muluk-i Ajam" – reveal him as a historian and scholar.
- "Nazm al-Jawahir," "Hadith al-Arba'in," "Mahbub al-Qulub," "Siraj al-Muslimin," "Risale-yi Tir Andokhtan," and "Munajat": These works showcase his historical contributions to explaining the Islamic faith to the common people in Turkic.
- "Lisan al-Tayr": Written near the end of his life, this masterpiece demonstrates the great man's arrival at a period of profound maturity and wisdom.

Thanks to the works mentioned above, almost every step of Alisher Navoi's 60 years of life and creation can be vividly traced. All these works collectively form a complete memoir, with the poet's life and artistry being reflected in various hues and meters.

## b) His Life

Alisher Navoi was born on February 9, 1441, into an aristocratic family in the ancient city of Herat, located in the Khorasan province.

The distinguished poet Amir Alisher Navoi's aristocratic father and grandfather both served in government administration within the Timurid court. As stated in Sam Mirza's *tazkira* (biographical dictionary), "Alisher Navoi's paternal grandfather, Mir Abu Sa'id Jang, was also one of the chief amirs of Sultan Husayn's grandfather, Bayqara Mirza (Sultan Husayn Bayqara's paternal grandfather)." His father, furthermore, served as the vizier to Sultan Abu Sa'id (reigned 1451-1469), who was Timur's grandson, Miranshah's son, and the ruler of Samarkand. Later, according to Devletshah's *tazkira*, he became "one of the highest officials of Sultan Abu'l-Qasim Babur (Abu'l-Qasim Babur reigned 1451-1457), Shahrukh's son and the ruler of Khorasan." Due to these connections, Alisher's family lived in close proximity to the Timurid dynasty, and he attended school alongside Husayn Bayqara, a member of the Timurid lineage. As mentioned earlier, Husayn Bayqara's father and Alisher Navoi's father were also milk-brothers.

After Shahrukh Mirza, the eldest son of Amir Timur and ruler of Khorasan, passed away in 1447, a fierce struggle for the throne erupted among the princes, plunging the country into turmoil. During this period, Alisher's father took his entire family on a journey towards Iraq. In 1452, they returned to Herat, and Alisher resumed his education there. Navoi began writing poetry in his childhood, and his early verses quickly gained popularity. By the age of 15, he had already established a name for himself as a recognized poet.

Alisher Navoi's passion and love for literature were greatly influenced first by his father and uncles, and subsequently by the environment he grew up in. His inclination towards poetry was shaped by his father, Kichgine Bahadur, who composed poems in syllabic meter; his uncle, Mir Sa'id, who wrote under the pen name "Qabili"; Mir Sa'id's son, Mir Heydar, who used the pen name "Sabuni"; and Muhammad Ali, who wrote as "Qarib." Furthermore, after his father's death, Sultan Abu'l-Qasim Babur, who wrote Turkic poems and became Alisher Navoi's patron, played a significant role. Equally influential was Hasan Ardashir, who wrote under the pen name "Qalandar" and encouraged Navoi to read Lutfi and emulate his style.

The poet, who chose the pen name "Navoi" for his poems written in Turkic and "Fani" for his Persian poems, was accepted into the court of the Khorasan Shah Abul-Qasim Babur in 1456. This Shah was also a poet and highly valued young Alisher's talent. It was in Abul-Qasim Babur's court that Navoi earned the title "Master of Two Languages ("Zullisaneyn"). At that time, Alisher Navoi lived in the city of Mashhad.

Navoi was very young, just 15 years old, during his years of service in Abul-Qasim Babur's court. Unfortunately, court life changed his outlook on the future and left its mark on his personal life. "This poet, who matured during a corrupt and tumultuous period of royal courts, witnessed the most vile and hateful scenes of feudalism. He was even among the wild armies of sons who marched against their fathers in the struggle for the crown and throne. Alisher Navoi repeatedly saw fathers sacrificing their sons for the throne, women being taken captive like herds, and the horrific Eastern punishments of beheading, hanging, and poisoning. Eventually, he began to despise his position" (M.Əmir Nəvayi, 2009, p. 77).

Alisher Navoi never married in his life. Perhaps the immorality and cruelty towards women in the court harems, experienced during his time in the palace, deeply affected his poetic soul. As a child who lost his mother at the age of six, his unfulfilled longing for a mother's warmth and affection likely remained a raw emotional wound throughout his youth. It was precisely this degradation of women in his environment that influenced his decision not to start a family. Many legends have been written about this, such as the love story between him and Güll, the gardener's daughter. However, although the poet hinted in some of his works that he would write a piece about this, he never did. This has been written about in a slightly more comprehensive manner on page 435 of the present work.

Sometimes, Alisher Navoi's decision not to marry is attributed to his Sufi outlook and affiliation with the Naqshbandi order. However, his complete withdrawal from worldly life and full embrace of

Sufism, adopting a dervish-like existence, dates to 1478. "He withdrew from the splendor and patronage of the highest position and greatest favors, retreating into solitude. That is, he entered into a spiritual and mystical life. Alisher was 37 years old when he renounced the world... He gave up the pleasure of marriage and... dedicated his life to the joy of study." (Həsənzadə, 2009, p. 31). It's true that there are many points related to his personal life in his philosophical and didactic work "Lisanut-teyr", which he wrote as a response to Farid al-Din Attar's "Mantiq al-Tayr." It should be remembered that this work was completed closer to the end of his life, between 1497 and 1499.

It's known that Abdurrahman Jami, a renowned Shaykh al-Islam, scholar, and poet of his time, who commanded great respect, was the one who invited Alisher Navoi into the Naqshbandi order. Jami, however, was married and had children. In fact, he wrote his famous "Baharistan" tazkira as a textbook for his 7-year-old son, Ziyaeddin. This indicates that marriage was not the reason for Navoi's celibacy. Moreover, as mentioned, Alisher Navoi was already 37 years old at this time. It's also true that Navoi had a rich reading culture, having read many religious and Sufi books since childhood.

After the death of Abul-Qasim Babur, Alisher Navoi returned to Herat (formerly known as "Hiri," sometimes spelled "Heri") in 1464. There, he befriended the people of Badakhshan. Soon after, the last representatives of Badakhshan rebelled against Abu Sa'id Mirza. Sultan Abu Sa'id suspected Alisher Navoi of leading this rebellion and exiled him to Samarkand in 1466. The "Baburnama" mentions this event, stating, "Navoi went to Samarkand for a while and studied there, but the reason for his departure is unknown." In Samarkand, he engaged in the "study of sciences and arts," acquiring great skill in "calligraphy," "drawing," "music," and "painting" (Həsənzadə, 2009, p. 17), and he learned the science of prosody (aruz).

This fact is evident in Alisher Navoi's letter to his mentor and paternal guardian, Seyyid Hasan Ardəşir. While at the Ulugh Beg Madrasah, Alisher Navoi began studying under Mawlana Jalaluddin Faizullah Abul-Leys Samarqandi, a renowned scholar and teacher of that era. Here, young Alisher also met other learned individuals, in addition to famous scholars and musicians. The training, upbringing, and education he received in Samarkand left an indelible mark on Alisher Navoi's life. With the help of his master, Hoja Jalaluddin Faizullah Abul-Leysi, who was considered a great scholar of Arabic and Persian in his time, he deeply mastered the secrets of Islamic jurisprudence (fiqh) and Arabic linguistics. Through his extraordinary talent, sharp intellect, and profound dedication to knowledge, he was able to rediscover himself in Samarkand.

In 1469, a change occurred in the Khorasan government: Husayn Bayqara became the Shah of Khorasan and ascended to the throne in Herat. Husayn Bayqara and Alisher Navoi, who had studied together since childhood, had a pact of friendship: "That is, if one achieves power, he should not forget the other." (Həsənzadə, 2009, p. 21) For this reason, Husayn Bayqara invited his friend in Samarkand, the 28-year-old Alisher Navoi, whose talent and creative abilities he knew well, to join him. When Alisher Navoi arrived in Herat in response to this invitation, he presented the "Hilaliyya" qasida as a congratulatory gift to his childhood friend at a gathering held on April 14, 1469, for the occasion of the Eid al-Fitr. The work consists of ninety-one couplets. The main content of the qasida praises his friend Husayn Bayqara and offers blessings for the first steps of his rule. It congratulates the Shah and highlights his virtues as a person, listing the aspects that would make his reign just and beautiful, and expresses belief in the triumph and invincibility of his rule. Alisher Navoi named the work "Hilal" (Moon) because Sultan Husayn Bayqara ascended to the throne during the month of Ramadan. The poet later included this qasida in the third book of his "Khazain al-Ma'ani" divan, which is the "Badaya' al-Wasat" divan.

Sultan Husayn Bayqara greatly admired the qasida. Upon Alisher's "arrival in Herat, he was welcomed with extraordinary pomp and ceremony by Sultan Husayn" (Köçərli, 2009, p. 56). Sultan Husayn immediately appointed him to the position of seal-bearer in the court in 1469. "Alisher Navoi, who had seen three rulers of Khorasan and served in the courts of two of them (Abol-Qasim Babur and Abu Sa'id), only gained recognition as a prominent public figure during the reign of Husayn Bayqara (ruling years 1469-1506)" (Xəlilov, 2009, p. 201).

After serving as seal-bearer for three years, Alisher Navoi willingly relinquished the position, and his friend from Samarkand, the poet Sheikhim Suheyli, was appointed in his stead. Navoi preferred to work only as an advisor at the court, wishing to dedicate more of his time to creative pursuits. However, in February 1472, his friend Husayn Bayqara appointed him chief vizier and bestowed upon him the title “Amir-i Kabir” (Great Amir). In this new role, Alisher Navoi's first priority was to restore peace and order in the country. Following that, as he wrote in his work “Waqfiyya”, he initiated significant endowment (waqf) projects. He fostered the development of trade and various crafts, such as pottery, to improve people's livelihoods. He also promoted agricultural development in distant winter pastures, leading to increased prosperity throughout the country. As detailed in “Waqfiyya,” Navoi used his personal funds to provide clothing, food, and drink for all the poor, and even contributed a substantial amount to the royal treasury annually. These acts are also noted in the “Baburnama.” He oversaw the construction of new buildings in Herat and other cities along the Silk Road, transforming their appearance and improving their infrastructure.

One cannot help but be amazed by his construction and creative skills after seeing the tomb he built in the name of Imam Ali (AS) and the Mazari-Sharif Mosque he erected over it on a plain. You feel like a direct participant in the events of that century.

Yes, the city of Mazar-i-Sharif, which was built on that once-empty plain and whose vastness is evident today, along with the dozens of bridges, mosques, and historical architectural monuments he had constructed, are all legacies and memorials to Navoi.

“After he became a court vizier, he invited several philosophers, poets, scholars, artists, musicians, calligraphers, and other creative individuals from Central Asia, Afghanistan, Iran, Azerbaijan, India, and other countries to Herat, creating a major transformation in the country's cultural life. The great artist and prominent statesman Alisher Navoi also improved Husayn Bayqara's system of governance.” (Rüstəm, 2009, p. 197). He actively participated in increasing the country's political and spiritual power, dedicating all his income to reconstruction efforts. According to Mirkhond's *Tazkira*, Sultan Husayn's desire was to elevate his childhood friend to the highest position. Therefore, a year after appointing him as chief vizier (in the month of Sha'ban in the year 876 AH), he offered Alisher Navoi the throne. Amir Alisher was 32 years old at the time. However, Alisher Navoi decisively refused this offer.

“Alisher Navoi, due to inheriting his father's estate and achieving many high positions

in his country, possessed great wealth. He always spent this wealth on good causes. He strove to uplift the hearts of the poor and the weak. He never took a salary in the positions he held. In addition, he would send valuable gifts to the ruler every year. He had many charitable institutions built and historical buildings repaired. As stated in the tazkiras of Lutfali Bey and Sam Mirza, the charitable buildings he had constructed in Khorasan alone number close to 370, and among them are 90 caravanserais called 'Rubai' for travelers to come, relax, and rest. 'Rubai' was established for the purpose of reading for those who stayed in these caravanserais.” (Həsənzadə, 2009, p. 47).

Alisher Navoi served as vizier in Sultan Husayn Bayqara's court for only four years, resigning from the position in 1476. The conscience of such a noble person, poet, and scholar as Nava'i did not align with the moral conduct of the rulers. The oppression inflicted upon the people by the court officials and bureaucrats led to widespread discontent. Most of the oppressors couldn't tolerate Alisher, so he went to Astrabad, where he had been appointed as a governor, to live (in reality, he was exiled to Astrabad). While in Astrabad, he heard that his younger brother, Dervishali Bey, had been hanged after incurring the Sultan's wrath, a consequence of court disputes. All of this deeply affected Alisher Navoi. He returned to Herat in 1488 and resigned from all his posts. He wished to completely adopt the attire of a dervish. He held the position of *saqi* (cup-bearer) in the court. Several of his famous “*Saqinamahs*” have survived to this day. It's known that the first *saqinamahs* belonged to the pens of Nizami and Hafiz. However, Alisher Navoi holds a place in the history of Turkic peoples' literature, especially Uzbek literature, as the author of the first *saqinamahs* written in Turkic.

During the eleven years he lived in Astrabad, he engaged in scholarly and literary work. He created his great works, including completing his “Khamsa.” This Uzbek thinker and poet gifted us works of immense value.

Even after Alisher Navoi's departure from the court, Sultan Husayn Bayqara never wanted to sever ties with him. Though the Sultan tried to mend their past friendship, Alisher Navoi had definitively decided not to return to the court on the very day he left. Unyielding in his own persistence, Husayn Bayqara entrusted the leadership of Herat and the court to Alisher Navoi in 1500 when he embarked on a campaign, aiming to atone for his perceived wrongdoings against Alisher Navoi. Left with no choice, and despite his declining health, Alisher Navoi couldn't refuse his friend, who had already left the city.

After resigning from his court official position in 1476, Alisher Navoi met the great thinker and poet Abdurrahman Jami, whom he considered his master and spiritual guide. He developed a deep affection for Sufi ethics. In fact, sources indicate that during those very years, he wished to fully embrace a dervish life, but Husayn Bayqara's strong insistence dissuaded him from this idea. Throughout his life, Alisher Navoi regarded Abdurrahman Jami as his spiritual guide within the Naqshbandi order and delved deeply into the teachings of Farid al-Din Attar.

From the memoirs of Alisher Navoi: “I've become so weak that I can't count the ailments of my body. I can no longer stand straight. I've succumbed to many illnesses for which doctors can find no cure... I cannot eat during the day, and I cannot sleep for a moment at night. I cannot stand without leaning on a cane. I can't even mount a horse to get fresh air and walk unless two people stand by me and help.” (Həsənzadə, 2009, p. 40).

Amir Alisher Navoi passed away on January 3, 1501, in his birthplace, Herat. His death became a great mourning for the entire country. Hundreds of memorials written on this occasion demonstrate that the poet had achieved widespread fame, knowing no territorial limits, even during his lifetime. “By order of Sultan Husayn Bayqara, the entire country observed a full year of mourning for the deceased great artist. This fact is not only rare but also valuable as it demonstrates the poet's influence among the people and the fame he gained during his life.” (Əliyev, 2009, p. 147).

Alisher Navoi's tomb is located just steps from the Gawharshad Begum Madrasa (the elder daughter-in-law of Amir Timur and wife of Shahrukh). The Gawharshad Begum Madrasa is surrounded by a beautiful garden.

For 500 years, these monuments have been the first pilgrimage sites for anyone visiting Herat. While Herat's name earned a golden page in history in honor of Alexander the Great, today it's visited in the name of Alisher Navoi. This is because Alisher Navoi completely rebuilt Herat. Today, Herat has become a pilgrimage site precisely because of these structures. Emir Alisher Navoi continues to live on in hearts, literature, literary history, linguistics, religion, history, geography, philosophy, theology, and Sufi sciences.

Alisher Navoi's life reflects the close relationship between literary activity, political experience, and cultural responsibility. He was educated in a distinguished intellectual environment and developed early ties with figures who would later play central roles in the political and cultural life of the Timurid court. These experiences helped shape both his literary sensibility and his public worldview.

Navoi was not merely a poet writing in relative isolation; he was deeply involved in the institutions and networks of his time. His service in state administration, his contact with rulers and scholars, and his active participation in the cultural life of Herat allowed him to unite literary vision with practical influence. This combination explains why his role in history cannot be reduced to poetic authorship alone. He acted simultaneously as a writer, advisor, patron, and organizer of cultural life.

A close examination of Alisher Navoi's life demonstrates that his personality was shaped not only by poetic talent, but also by political experience, cultural patronage, and spiritual-intellectual inquiry. The court environment, political tensions, networks of friendship and patronage, as well as his affinity with Sufi thought had a direct impact on his worldview and literary orientation. In this sense, Navoi's



biography should be considered not merely as historical background, but as one of the principal keys to understanding the ideological and artistic essence of his works.

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### c) Creativity

Navoi's creative legacy is remarkable both for its breadth and for its intellectual and artistic depth. His poetry, narrative works, philological texts, and religious-philosophical writings reveal the activity of an author who understood literature as a form of cultural leadership. He did not write only to produce aesthetically successful texts; he wrote in order to shape linguistic consciousness, ethical values, and literary standards.

One of the most significant aspects of Navoi's contribution is his role in demonstrating that Turkic could serve as a language of high literature. In a cultural environment where Persian had long dominated elite literary production, this was not simply a stylistic choice but a major cultural intervention. His works showed that Turkic could convey subtle emotional states, philosophical reflection, religious symbolism, and complex poetic structures with full artistic adequacy.

Alisher Navoi's creative legacy is distinguished not only by generic diversity and artistic richness, but also by its systematic demonstration of the expressive capacity of the Turkic literary language. His *divans*, *Khamsa*, philological writings, and religious-philosophical works show that he treated Turkic not merely as a poetic medium, but as a refined literary language capable of conveying complex intellectual, aesthetic, and spiritual meanings. From this perspective, Navoi's work transcended the boundaries of individual poetic achievement and marked a turning point in the history of Turkic literary thought.

Among Navoi's major achievements, the creation of his *Khamsa* occupies a central place. By composing a *Khamsa* in Turkic, he entered into a prestigious classical tradition associated with such monumental names as Nizami Ganjavi and Amir Khusraw. Yet his work should not be regarded as a simple repetition of inherited forms. Rather, it represents a new stage in the adaptation and transformation of that tradition within the Turkic literary sphere. In doing so, Navoi contributed to the emergence of a stronger Turkic literary self-awareness.

His *divans* and other writings further confirm the diversity of his literary mission. They reveal lyrical sensitivity, philosophical seriousness, and a consistent concern for moral and spiritual questions. In addition, his philological and reflective works show that he was also a conscious theorist of language and literature. This makes his heritage especially important for understanding not only literary history, but also the intellectual history of Turkic culture.

The great thinker Alisher Navoi authored immortal works of immense lyrical-romantic, realist-historical, literary-artistic, philosophical-mystical, and scientific-theoretical significance, earning him a unique place among world classics. With the exception of his work "Divan-i Fani," all of his creations – including the four *divans* collected under the general title "Khazain ul-Ma'ani" and his

“Khamsa,” along with 20-22 scientific-philological and religious-mystical works – were written in Turkic. Interestingly, all of his work titles are composed of Arabic words. We can interpret this as a traditional practice in medieval Eastern Islamic literature (including “Divan-i Fani”), reflecting the influence of Islam.

When did Alisher Navoi begin his creative journey? Whose work or which particular piece influenced him to take serious steps in this direction? As it was noted in his biography, his poetic talent was genetically predisposed, and his family environment – growing up amidst conversations of poetry and art, listening and observing them – certainly played a significant role. For example, he writes in his work “Majalis un-Nafais”: “The first gathering is on the topic of recalling noble individuals and respected men, whom this humble person (i.e., Navoi – A.U.) reached the end of their lives, but was not honored in return for their service. Among them is ‘Salik-i Atwar’ – Mir Qasim Anwar, may his soul be sanctified. At that time, I was between 3 and 4 years old. Respected men (when he was with his father and court officials – A.U.) wanted me to read, and some were astonished when I recited poetry. This is the first poem I learned from Mir Qasim Anwar (Navoi, 2011, p. 291) (literal translation):

*I am a reveler, setting the world ablaze,  
tearing my garments,  
A lover, By the wealth of your sorrow,  
I fear not the world's anxieties.*

*(Nağıyeva, 2001, p. 11)*

At five or six years old, Alisher Navoi had already memorized Farid al-Din Attar's “Mantiq al-Tayr” – an epic poem of four thousand eight hundred thirty-eight couplets. In fact, after reading such works, little Alisher would become so withdrawn that these books were forbidden and taken from him. But it was too late; he could already memorize any work he picked up in a single reading. Naturally gifted, the young Alisher Navoi gained renown for his ghazals, which were often recited with mughams (a form of classical music) at gatherings.

Alisher Navoi's collection of works titled “First Divan” – a compilation of 434 poems meticulously prepared by the skilled calligrapher Sultan Ali Mashhadi, who was closely involved with Alisher Navoi's works – was compiled in 1465 though academic Aziz Kayumov states this date as 1466] (Kayumov, 2011, p. 195). Alisher Navoi was 24 at the time. Owning a “Divan” at such a young age was no easy feat. This “Divan” includes his ghazals, ruba'is, and two mustazads. “These poems, written during Navoi's youth, reflect the power of love, its warmth, and his anxieties and hopes,” as noted by academic Aziz Kayumov. (Kayumov, 2011, p.196).

Alisher Navoi's second Divan is titled “Badayi' ul-Bidaya” (meaning “The Beginning of Eloquence” or “The Commencement of Beauties”). This collection includes poems he wrote between 1469 and 1476. Sources indicate that Navoi himself compiled this Divan and even penned its preface. In this preface, the poet articulated his thoughts on the arrangement of his works and their core themes. The Divan features 777 ghazals along with other poetic genres such as mustazad, mukhammas, musaddas, tarjiband, qita, rubai, lughaz, muamma, tuyuq, and fard. In total, this Divan contains 1046 poems. Naturally, once a Divan was fully compiled and completed by its initial calligrapher, copies would be duplicated and circulated.

One of the divans prepared during Alisher Navoi's lifetime is still preserved at the Azerbaijan National Academy of Sciences (ANAS) Institute of Manuscripts named after Muhammad Fuzuli. This divan, titled “Ghara'ib us-Sighar” (meaning “Peculiarities of Childhood”), was prepared by a calligrapher in 1484 (Hijri 889).

The manuscript is bound in a brown leather cover with a medallion and adorned with gilded ornaments. Its internal headings are written in gold and blue with Nasta'liq script. The divan consists of 189 folios and measures 14x23 cm.

Inside the manuscript, you'll find 612 ghazals, 3 mustazads, 2 musaddas, 5 mukhammas, 3 tarjibands, 5 qitas, 62 ruba'is, 62 muammas, 10 tuyuqs, 51 fards, and 43 ghazal fragments (these fragments are as follows: 27 pieces of 2 couplets, 8 pieces of 3 couplets, 3 pieces of 4 couplets, 2 pieces of 5 couplets, 2 pieces of 9 couplets, and 1 piece of 11 couplets).

The manuscript begins with the following couplet:

*Though the pen traced the lines of my words with grace,  
The heart's fire ignited the ink on the page.*

(Navai: 889/1484)

The divan prepared in 1486, preserved at the Abu Rayhan Biruni Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan, was compiled by a calligrapher named Ali Nur. In this divan, each ghazal is followed by a stanza of advice and counsel. The primary themes of these ghazals include love, loyalty, the beauty of nature, the allure of open-heartedness, and more. The divan also poetically incorporates some Naqshbandi rules, presenting lyrical vignettes such as maintaining reclusiveness, traveling through one's homeland, observing one's surroundings with every step, and always having a heart-pleasing occupation.

The 862 ghazals Alisher Navoi wrote between 1476 and 1482 were collected in his divan titled "Navadir un-Nihaya" (meaning "Rarities of the End"). Navoi scholar Jannat Naghiyeva, in her monograph "Navoi in Azerbaijan," referred to this divan as a "very rarely found divan." "Navadir un-Nihaya" was included in a single volume with the Baku manuscript copy of the "Badayi' ul-Bidaya" divan, transcribed by a person named Yusuf ibn Molla Muhammad in 1632 CE (1042 Hijri). (Naghiyeva, 2001, p. 30)

The poet's own four "Divans" were essentially a collection of his lyrical-philosophical sentiments and his realistic views on life. However, the great Abdurrahman Jami, whom Navoi constantly consulted and held in high esteem as a master, advised him to gather all these divans under one title and reorganize them, systematizing them according to theme and chronology of composition. Following his master's counsel, Alisher Navoi organized all his poems, including the divans he had compiled until then, into a single collection titled "Khazain ul-Ma'ani" (Treasures of Meanings). The richly designed manuscript of the "Khamsa," transcribed under Alisher Navoi's direct supervision in 1492/1493, was copied by Sultan Ali Mashhadi, a literate and knowledgeable expert in Navoi's works. Its binding was crafted by the skilled artist and bookbinder, Sultan Ali Naravi. On folio 1b of the manuscript, an unknown person made notes, seemingly to arrange the names of the poems (Naghiyeva, 2001, p. 14).

His divan titled "Khazainul-ma'ani" (Treasures of Meanings) consists of four parts (this divan is sometimes also called "Chahar Divan" or "Four Divans"):

1. "Gharaibus-sighar" ("Oddities of Childhood," 837 poems);
2. "Navadirush-shabab" ("Rarities of Youth," 759 poems);
3. "Badayi'ul-vasat" ("Beauties of Middle Age," 740 poems);
4. "Fava'idul-kibar" ("Benefits of Old Age," 793 poems).

Thus, Alisher Navoi's divan, compiled under the title "Khazainul-ma'ani" (Treasures of Meanings), is considered the primary source for studying his poetic world. This divan consists of a total of 3129 poems.

In the "Gharaibus-sighar" ("Oddities of Childhood") divan, Navoi wrote a "Foreword" to the general collection of "Khazainul-ma'ani."

The "Gharaibus-sighar" divan includes poems he wrote from the age of seven or eight

until he was twenty. As Alisher Navoi noted, these poems reflect the spring of life's seasons and the blooming of life's garden buds. Lyrical ghazals dedicated to Seyyid Hasan Ardakhir, who patronized him after the death of his parents, hold a special place here. "Gharaibus-sighar" contains 650 ghazals, one mustazad, three mukhammas, one musaddas, one tarjiband, fifty qit'as, and 131 ruba'is.

The second divan, “Navadirush-shabab” (“Rarities of Youth”), collects poems he wrote during his youth, from the age of 20 until he was thirty-five. It contains six hundred fifty ghazals, one mustazad, three mukhammas, one musaddas, one tarjiband, one tarkibbend, fifty qit'as, and fifty-two muamma. The themes of the poems here primarily consist of love, the affection between lover and beloved, sometimes generalized advice, and in short, the beauties of youth.

The poems in the “Badayi'ul-vasat” (“Beauties of Middle Age”) divan, in the words of academic Aziz Kayumov, “differ little in theme from other divans. Here, too, love, mystical insights, and studies of life” are reflected. Alisher Navoi referred to middle age, the period from thirty-five to forty-five, as the autumn of life's seasons (Kayumov, 2011, p. 213). The “Badayi'ul-vasat” divan contains seven hundred forty poems, including ghazals and musammas, as well as tarjibands, qasidas, qit'as, tuyuqs, and lughaz. In these examples, Navoi penned his views on human and societal life.

The final divan included in the “Khazainul-ma'ani” collection, “Fava'idul-kibar,” (“Benefits of Old Age”) primarily features ghazals and musammas, along with several tarjibands, tarkibbends, qit'as, and muammas, totaling seven hundred ninety-three poems. These poems express, relatively, “the wishes and dreams, thoughts and feelings of an elderly person” (Kayumov, 2011, p. 214), as well as daily concerns. This section pertains to human life from forty-five to sixty years of age – the period moving towards old age (Kayumov, 2011, p. 207).

The great Uzbek poet, linguist, literary critic, calligrapher, composer, and statesman, Amir Alisher Navoi, with his creative prowess, boldly crossed a historical barrier, blazing a new trail in literary history as a Turkic literary language revolutionary: he elevated the Turkic literary language to a high throne in world literature. Influenced by the “Khamsa” of the great Nizami, whom he called “master” and bowed to in all his works, Navoi for the first time wrote his “Khamsa” in Turkic. At a time when Persian was dominant as a poetic language, he emphasized the grandeur and beauty of the Turkic language through the lyrical emotions, moral-philosophical views, and mesmerizing love scenes in his Turkic “Khamsa.”

His “Khamsa” (1483-1485), gifted to the immense field of literature, comprises the works: “Hayrat al-Abrar” (“Wonders of the Pious,” 1483), “Farhad and Shirin” (1484), “Layli and Majnun” (1484), “Sab'ai Sayyar” (“Seven Planets,” 1484), and “Saddi Iskandari” (“The Wall of Alexander” or “Alexander's Barrier,” 1485). Despite more than five centuries having passed, these works, with their profound moral and philosophical value, remain relevant, beloved, translated into world languages, and published even today in the 21st century.

In 1483, the forty-two-year-old Alisher Navoi began writing his “Khamsa,” completing this collection of five epics, totaling 52,000 verses, in just three years. As he noted himself, his friend Abdurrahman Jami influenced him to undertake such a colossal work as the “Khamsa.” In that same year, the sixty-nine-year-old Jami also began his own “Khamsa.”

In his work “Muhakamat al-Lughatayn,” the poet himself writes that his “Khamsa” is, from beginning to end, a response to Nizami Ganjavi's “Five Treasuries,” and at the same time:

1. “Hayrat al-Abrar” is a nazira (imitation/response) to Nizami's “Treasury of Mysteries.” This work covers themes such as faith, Islamic ethics, justice, hypocritical dervishes, manners and upbringing, knowledge and the amber-scented pen, benevolent, brave, and truthful people, ignorance and arrogance, the beauty of nature (especially spring and the seasons of human life), and Sufism. This epic, consisting of sixty-three sections, is a masnavi of three thousand nine hundred eighty-eight couplets, composed of twenty-one introductory sections, twenty discourses and their explanations (or confirmations), twenty stories, and three concluding sections.

2. “Farhad and Shirin” is a nazira (imitation/response) to Amir Khosrow Dehlavi's “Shirin and Khosrov.” The poet notes that while Nizami Ganjavi wrote “Khusrow and Shirin” and Amir Khosrow Dehlavi wrote “Shirin and Khusrow,” he titled his work “Farhad and Shirin.” According to Navoi, although both classical masters praised Khosrow, he chose the working-class figure of Farhad (a master of mountain work, a stonecutter in folk mythology) as his main protagonist. As Navoi scholar Erghash Achilov puts it, Alisher Navoi created the image of Farhad as a loving seeker (*ashiq salik*)

who reaches the Divine through the Sufi path (Naqshbandi order). The work's theme carries both worldly and mystical meanings, which are closely intertwined.

3. “Layli and Majnun” is a *nazira* (imitation/response) to Hoja Kirmani's “Gawharnama.” The theme of “Layli and Majnun” has led to countless works by various peoples (some sources mention over 120). Some sources even claim these individuals once lived, while others state they are fictional characters or drawn from folk literature. The core theme of the work is an epic of love, and events within the work unfold in two directions: worldly and mystical. In Alisher Navoi's version, Zayd acts as an intermediary between the lovers, Layli and Majnun, delivering their letters to each other. In Nizami Ganjavi's version, a benevolent person fulfills this role.

4. “Sab'ai Sayyar” (“Seven Travelers”) is a *nazira* to Ashraf Maraghi's “Seven Angels.” Navoi completed this work, consisting of five thousand couplets, in just four months. The poet noted that if there hadn't been certain disturbances, he could have finished it in four weeks. This signifies Alisher Navoi's high creative potential and his dedication as a writer. The epic poem “Sab'ai Sayyar” is the fourth dastan in Alisher Navoi's “Khamsa.” This romantic, adventure-filled epic is made up of thirty-eight sections and five thousand nine couplets. The poem begins with traditional sections: the first section is Tawhid (Praise of Allah); the second section is Munajat (supplicatory prayers to the Lord of the Worlds); the third section is a Na't to Prophet Muhammad (PBUH); the fourth section is about the Prophet's (PBUH) Mi'raj (ascension); the fifth section is the praise of words; the sixth section discusses the superiority of poetry over prose, praises the masters of the five treasures, Nizami Ganjavi and Khosrow Dehlavi, and reflects on how he considers himself a drop in their ocean, a speck in their sun; the seventh section is a eulogy to Abdurrahman Jami; the eighth section provides artistic interpretations of Bahram's adventures; the ninth section is about Husayn Bayqara; the tenth section praises his beloved wife, Khadijabegim; and the eleventh section is about the structure of the “Sab'ai Sayyar” (“Seven Travelers”) poem. The events within the poem begin from the twelfth section. At the beginning of the poem, the auspiciousness of the number seven is discussed. It speaks of the seven layers of the heavens, with seven travelers in each layer, the divine wisdom, the seven layers of the earth, and the seven climes, even mentioning there being seven planets. Bahram, the king of the seven climes, built seven castles in seven colors, and seven angels were said to be in his service. King Bahram would visit a castle of a different color each day to listen to the story of a traveler from one of the climes. The work primarily consists of the stories of seven travelers describing the love adventures of its main protagonists, Bahram and Dilara.

5. Alisher Navoi completed “Saddi Iskandari,” the fifth, final, and most substantial poem of his “Khamsa,” in 1485. This work spans seven thousand two hundred fifteen couplets (14,430 lines), comprising eighty-nine sections, including an introduction, main content, and a conclusion. In his work “Muhakamat al-Lughatayn,” Alisher Navoi notes that “Saddi Iskandari” is a *nazira* to “Iskandar Pandnama.” However, reviewing the composition dates reveals that Abdurrahman Jami completed his “Khiradnama-yi Iskandari” (“Alexander's Book of Wisdom,” 1486-1487) after Alisher Navoi. In “Khiradnama-yi Iskandari,” Jami discusses Navoi's “Khamsa,” writing, “It came as a wondrous *naqsh* (design/work) in the Turkic language. Blessings be upon this word, for that *naqsh* was born from one pen. This pen showed mercy to those who write in Persian. If he had written in Persian, they would have had no chance.” Jami's statement implies that if Navoi had written in Persian, the works of other Persian-language poets would have seemed inferior in comparison. Jami greatly valued Navoi's talent and literary heritage, and Navoi, in turn, spoke of Jami with admiration. (Nağıyeva, 2001, pp. 16-17).

In the work, the figure of Alexander is imagined as a Turkic ruler, embodying Sultan Husayn Bayqara and his son Badi' al-Zaman. Unlike his predecessors (Nizami Ganjavi, Amir Khosrow Dehlavi, and Abdurrahman Jami), Alisher Navoi structured the sections concerning Alexander in accordance with the verses related to Alexander Dhul-Qarnayn in the Quran and the activities of the historical figure Alexander (the Great).

The poem being titled “Saddi Iskandari” also points to the Quran as a primary source.

In Alisher Navoi's interpretation, Alexander campaigned against nations with the aim of cleansing the world of infidelity and ignorance, establishing justice globally, and aligning human order with the

grand order of the universe. This is a Sufi interpretation, and the poet's Sufi-mystical views are evident in the epic's introduction, in the chapters recounting events related to Alexander, and in other sections. For instance, upon his death, Alexander requests that one of his arms be left outside the coffin when he is buried. Through this, he calls on people not to be obsessed with the material aspects of this fleeting world, signalling that despite being a conqueror, Alexander went to the afterlife empty-handed, taking nothing with him.

In the 89th section of his work, “Saddi Iskandari” (The Wall of Alexander), Alisher Navoi paints a vivid picture of his “Khamsa,” reflecting on its creation through an anecdotal narrative. The renowned artist Kamal ud-Din Behzad (1455-1536) even created a historical miniature depicting this very scene.

The brief summary of that section goes like this: Navoi recounts the difficulties he faced while writing the “Khamsa.” When he was overwhelmed by despair due to the immense challenges, a herald of good fortune appeared to him, saying, “You, who are drowning in these waves of need and cannot find a way to salvation, go to the door of your pir – Jami – seek his powerful knowledge and vast information, let him rescue you.” After listening to him, Jami then says, “Until now, no hand has written in the Turkic language with such prowess. Your work will be read not only by Turks but also in Iran, and your glorious effort will be called a miracle. If he had written in Persian, they would have had no chance.” Jami meant that if Navoi had written in Persian, the works of other Persian-language poets would have paled in comparison. This shows Jami's high regard for Navoi's talent and literary legacy.

At this moment, overwhelmed by emotion in Jami's presence, Navoi faints and has a dream. He finds himself in a garden as beautiful as the Garden of Irem. Poets are gathered around, waiting to evaluate his “Khamsa.” Among them, the first is the unparalleled elder with pure thoughts, Nizami. To his right is the commander of the army of words, Amir Khosrow Dehlavi, and to his left is his own pir, Jami. Jami himself invited Navoi to this magnificent gathering. Besides these three, Firdowsi, Saadi, Sanai, Unsuri, Khaqani, and Anvari are also seated in the assembly. Hasan Dehlavi introduces these great figures. Nizami turns to Navoi and says, “You have become the ruler of the realm of ghazal. My 'Khamsa' is your powerful spring” (Navoiy, 2011, p. 857; Nağıyeva, 2001, p. 25).

Alisher Navoi's “Khamsa,” which brought him worldwide fame, has been mentioned alongside Nizami's “Khamsa” since its creation. Naturally, while Nizami Ganjavi completed his “Khamsa” in 30 years, Amir Khosrow Dehlavi in 40 years, and Alisher Navoi in 3 years, the fundamental achievement and the true miracle – the genuine discovery – belongs to Nizami Ganjavi. This is because he was the first to sow the seeds of living words, finding five keys to five treasuries. (Jami, on the other hand, finished his “Khamsa” in 7 years, later including two more works in the collection and naming it “Seven Crowns”).

As evident from the titles of the works within the “Khamsa,” they follow traditional classical themes, conventional classical characters, customary events (with variations in depiction), and customary beginnings and endings. Each poet simply managed to create their unique style within the context of human experience.

Throughout his prolific career, this great artist utilized sixteen out of twenty-one literary genre forms.

Alisher Navoi wrote his works in Persian under the pseudonym “Fani.” He compiled a divan titled “Divan-i Fani,” consisting of his lyrical works in Persian, including ghazals, qasidas, mukhammas, musaddas, and tuyuqs.

This divan contains one thousand ninety-seven poems, comprising six thousand lines. Among these, 552 are ghazals, and the *tawhid* (unity of God) section of the work begins with a ghazal (Navoiy, 2011, pp. 6-557).

- He wrote *naziras* for twenty-two ghazals by Sheikh Saadi Shirazi and two original poems in the style of his ghazals.
- He penned *naziras* for two hundred eleven Sufi-themed ghazals by Khwaja Hafiz Shirazi.
- He composed *naziras* for thirty-two ghazals by Amir Khosrow Dehlavi.

- He created *naziras* for three ghazals by Amir Sheikh Suhayli.
- He wrote *naziras* for thirty-one ghazals by Abdurrahman Jami and two original poems in the style of his ghazals.
- He crafted *naziras* for two ghazals by Khwaja Salman Savaji.
- He produced a *nazira* for one ghazal by Sheikh Sabzavari.
- He made *naziras* for four ghazals by Kamal Khujandi.
- He composed a *nazira* for one ghazal by Sahib Balkhi.
- He wrote a *nazira* for one ghazal by Katibi.
- He created a *nazira* for one ghazal by Sayfi.

He included *naziras* (imitations/responses) to several famous ghazals that he admired and selected without naming their authors. Among the ghazals, he incorporated eighty original poems titled “Mukhtara,” eighty titled “Ayzan,” and eight titled “Ikhtira.” In the sections titled “Mukhtara” (a word meaning “invention” or “discovery”) in “Divan-i Fani,” the poet has fifty original ghazals.

“Musaddas” (Navoiy, 2011, pp. 559-560) is a classical poetic form written as a nine-stanza work, with each stanza consisting of six lines, traditionally rhyming in an “aaaa bb” scheme. The word “Musaddas” translates from Arabic as “a sextet” or “having six parts.” This particular “Musaddas” is a *nazira* to Abdurrahman Jami.

“Marsiya” (Navoiy, 2011, pp. 561-567) (“Elegy on the Death of Hazrat Makhdum”) is a lament composed of seven stanzas, each with ten couplets (totaling 140 lines). Extensive notes on this work can be found in the “Khamsat al-Mutahayyirin” section (pages 152-174) of this book, which is about Abdurrahman Jami. (Here, “Hazrat Makhdum” refers to Abdurrahman Jami – A.U.)

Muqatta‘at (Navoiy, 2011, pp. 569-581) consists of sixty-four stanzas, a poetic form totalling three hundred six lines.

Rubai (Navoiy, 2011, pp. 582-594) is one of the widely spread poetic genres in Eastern written literature. These are seventy-two independent four-line works where the first, second, and fourth lines rhyme, while the third line remains unrhymed.

Tarikh (Navoiy, 2011, pp. 595-599) (meaning *abjad*) is a poetic expression of events in

Eastern poetry conveyed through letters. This poetic form is primarily used to mark the death date of an individual. In “Divan-i Fani,” Navoi included “Tarikh” poems about esteemed figures like Abdurrahman Jami, whom he addressed as his master and pir, Hoja Ubaydullah, Sayyid Hasan Ardakhir, Hoja Ahrar Vali, and Muhammad Pahlavan.

Muammalar (Navoiy, 2011, pp. 600-634) are one of the most common artistic forms in classical Eastern poetry. These are verse riddles, often expressed in one or two couplets. The word also means “hidden meaning” or “unknown.” In the divan under discussion, Navoi included two hundred sixty-six *muammalar* under titles such as “Adam,” “Amin,” “Amir,” “Habil,” “Ayaz,” “Ilyas,” “Anis,” “Afzal,” “Ibrahim,” “Iskandar,” “Ikhtiyar,” “Isfandiyar,” “Ifrikhar,” and others. Of these, two hundred fifty-seven stanzas are two lines long, and nine stanzas are four lines long.

Lughaz (Navoiy, 2011, pp. 635-639) are riddle-like verse fragments written in *aruz* meter, explaining the characteristics of an object or being. There are thirty-eight couplets (totalling 76 lines) of *lughaz* under titles like “Sheikh Baba,” “Takhti-ravan,” “Parvana” and so forth.

Qasidas (Navoiy, 2011, pp. 640-695) – these two qasidas, “Sittai-zaruri” (“Six Necessities”) and “Fusul-i Arbaa” (“Four Seasons of the Year”), are featured in “Divan-i Fani.” It's known that Alisher Navoi's first qasida written in Turkic, titled “Hilaliyya,” was dedicated to Sultan Husayn Bayqara's ascension to the throne. However, since these two qasidas were written in Persian, he included them in “Divan-i Fani.”

The work “Sitta-i Zaruriya” (Navoiy, 2011, pp. 600-634) (“Six Necessities”) consists of six qasidas that discuss praise of God, praise of the Prophet, Sufism, and divine knowledge expressed in the language of truth. It begins with a two-page prose and verse “Dibacha” (preface), which highlights the core meaning of the qasidas. After the sections of praise and commendation, Navoi addresses his relationships with Sultan Husayn Bayqara and Abdurrahman Jami. The first qasida, titled “Ruh al-Quds” is one hundred twenty-eight couplets long and extols God's creative power. The second qasida,

named “Ayn al-Hayat dar Na't-i Rasul a.s.” offers praise to the great personality of Prophet Muhammad (PBUH) in one hundred six couplets. The other four qasidas are: “Tuhfat al-Afkar” a ninety-nine-couplet *nazira* to Amir Khosrow Dehlavi's “Darya-yi Abrar”; “Qut al-Qulub”, a one hundred twenty-couplet qasida that is a *nazira* to Hakim Anvari; “Minhaj al-Nijat”, a one hundred thirty-eight-couplet qasida that is a *nazira* to Mir Qasim Anvar and Afzal al-Din Khaqani; and “Nasim al-Huda”, a one hundred twenty-nine-couplet qasida that is a *nazira* to Afzal al-Din Khaqani.

His qasida titled “Fusul-i Arbaa” (Navoiy, 2011, pp. 696-713) (“Four Seasons of the Year”) can be described as a poetic tableau of the seasons, composed in various meters: “Saraton” (winter) with 61 couplets, “Khazan” (autumn) with 33, “Bahar” (spring) with 57, and “Day” (summer) with 60 couplets. It primarily discusses natural phenomena like heat, cold, humidity, and autumn's changes.

“Mufradat” (Navoiy, 2011, pp. 714-733) (“Treatise on Muamma”) is a scholarly treatise on the theory of the *muamma* genre in literary criticism, which Alisher Navoi wrote in Persian and included in “Divan-i Fani” in 1485, alongside his Turkic work on *aruz* meter, “Mizan al-Awzan.” The author discusses this treatise in his work “Khamsat al-Mutahayyirin.” About this highly valued work of its time, Abdurrahman Jami famously stated: “My friend's messenger brought me a treatise; this treatise took away the many years of worries in my heart.” “Mufradat,” which explains the theory of *muamma*, presents three sections, fifteen practical applications, and forty-three stylistic rules, illustrated with one hundred twenty-one *muamma* examples. Navoi scholar Siyuma Ganiyeva notes in her commentary that “this explanation includes the elucidation of one hundred eight *muammas*, but thirteen *muammas* were not written, so their explanations were not provided” (Navoiy, 2011, p. 804).

One of the works included in “Divan-i Fani” is “Khamsat al-Mutahayyirin” (Navoiy, 2011, pp. 734-797), a beautiful classical work dedicated to Abdurrahman Jami, which is discussed separately in this book. This work was written in two languages: Alisher Navoi expressed his thoughts and ideas in Turkic, while his correspondence with Jami was in Persian. Our notes and thoughts on “Divan-i Fani” are based on the 5th volume of Alisher Navoi's 10-volume “Selected Works,” published in Uzbekistan in 2011. The explanations and commentaries are attributed to Navoi scholars Siyuma Ganiyeva and Saifuddin Rafiddunova.

These works serve as reliable sources for studying important and precise historical facts, socio-political events, and other aspects of science, literature, and Sufism of the period. In Alisher Navoi's rich translation experience, we can cite classic works from Eastern literary history as examples, such as Saadi Shirazi's “Gulistan,” Nizami Aruzi Samarqandi's “Chahar Maqala” (“Four Discourses”), and works by Abdurrahman Jami and others.

Alisher Navoi's rich body of work also includes significant scientific-philological and religious-Sufi works written in Turkic. Among these, he composed the following prose works: “Muhakamat al-Lughatayn,” “Mizan al-Awzan,” “Sab'at Abhur,” “Waqfiyya,” “Munsha'at,” “Halat-i Sayyid Hasan Ardakhir,” “Halat-i Pahlavan Muhammad,” “Khamsat al-Mutahayyirin,” “Majalis al-Nafais,” “Nasayim al-Mahabba,” “Tarikh-i Anbiya va Hukama,” “Tarikh-i Muluk-i Ajam,” “Mahbub al-Qulub,” “Risala-yi Tir-andazi,” and “Munajat.” He also wrote the following religious-themed works in verse: “Nazm al-Jawahir,” “Hadith-i Arba'in,” “Siraj al-Muslimin,” and the Sufi-oriented “Lisan al-Tayr.”

These works address complex historical, scientific, and theoretical problems across various fields, including literary criticism, linguistics, *aruz* prosody, biography (tazkira), history, Islamic doctrines, and Sufism.

Therefore, after surveying Navoi's legacy, we can categorize his artistic, literary, and scholarly contributions into four main groups:

1. “Khazain al-Ma'ani” divan (which combines the poet's four divans).
2. His “Khamsa” (meaning his five epic poems).
3. His works written in Persian, collected in “Divan-i Fani.”
4. His scientific-philological, religious-Sufi, and historical works (21 works in total).



## Discussion

The analysis of Alisher Navoi's legacy demonstrates that his historical significance cannot be limited to his role as a classical poet. He should also be regarded as a major intellectual figure who strengthened the prestige of the Chagatai-Turkic literary language and practically proved its capacity for high poetic and philosophical expression. If Nizami Ganjavi and Amir Khusraw established classical models of the masnavi tradition in the broader Eastern literary context, Navoi reworked this model in Turkic and endowed it with a new historical and cultural dimension. In this sense, his Khamsa should be interpreted not simply as a continuation of imitation or nazira tradition, but as an important stage in the development of Turkic literary self-consciousness.

Navoi's activity as a statesman was closely connected with his literary and cultural mission. The transformation of Herat into a major center of culture, the patronage of scholarship and the arts, and the strengthening of Turkic as a language of literary and courtly expression indicate that political authority and cultural vision were united in his personality. For this reason, Navoi's heritage should be evaluated not only as a body of poetic texts, but also as an integrated cultural project.

Moreover, his works present Sufi thought, the ideal of just rulership, moral purity, the divine and human dimensions of love, and a high appreciation of knowledge and ethics as interconnected concepts. This shows that for Navoi literature was not merely a field of aesthetic creativity, but also a means of moral cultivation and human perfection. Therefore, Alisher Navoi occupies a unique place in Turkic and Eastern literary thought as one of the rare classical figures who united language, literature, spirituality, and statecraft within a single intellectual system.

At the same time, the present analysis suggests that future studies should pay greater attention to comparative perspectives, especially Navoi's relation to Nizami, Jami, and Amir Khusraw, as well as to the reception of his works in later Turkic literatures. Such an approach would further clarify the extent of his influence and allow scholars to position him more precisely within the broader map of Eurasian literary history.

## Conclusion

The analysis carried out in this article shows that the era, life, and literary heritage of Alisher Navoi are inseparably interconnected. Formed within the complex socio-political and cultural environment of the Timurid period, he embodied in his personality the poet, the thinker, the statesman, and the cultural patron. Navoi's creative legacy played a decisive role in raising Chagatai-Turkic to the level of a classical literary language, while his Khamsa, divans, and scholarly-philosophical writings exerted a profound influence on the subsequent development of Turkic literature.

It can therefore be concluded that Navoi was not only the author of a great literary heritage, but also a major historical figure in the formation of Turkic cultural self-consciousness. His views on language, literature, spirituality, and social justice continue to preserve their scholarly and moral significance. In this regard, the legacy of Alisher Navoi should be regarded not only as part of the historical-cultural past, but also as one of the enduring points of reference in modern humanities scholarship.

## References

1. "M. Əmir Əlişir Nəvayi". (1999). In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1926), 77–78.
2. *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. (2009). A. Ülvi (Haz.). Qartal.
3. Əliyev, S. (1999). Dahi şair, böyük alim. In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1966), 146–149.
4. Bobur, Z. M. (1989). *Boburnoma* (A. Utkam, Red.). Yulduzcha.
5. Həbibbəyli, İ. (2017). Əlişir Nəvai – ümumtürk ədəbiyyatında böyük zirvə. In *Əlişir Nəvai və Azərbaycan ədəbiyyatı beynəlxalq elmi konfransın materialları*. Elm və Təhsil, 72.

6. Həsənzadə, Ə. (1999). Təracümi-əhval (məşahir) Əlişir Nəvai. In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1914), 17-50.
7. İslam ensiklopediyası. (2016–2020). Ali Şîr Nevâî. Türkiyə: TDV İslâm Araşdırmaları Mərkəzi.
8. Kayumov, A. (2011). *Dilkusho povtory i dushevnyye pesni*. Mumtoz Soz.
9. Köçərli, F. (1999). Əlişir Nəvai – Əmir Nizaməddin. In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1925), 55-62.
10. Nağıyeva, C. (2001). *Azərbaycanda Nəvai*. Tural-Ə.
11. Navoi, A. (2011a). *Mukammal asarlar to'plami* (C. 5). Gafur G'ulom.
12. Navoi, A. (2011b). *Mukammal asarlar to'plami* (C. 9). Gafur G'ulom.
13. Nəvai, Ə. (1484/əlyazma). *Divan (Ğəraibüs-siğər)*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-114/2010).
14. Nəvai, Ə. (1537/əlyazma). *Lisanüt-teyr*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri D-310/3006).
15. Nəvai, Ə. (1557/əlyazma). *Məcalisün-nəfayis*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-107/2996).
16. Nəvai, Ə. (1645/əlyazma). *Vəqfiyyə*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-274/14181).
17. Nəvai, Ə. (1821/əlyazma). *Leyli və Məcnun*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri D-314/13270).
18. Nəvai, Ə. (1821/əlyazma). *Səddi-İskəndəri*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri D-314/13270).
19. Nəvai, Ə. (1864/əlyazma). *Məhbubül-qülub*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-104/11437).
20. Nəvai, Ə. (XVIII əsr/əlyazma). *Çahar divan*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-84/2998).
21. Nəvai, Ə. (XVIII əsr/əlyazma). *Hədisi-ərbəin*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-45/2794 I).
22. Nəvai, Ə. (XVIII əsr/əlyazma). *Münşəat*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-45/2794 V).
23. Nəvai, Ə. (XVIII əsr/əlyazma). *Nəzmül-cəvahir*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-45/2794 II).
24. Nəvai, Ə. (XVIII əsr/əlyazma). *Xəmsətül-mütəhəyyirin*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-45/2794 III).
25. Nəvai, Ə. (təx. XVIII əsr/əlyazma). *Məcalisün-nəfayis*. AMEA Məhəmməd Füzuli adına Əlyazmalar İnstitutu, Nadir fond (şifri M-45/2794 IV).
26. Rüstəm, S. (1999). Əlişir Nəvai. In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1975), 196-199.
27. Türk ədəbiyyatı (El ədəbiyyatı). (1992). III cild. Ankara.
28. Ülvi, A. (2008). *Azərbaycan–özbək (çağatay) ədəbi əlaqələri*. Qartal.
29. Ülvi, A. (2023). *Əlişir Nəvainin əsri və nəsri*. Elm və Təhsil.
30. Xəlilov, P. (1999). Əlişir Nəvai. In A. Ülvi (Haz.), *Əlişir Nəvai Azərbaycan ədəbiyyatşünaslığında: Məqalələr*. Qartal. (İlk nəşr: 1977), 200-216.

Received: 14.11.2025

Accepted: 10.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/54-66>

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## **Innovative Business Models in the Field of Tourism and Hospitality**

### **Abstract**

The development of the tourist market and geopolitical uncertainty make it necessary to improve traditional business models for cost-effective corporate competitiveness and ensure that strategic management in organisations is complemented by actual audience's needs. New information systems and digital innovations allow for new ways of enhancing business efficiency that should be addressed in the novel business models. The article aims the study of innovative business models in tourism and hospitality sector as potential for sustainable development of companies, increased efficiency of marketing strategies and audience expansion. Research techniques entailed an analysis and synthesis, generalization, concretization, and the construction of statistical models of consumer behavior. The paper considers the essence and distinctive features of key novelties in strategic management for tourism, hotel and restaurant business industry such as large-scale digitization of services (personalized advertising; targeting; electronic booking, etc.); formation of new areas of activity ("green" tourism, religious tourism, military-tourism...); creating unique individual offers (rest-and-therapeutic recreation; thematic/ hobby tours), the integrated approach which included not only hotel chains but also catering establishment management or providing entertainment to maximize the satisfaction specific requests from certain visitors audience segments and raise attractive level of destinations. The emphasis is put on modern marketing strategies in hospitality and tourism, such as context-targeted advertising, content marketing, individual price offers and targeted ads on social networks.

New business operations; innovation-based planning should concentrate on the increase demand and consumer readiness, creating new products and services, optimizing the design of organizations and relationships in firms with a focus on influence technologies, as well as adapting the latest methods of promotion and sales demand (as a result profitability will increase along with expansion into the market). The necessity for the creation of favorable environment, supportive of small business and institutions stimulated the innovative development of territories and PPP (public-private partnership) projects in tourism sector, has been substantiated.

**Keywords:** *hospitality industry, digital technologies, business process transformation, innovation, personalization, competitiveness, sustainable development*

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## **Turizm və qonaqpərvərlik sahəsində innovativ biznes modelləri**

### **Xülasə**

Turizm bazarının inkişafı və geosiyasi qeyri-müəyyənlik ənənəvi biznes modellərinin təkmilləşdirilməsini zəruri edir ki, bu da korporativ rəqabət qabiliyyətini təmin etsin və təşkilatlarda strateji idarəetmə real auditoriyanın tələbatları ilə uyğunlaşdırılsın. Yeni informasiya sistemləri və rəqəmsal innovasiyalar biznesin səmərəliliyini artırmaq üçün yeni imkanlar yaradır və bu imkanlar yeni biznes modellərində nəzərə alınmalıdır. Məqalənin məqsədi turizm və qonaqpərvərlik sektorunda innovativ biznes modellərini şirkətlərin davamlı inkişafı, marketing strategiyalarının səmərəliliyinin artırılması və auditoriyanın genişləndirilməsi üçün potensial kimi araşdırmaqdır.

Tədqiqat metodları kimi analiz və sintez, ümumiləşdirmə, konkretləşdirmə və istehlakçı davranışının statistik modellərinin qurulması istifadə edilmişdir. Məqalədə turizm, hotel və restoran

biznesi sahəsində strateji idarəetmədə əsas yeniliklərin mahiyyəti və fərqli xüsusiyyətləri nəzərdən keçirilir. Bunlara xidmətlərin genişmiqyaslı rəqəmsallaşdırılması (fərdiləşdirilmiş reklam, targetinq, elektron bronlaşdırma və s.), fəaliyyətin yeni istiqamətlərinin formalaşdırılması ("yaşıl" turizm, dini turizm, hərbi turizm və s.), həmçinin unikal fərdi təkliflərin yaradılması (istirahət və müalicəvi turizm, tematik və hobbli turları) daxildir.

Bundan əlavə, mehmanxana şəbəkələri ilə yanaşı ictimai iaşə müəssisələrinin idarə edilməsi və əyləncə xidmətlərinin göstərilməsini də əhatə edən integrasiya olunmuş yanaşma, ziyarətçilərin müxtəlif auditoriya segmentlərinin xüsusi tələblərini maksimum dərəcədə təmin etməyə və turizm məkanlarının cəlbediciliyini artırmağa yönəlmişdir. Tədqiqatda həmçinin qonaqpərvərlik və turizm sahəsində müasir marketinq strategiyalarına – kontekst yönümlü reklam, kontent marketinqi, fərdi qiymət təklifləri və sosial şəbəkələrdə hədəflənmiş reklam kimi alətlərə xüsusi diqqət yetirilmişdir.

Yeni biznes əməliyyatları və innovasiyaya əsaslanan planlaşdırma tələbin artmasına və istehlakçıların hazırlıq səviyyəsinə yönəlməli, yeni məhsul və xidmətlərin yaradılmasını, təşkilati strukturların və müəssisələrarası münasibətlərin optimallaşdırılmasını, həmçinin təsir texnologiyalarına əsaslanan idarəetməni və satışların təşviqinin ən son metodlarına uyğunlaşmanı təmin etməlidir. Bunun nəticəsində gəlirlilik artacaq və bazara çıxış imkanları genişlənəcəkdir. Məqalədə həmçinin turizm sektorunda innovativ inkişafı stimullaşdırmaq üçün kiçik biznesin və dövlət-özəl tərəfdaşlığı (PPP) layihələrinin dəstəklənməsi üçün əlverişli mühitin yaradılmasının zəruriliyi əsaslandırılmışdır.

**Açar sözlər:** qonaqpərvərlik sənayesi, rəqəmsal texnologiyalar, biznes proseslərinin transformasiyası, innovasiya, fərdiləşdirmə, rəqabət qabiliyyəti, davamlı inkişaf

## Introduction

The upgrading of b-type is intended to promote economic efficiency, cut expenses and embed the corporate interactive-communicative strategy. Encouraging investments and technological improvements, investment stimulation and experiential marketing are inalienable elements of the enhancement of business methods in tourism and hospitality as described below.

In the current stage of regional economic structure, with tourism becoming an important force in regional economy development, the construction of targeted tourist routes, absorption and utilization of locations resources and opening up new location resources should be make sure to meet the needs as well as interests for audiences. At the same time, infrastructure cooperation to be given by the hotel/restaurant business should also not change as modern tourist wants complete products and integrated offers.

To enable the realization of new business models, however, this also requires an effective quality management mechanism like customer-oriented design and marketing strategies as well as systematic optimization processes or communication that include everyone. Some of the current researchers (especially Sukach et al. (2021) and Rasoolimanesh et al. (2023)), they concentrate on a creativity factor of the tourism industry, while others (Rusch, 2023) are advocating the environmental friendliness and creativity of sites as theoretical foundations for creation within the hotel industry. In their research, Ali et al. (2021), Povorozniuk (2023), Streimikiene et al. (2021) identified prospects for the development of destination infrastructure of new forms of tourism: educational, business, medical, green and proposed state-business-public partnership in the realization of destination supporting programs. Meanwhile, Thommandru et al. (2023) and Rather (2025) address digital transformation in marketing vector for tourism by highlighting the possibilities of targeted advertising, social networks, personalization, AI technology and also involving influencers.

It is evident there are several disconnects between destination and hospitality development plans. Special attention should be paid to digitalisation and the transformation of marketing campaigns using insight carried out on consumer behaviour study (e.g., analytical platforms "Meta Ads Manager" and "Google Analytics") for the purpose of the maximum personalization of suggestions, cause an association with a brand emotionally, enlarge the quantity of customer's audience, promote visual and interactive information through social network service about a new product, adapt advertising

company in this segment. This emphasizes the necessity for more researches in relevance with the potential of new business models that can play an efficient role in tourism and hospitality industry for companies' sustainable development.

The scientific novelty of this study lies in the proposal of an innovative business model in the field of tourism and hospitality as a potential for sustainable development of companies, increasing the effectiveness of marketing strategies and expanding the audience.

### **Literature Review**

The problem was directed on the basis of existent studies in scientific works of several recent researchers. Khan et al. (2020) and Pletsan et al. (2023) identified one of the major barriers in the development of entrepreneurial activities in tourism as non-observance of sustainable development trends, lack of use of historical and cultural heritage resources by regions, low level of advertising regional destinations and local natural conditions, which substantially reduce the variety range in rendering regional tourist services available to vendors and competitiveness on a market. Low recreational potential and low employment as problematic are also emphasised by the authors in the industry.

Ivars-Baidal et al. (2023) stress the necessity of use of international experience when creating tourism brand: designing programs addressing the support to market players in tourism and hotel and restaurant business, practical cooperation of individual participants in formation of mutual assistance of activities, forming tourist demand for visitation destinations and memorable routes; search for innovation concepts in promoting “green”, rural and ecotourism including existing now military tourism.

In the case of corporate social responsibility, Achmad and Yulianah (2022) also claim that new business models for tourism and hospitality development can offer certain outcomes as follows: closing unequal development levels in adopting between a region, maximizing investment climate for availing financial inflow while securing more infrastructure landscape.

In the publications of publications Elshaer and Marzouk (2024) and Verma et al. (2021) that focus on the digitization of marketing in tourism – targeting and personalizing. Researchers are showcasing that augmented reality could be the key to higher profits in hotel, restaurant and tourism industry it can also help in developing a strong bond of trust and loyalty with audiences.

However, there are several aspects of the topic under investigation that need to be further explored. The tourism industry stands to gain from applied solutions in the domain of innovation that will enable better performance of existing business models and effect a successful launch of new ones for sustainable development. There are gaps in the modern concepts of development that consist of the weak practical focus on the proposed strategies, as well as insufficient consideration to crisis conditions of formation of a modern tourism sector due to geopolitical instability.

### **Aims**

The purpose of this article is to analyze the potential of innovative business models in the field of tourism and hospitality to achieve sustainable development of companies, improve the effectiveness of marketing strategies, and expand the customer audience.

### **Materials and Methods**

The study mainly involved a systematic and comprehensive analysis of scientific publications, research papers, and major global trends. The approach to the analysis included thematic coding. Given the practical realities, the sample size was considered appropriate, providing sufficient scientific and statistical power. To reduce internal bias in the publications used for this study, an open access and data reuse strategy was applied. This involved providing access to the full study data, including raw data and code, which allowed for verification of results and additional analysis as needed, thereby reducing the impact of bias.

The main materials for the study were selected industry publications indexed in leading scientific databases (Web of Science, Scopus), as well as statistics from official sources. The sample period is 2019-2025. Search engines such as Google Scholar were used to effectively search for information during the study. The queries were formulated by selecting relevant keywords, and clarifying

questions or commands were used to narrow down the search results. For a more in-depth analysis, the results from different sources were reviewed, paying attention to the quality of the information. The criteria for including and excluding publications were spatial and temporal indicators and the level of information reliability. The criteria for assessing the quality of the sources were the relevance and objectivity of the publication, completeness of coverage of the topic, and credibility.

Aspects of the critical evaluation of research included checking: the relevance, novelty and significance of the problem; compliance of the chosen methodology with the purpose and objectives of the study; reliability and validity of the results; logical validity of the conclusions and compliance with scientific standards, as well as potential implementation in practice.

To solve the problems set forth a complex of general scientific and special research methods were applied in the work:

1. Types of analysis and synthesis methods are used in studies, analyses the key aspects of modern business models in industry, evaluates the influence of digitalization on functioning of business processes effect for economic development;
2. Generalization and systematization – to systematize the conceptual and categorical base and to specify basic categories, terms;
3. Statistical research in order to determine the level of development of innovative business models in tourism and hospitality;
4. Structural-logical approach - elaboration proposals for improving an organizational mechanism of business-processes transformation in digital environment.

The limits of the research lies in the difficulty of confirming results obtained from theoretical conclusions and poor-quality, unarranged analysis, as well as in possible regional bias.

## **Results**

The activities of modern companies in the tourism and hospitality industry go beyond niche business, becoming dynamic and integrated. Current business models in the industry must respond to the challenges of the modern economic space – they must be complementary to the principles of sustainable development, innovative, inclusive, and strive for continuous improvement. In particular, this includes the development of infrastructure for “green” tourism, the creation of a bank of targeted projects for the development of regional destinations and the local hospitality industry, the expansion of investment programs, and the promotion of sustainable tourism “brands.”

It is not advisable to narrow innovation in the tourism sector down to service innovation alone, as this industry is a multi-vector production complex with broad opportunities for innovation. In this regard, it seems appropriate to classify the key types of innovation in the tourism business, which often overlap and are closely interrelated (Table 1).

**Table 1.**  
 Innovation trends in the tourism and hospitality business\*.

| <b>Direction of innovation</b>            | <b>The essence of innovation</b>                                                                                                                                                                                                                                    | <b>Implementation examples</b>                                                                                                                                                                                                                                                                    |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product innovations                       | Development and implementation of a new or improved product, attraction of new recreational resources, development of new tourist and recreational destinations or types of tourist activities, new tourist routes, directions                                      | New travel direction (wildlife tours); new services on health improvement in hospitality establishments; event tourism; gastronomic tourism                                                                                                                                                       |
| Resource innovations                      | Attracting a new type of tourism resources (natural and historical and cultural sites, current phenomena and events, infrastructure for new types of tourism)                                                                                                       | Military tourism, stalking, stalking, extreme tours, event tourism                                                                                                                                                                                                                                |
| Technical and technological innovations   | In the implementation of improved or new techniques and technologies promotion of services, their implementation, customer service, new types of logistical support for tourist services and transport services for tourists                                        | Digital tour and hotel reservation systems; ticket sales systems; integrated hotel management and virtual concierges; touch -screen information displays; e- commerce; review platforms                                                                                                           |
| Marketing innovations                     | Developing new market segments and client audiences, forming new advertising models                                                                                                                                                                                 | Improved service in the field of hospitality: early booking, taxi ordering, food delivery, electronic menu; development of social tours and inclusive proposals                                                                                                                                   |
| Organizational and managerial innovations | Improving management and organizational structures, creating new job profiles; improving sectoral state and regional management                                                                                                                                     | Implementation of integrated hotel chains; use of contractual approaches to hospitality management, CRM systems.                                                                                                                                                                                  |
| Service innovations                       | Integration of new methods of training and retraining of personnel; pricing based on the principle of “live price”; creation of transparent processes of interaction with stakeholders; development of a network of hospitality establishments based on franchising | Improved consumer interface, new forms of interaction with partners and service management, protection against industrial espionage, territorial expansion of business without a vertically integrated management network                                                                         |
| Logistics innovations                     | Improvements in supply chains, delivery and distribution systems; integrated destination information systems.                                                                                                                                                       | hub systems at airports - the concept of movement through a single connecting air transport hub; the concept of “Just in Time” or “Pull – systems” – coordination of tourist flows with the potential of the destination based on the principles of sustainable development and quality services. |

\*Source: compiled by the author

Novel business models in tourism and the catering industry always include a digitalization of advertising. Added-value personalized advertising, targeting, and influencer marketing have also



become standard tools for breaking barriers between the company and its audience (as well as growing the latter) in order to build long-term trust among brand users' (Williams et al., 2023).

The specificity of the innovative activity in tourism is expressed firstly by the fact that to develop its individual directions cluster type enterprises' cooperation is required.

The establishment of a creative space for business development and attention the market creation local destinations it is necessary to involve investors, carry out public-private partnership projects in order to stimulate transport accessibility of territories through subsidizing lease payments. Furthermore, there are always new business models that need refinement — the partnership between travel companies and hotels & restaurants businesses with sellers from related service industries; developing “smart” hotels; updating loyalty programs regularly; introducing chatbots to communicate with users are just a few examples.

Innovative business model-based marketing seeks to maximize complementarity with the interests of all stakeholders, including potential customer audience needs, to be met. In particular, they should satisfy several criteria: provide nontrivial solutions from the network solution approach; contain minimal advertising expenses; employ with personalization tools;; work through social media channels (e.g., Facebook<sup>TM</sup>); support search engine optimization (further – SEO) and artificial intelligence. Computer programs like OPERA enterprise solution, KeiHotel and FIDELIO have been found to be an efficient choice in managing hotels business.

Algorithms analytics allow for finer targeting, and social media like Instagram, Facebook, and YouTube become fundamental tools for marketing campaigns. You also want to involve influencers who might influence what customers think of a product, especially in terms of reviews and video reviews. Significance of Google Analytics tools from the point of view of monitoring user behaviour: companies can interpret customer decisions and personalise messages on-the-fly (Table 2).

**Table 2.**  
 Directions of digitalization of marketing strategies in innovative  
 business models in the field of tourism and hotel and restaurant business\*.

| Direction                    | Key objectives                                                                     | Main characteristics                                                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Targeted advertising         | Selecting and engaging the target audience segment most interested in the services | Targeted personalized advertising that takes into account the analysis of behavioral trends of the target audience of consumers                           |
| Influencer Engagement        | Increasing brand awareness, audience trust in the company and product              | Engaging celebrities, bloggers, and other influencers to build sustainable consumer preferences among potential audiences                                 |
| SEO optimization             | Growth in the number of visitors to the company's online resources                 | Optimization of the company's resources' positions in search engines                                                                                      |
| PPC strategy (Pay Per Click) | Attracting traffic to the site                                                     | Paid advertising on search platforms, social networks, and media environments aimed at increasing sales, attracting leads, and increasing brand awareness |
| email marketing              | Ensuring customer loyalty                                                          | Sending advertising offers to the target audience via email                                                                                               |
| Retargeted advertising       | Building an audience of regular customers                                          | Targeted advertising to users who have had experience interacting with the company                                                                        |

|                 |                                                                                                            |                                                               |
|-----------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Social networks | The company needs to grow its customer base through brand promotion which should target younger consumers. | Engaging social media to promote the brand                    |
| Cross-promotion | Unification and expansion of the customer audience                                                         | Interaction with other companies for mutual marketing support |

*\*Source:* compiled by the author

In reviewing Table 2, attention should be paid to the business development potential of social platforms in tourism and hospitality. As the figures of UNIQODE (2024) indicate, almost 35% potential travelers tend to use Instagram in order to select novel destinations for tourism and recreation. Hence, marketing is advised at this time to concentrate: where feasible on visually-appealing content as a means in which to push of the brand, product, or destination. Creative digital novelties encompass the minimalistic use of QR codes giving immediate access to customers about the product, electronic menus which can be interfaced for fast ordering and consumer engagement to help create a recipe generates additional advertising stories.

Brand globalisation, with its focus on service quality, offers some intriguing stories for new business models in contemporary tourism and hospitality. International hotel and restaurant chains (for example, Hilton Worldwide, Marriott International, Wyndham Hotel Group and InterContinental Hotels Group) are notable examples there — the vast majority of hospitality sector establishments can be ascribed to large ventures like these (Fig. 1).

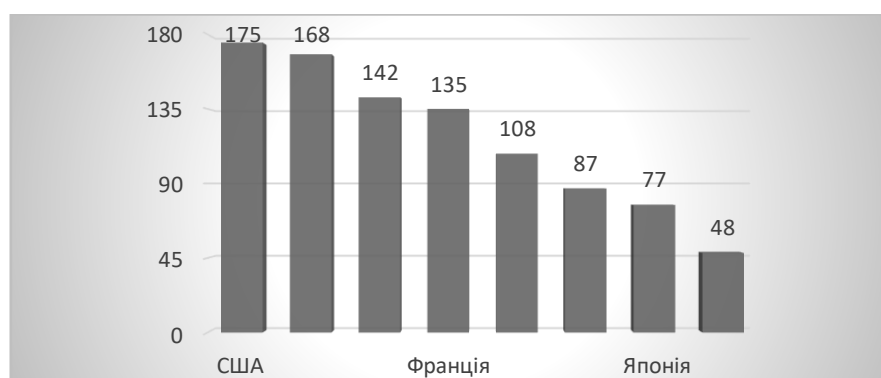


**Figure 1.** Number of establishments of global hospitality companies by country, 2023\*

*\*Source:* Booking.com (2023)

New trends in the area of business development of developed networks include collaboration and convergence between hotel and restaurant activities with other service sectors, intuitive meeting services for customer expectations and needs, various internal cross-referenced hotel segments (mobile applications or loyalty programs. Smart hotels are increasingly common with the advent of voice activation devices, sound system management and rest and sleep promoting tools (e.g., Dodow metronome) (Özoğlu & Topal, 2020).

Digital business includes development of financial technologies (fintech) and rapid growth in online platforms as well as enhancing digital literacy amongst the population. The pace of advancement in financial inclusion through the use of digital technologies is notably slower in Ukraine than that of developed Organisation for Economic Co-operation and Development (OECD) countries. 2).

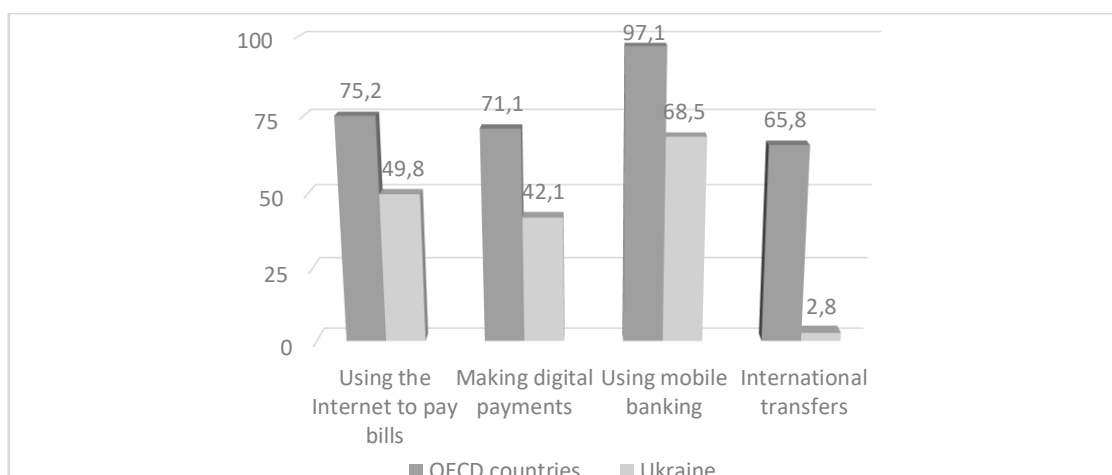


**Figure 2.** Digital financial inclusion indicators in 2023, % of population\*

*Source:* systematized by the author based on (World Bank, 2023)

Recently, companies related to tourism and hospitality are very dependent on the optimization of digital business, which has a great impact on the level of financial security. Revolutionary solutions in this space, such as encryption, AI- threat detection, data confidentiality, blockchain technology, all provide crystal clear accountability in financial transactions; it builds audience trust and speeds up the process for instant booking. Moreover, because of being considered as an innovative B2B and HR kinds of software, these promising ones such software can provide information and economic interaction in business environment too (Zibarzani et al., 2022). It's obvious that the diversity found in today's digital solutions can be utilized to advance inclusive and fiscally secure opportunities.

The European Agenda for Tourism 2030 (2022) provides a roadmap for sustainable, inclusive, innovative and resilient tourism in EU-27 until 2030. The main purposes of the agenda are to reduce environmental impact and increase corporate social responsibility in the field, promote inclusion, assist destinations in regions and support sectoral growth throughout the year. With this measure digital transformation is intended and maximum stakeholder inclusion. The EU is also putting in place lending, investment and grant programs to incentivise sustainable tourism development via a series of programmes including Horizon Europe (which will support sustainable tourism concepts), the Fund for European Regional Development (the ERDF) or Next Generation EU which among other things will be supporting green tourism.

Smart technologies-based method of a slow reproduction makes it possible to localize tourists flows and helps effectively integrate travel planning and place of call tools, which is possible to attract the hotel business for support facilities on local platforms in the most visited destinations with. This strategy would enable an actual promotion of local communities and culture, revitalize green/rural/cultural tourism and foster projects based on publicprivate interaction (Azevedo et al., 2024; Elshaer & Marzouk, 2024).

It is now obvious, that advanced digital technologies in tourism are a thing of the future. They provide new niches for startups and make tourism more affordable for different segments of the population. It is important to mention that the formation of innovative entrepreneurship in tourism and hospitality industry includes three components: entrepreneur itself; informational and management technologies, innovative technological solutions. For the purposes of promoting business in tourism and hospitality industry, it is reasonable to develop a simple model of innovative IT project realization (Figure 3).

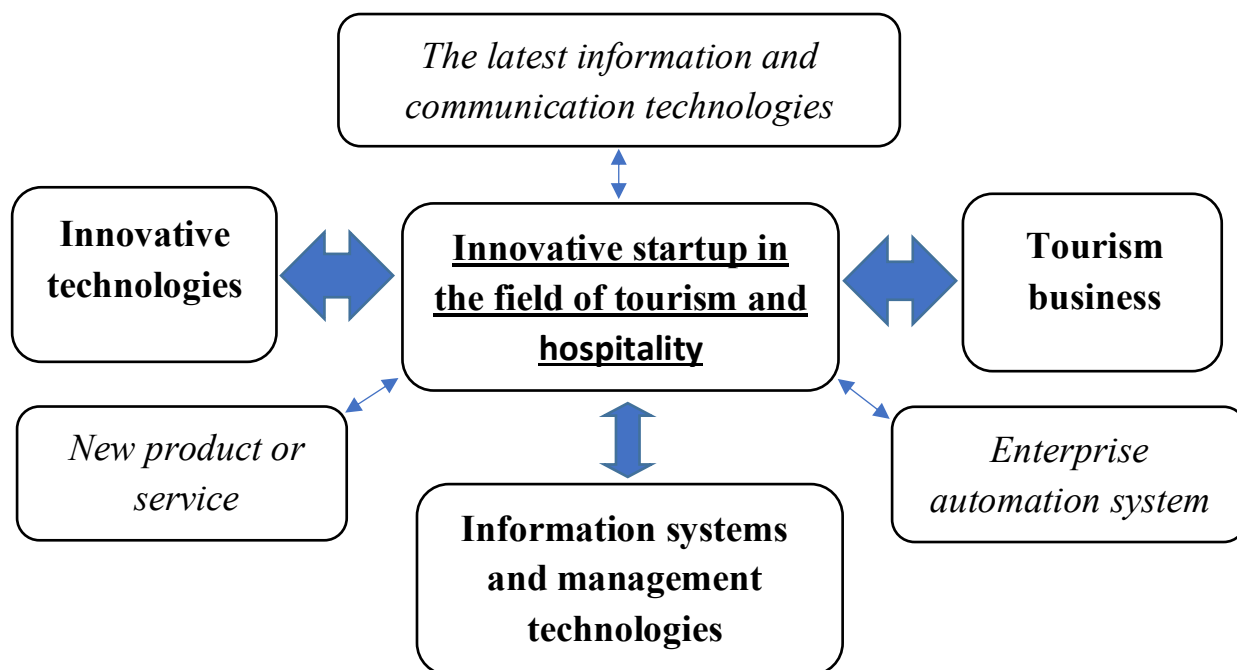


**Figure 3.** Basic model for developing innovative business projects in the field of tourism services\*

\*Source: developed by the author based on Amet-Ustaeva (2014), Streimikiene et al. (2021)

Considering the terms of the model presented in Fig. 3 will facilitate the creation of a competitive tourism product and create conditions for the client to operate independently on the invention tour, choose maximum favorable infrastructure conditions and form the final price of a complex. This line of innovation is a contribution to the development of smart tourism in connection with “smart destination” projects which focus on clustering the visitors’ community to a specific area or location, using QR codes enabled with multilingual support, developing mobile applications for targeted tourists, and reliance in the use of Internet and widening expansion in 5G access. An analysis of domestic and international practices showed that it is information technologies that are an integral part of the business model that make it possible to reduce the labor input when managing by 10–30% and accelerate the adoption of decisions in 2-5 times on the basis of creation and implementation of automatic management systems (Ivars-Baidal et al., 2023).

Economic effects of business processes activeness transformation in hospitality and tourism branch the ensured effect related to the active transformation of business processes in hotel and trade companies are: using the resources in more rational way; diversifying their own sources of investment, responding to maximum requirements of customer demand; increasing the enterprises competition potential.

### Discussion

A handful of modern thinkers considers what digitalization and innovation mean for business in tourism/hospitality. According to Waqanimaravu and Arasanmi’s (2020) definition, tourism is the kind of activity, recreation model and in the meantime a business, science and art – this makes it hard to develop a successful business model for company creation in this area. Contrarily, Font et al. (2021) and (2023) locate the pace of digital economy development and inclusive growth of tourism business as with bright prospects. In this respect, the authors examine the cloud computing-based technologies, artificial intelligence and business model dynamics in the context of digital transformation as a whole. The findings of the researchers further support this study's implications that personalization service, directed marketing and digital security of immediate financial transaction within advance booking system are important.

Meanwhile, Wang (2021) emphasizes how business environment requires efficient communication, which emanates feedback from the grounds of approachability and openness. Chatbots and 24/7 consulting let you deliver a new standard of customer service so your customer base will grow to trust your brand. This approach, according to the researchers, will allow for effective and rapid adaptation to new competitiveness requirements, including the transformation of business forms in accordance with global market dynamics, requirements for the quality of services and guarantees of their economic feasibility.

According to the findings of studies conducted by Yang and Hu (2024), it can be concluded that the future of tourism lies in recreational practices and active leisure, which directly corresponds to the shift that is observed today – in modern societies there is a change towards activation (dynamic) leisure, short-term recovery of working capacity, cognitive activities. Scientists have identified the effectiveness of integrating successful practices of international experience, investment and grant funds for the development of new tourism destinations. It is worth agreeing with the authors on the expediency of these measures in the context of optimizing tourism activities at a low level of overall socio-economic development and identifying adaptive reserves.

Rural and green tourism is a newer, yet active development phenomenon. Kravchuk et al. (2019) The base for securing stable occupation for the rural population and deriving income economic for tourism. The author sees rural tourism as a means of a relatively quick raise in the standard of living. The outlined strategy requires, in turn, the modernization of the tourism business based on digitalization, consulting, and active exchange of practical knowledge and skills. The results of scientific research by scientists are convergent with the conclusions of the current study on the direct dependence of the economic performance of tourism on the level of its adaptability to global digital dynamics.

Amore (2024) focuses on the gears to active integrated development of destinations and regional tourism, especially with reference to cross-sectoral cooperation. Considering the necessity of effectively balancing tourism development factors in aspects to provide better conditions for business development, the conclusion from author is worth being appended. The latter, especially new digital innovations, require a steady investment and strategic management of the company's growth. This approach is currently considered to be the basis for increasing competitiveness and investing in tourism on the basis of sustainable development.

## Conclusion

Entrepreneurial business sector stimulating the development of tourism and hospitality will also facilitate rapid reactions to new market challenges, enabling a competitive advantage and stronger economic power of companies' operations. Business transformation in a studied industry sector should be focused on. These include active promotion of sustainable tourism and restoration of ecosystems, formation of year-round demand background balanced resource use, industry digitalization, integration points for tourist complex into the life of other services and infrastructure.

The proposed optimization directions with respect to the business model quality improvement are: introduction of IT technologies and creation of e-tourism, modernization of tourist infrastructure, formation for the modernization of local destinations focused programs and banks, attraction of private capital under public-private partnership conditions, active tourism decentralization policy, implementation of digital platforms for tourism development: business establishment joint investment projects introduction: "green" standards application; support for eco-tourism and eco-initiatives.

To drive demand, one must concentrate on driving conversion and refining the target audience while extracting valuable behavioral data from Big Data. No doubt, technologies such as augmented reality, blockchain, voice assistants and recognition systems will demand substantial resources; modern business models therefore should obtain the best global experience in innovative development to maximize effect at minimal cost.

The study can encourage research in the search for grounds to improve management practices in tourism and hospitality industry under crisis external conditions, which promote efficient implementation of innovative business models into practice.

## References

1. Achmad, W., & Yulianah, Y. (2022). Corporate social responsibility of the hospitality industry in realizing sustainable tourism development. *Enrichment: Journal of Management*, 12(2), 1610–1616.
2. Ali, B. J., Gardi, B., Jabbar Othman, B., Ali Ahmed, S., Burhan Ismael, N., Abdalla Hamza, P., & Anwar, G. (2021). Hotel service quality: The impact of service quality on customer satisfaction in hospitality. *International Journal of Engineering, Business and Management*, 5(3), 14–28. <https://doi.org/10.22161/ijebm.5.3.2>
3. Amet-Ustaeva, D. M. (2014). Management of innovative development of tourism businesses. *Business Inform*, 7, 103–108. <http://www.business-inform.net>
4. Amore, A. (2024). Tourism, public policy and governance. In *The Wiley Blackwell companion to tourism* (pp. 635–651). Wiley. <https://doi.org/10.1002/9781119753797.ch43>
5. Azevedo, C., Roxo, M. T., & Brandão, A. (2024). Sustainable tourism e-communication impact on tourism behaviour. In *Smart innovation, systems and technologies* (Vol. 344, pp. 559–581). Springer. [https://doi.org/10.1007/978-981-99-0333-7\\_40](https://doi.org/10.1007/978-981-99-0333-7_40)
6. Booking.com. (2023). *Global hotel chains*. <https://www.booking.com/>
7. Elshaer, A. M., & Marzouk, A. M. (2024). Memorable tourist experiences: The role of smart tourism technologies and hotel innovations. *Tourism Recreation Research*, 49(3), 445–457. <https://doi.org/10.1080/02508281.2022.2027203>
8. European Commission. (2022, December 2). *European Tourism Agenda 2030: Commission welcomes the commitment of EU countries to make tourism greener, more digital and resilient*. [https://single-market-economy.ec.europa.eu/news/european-tourism-agenda-2030-commission-welcomes-commitment-eu-countries-make-tourism-greener-more-2022-12-02\\_en](https://single-market-economy.ec.europa.eu/news/european-tourism-agenda-2030-commission-welcomes-commitment-eu-countries-make-tourism-greener-more-2022-12-02_en)
9. Font, X., English, R., Gkritzali, A., & Tian, W. S. (2021). Value co-creation in sustainable tourism: A service-dominant logic approach. *Tourism Management*, 82, Article 104200. <https://doi.org/10.1016/j.tourman.2020.104200>
10. Font, X., Torres-Delgado, A., Crabol, G., Palomo Martinez, J., Kantanbacher, J., & Miller, G. (2023). The impact of sustainable tourism indicators on destination competitiveness: The European Tourism Indicator System. *Journal of Sustainable Tourism*, 31(7), 1608–1630. <https://doi.org/10.1080/09669582.2021.1910281>
11. Ivars-Baidal, J. A., Vera-Rebollo, J. F., Perles-Ribes, J., Femenia-Serra, F., & Celdrán-Bernabeu, M. A. (2023). Sustainable tourism indicators: What's new within the smart city/destination approach? *Journal of Sustainable Tourism*, 31(7), 1556–1582. <https://doi.org/10.1080/09669582.2021.1876075>
12. Khan, A., Bibi, S., Ardito, L., Lyu, J., Hayat, H., & Arif, A. M. (2020). Revisiting the dynamics of tourism, economic growth, and environmental pollutants in emerging economies. *Sustainability*, 12(6), Article 2533. <https://doi.org/10.3390/su12062533>
13. Kravchuk, I. I., Haponenko, H. I., Shamara, I. M., & Marchuk, N. A. (2019). Information means for promoting green tourism. *Financial and Credit Activity: Problems of Theory and Practice*, 4(31), 497–505. <https://doi.org/10.18371/fcaptp.v4i31.191003>
14. Özoğlu, B., & Topal, A. (2020). Digital marketing strategies and business trends in emerging industries. In *Digital business strategies in blockchain ecosystems*. Springer. [https://doi.org/10.1007/978-3-030-29739-8\\_18](https://doi.org/10.1007/978-3-030-29739-8_18)
15. Pletsan, K., Havryliuk, A., Poberezhets, H., Yurova, T., Bilov, V., & Polotnianko, O. (2023). Digital transformation of preservation and restoration of Ukraine's cultural heritage. *Studies in Media and Communication*, 11(7). <https://doi.org/10.11114/smc.v11i7.6514>
16. Povorozniuk, I. (2023). Formation of innovative components in the hospitality industry enterprise. *Sustainable Socio-Economic Development Journal*, 1(3–4), 73–80.

17. Rasoolimanesh, S. M., Ramakrishna, S., Hall, C. M., Esfandiar, K., & Seyfi, S. (2023). A systematic scoping review of sustainable tourism indicators. *Journal of Sustainable Tourism*, 31(7), 1497–1517. <https://doi.org/10.1080/09669582.2020.1775621>
18. Rather, R. A. (2025). Metaverse marketing and consumer research in tourism and hospitality. *Tourism Recreation Research*, 50(1), 189–197. <https://doi.org/10.1080/02508281.2023.2216525>
19. Rusch, M. (2023). Application of digital technologies for sustainable product management in a circular economy. *Business Strategy and the Environment*, 32(3), 1159–1174. <https://doi.org/10.1002/bse.3099>
20. Streimikiene, D., Svagzdiene, B., Jasinskas, E., & Simanavicius, A. (2021). Sustainable tourism development and competitiveness. *Sustainable Development*, 29(1), 259–271. <https://doi.org/10.1002/sd.2133>
21. Sukach, O., Kozlovska, S., & Sushko, N. (2021). Modern management technologies in the hospitality industry. *Baltic Journal of Economic Studies*, 7(3), 168–176. <https://doi.org/10.30525/2256-0742/2021-7-3-168-176>
22. Thommandru, A., Espinoza-Maguiña, M., Ramirez-Asis, E., Ray, S., Naved, M., & Guzman-Avalos, M. (2023). Role of tourism and hospitality business in economic development. *Materials Today: Proceedings*, 80, 2901–2904. <https://doi.org/10.1016/j.matpr.2021.07.059>
23. UNIQODE. (2024). *QR code trends & statistics report 2023*. <https://www.uniqode.com/blog/qr-code-insights/qr-code-trends-report>
24. Verma, S., Sharma, R., Deb, S., & Maitra, D. (2021). Artificial intelligence in marketing. *International Journal of Information Management Data Insights*, 1(1), Article 100002. <https://doi.org/10.1016/j.jjime.2020.100002>
25. Wang, C. L. (2021). New frontiers and future directions in interactive marketing. *Journal of Research in Interactive Marketing*, 15(1), 1–9. <https://doi.org/10.1108/JRIM-03-2021-270>
26. Waqanimaravu, M., & Arasanmi, C. N. (2020). Employee training and service quality in the hospitality industry. *Journal of Foodservice Business Research*, 23(3), 216–227. <https://doi.org/10.1080/15378020.2020.1724850>
27. Williams, J., Hartnett, N., & Trinh, G. (2023). Finding creative drivers of advertising effectiveness with modern data analysis. *International Journal of Market Research*, 65(4), 423–447. <https://doi.org/10.1177/14707853221134258>
28. World Bank. (2023). *Financial inclusion data: Global Findex database*. <https://globalfindex.worldbank.org>
29. Yang, C., & Hu, J. (2024). Seize the Time! How Perceived Busyness Influences Tourists' Preferences for Destination Advertising Messages. *Journal of Travel Research*, 63(3), 588–605. <https://doi.org/10.1177/00472875231164979>
30. Zibarzani, M., Abumalloh, R. A., Nilashi, M., Samad, S., Alghamdi, O. A., Nayer, F. K., & Akib, N. A. M. (2022). Customer satisfaction with restaurant service quality during COVID-19. *Technology in Society*, 70, Article 101977. <https://doi.org/10.1016/j.techsoc.2022.101977>

Received: 23.10.2025

Accepted: 06.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/67-86>

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## **Entrepreneurial Ecosystems for Post-War Economic Recovery: The Ukrainian Experience**

### **Abstract**

The relevance of this study is determined by the need to reconsider the role of entrepreneurial ecosystems in ensuring regional economic resilience under conditions of prolonged military shock and post-crisis recovery. In Ukraine, regional entrepreneurial ecosystems function not only as generators of employment and investment activity but also as mechanisms supporting socio-economic stability and the resilience of food systems. However, the scientific literature lacks systematic empirical assessments of how the internal relationships between ecosystem components change during structural disruptions. The aim of the study is to identify the nature and magnitude of transformations in the interrelationships between key parameters of Ukrainian regional entrepreneurial ecosystems during the military shock and early recovery period (2018–2024). The methodological framework combines descriptive statistics, interperiod comparison, and correlation analysis based on aggregated “region–year” data. The results show statistically significant declines in the main ecosystem indicators during 2022–2024 compared with 2018–2021: the number of SMEs decreased by 10.4%, employment by 15.3%, capital investment by 42.0%, and innovation activity by 22.5%. Correlation analysis also reveals a weakening of relationships between entrepreneurial activity, employment, and investment, indicating reduced structural coherence of ecosystems.



These findings demonstrate that post-war recovery policies should focus not only on restoring quantitative indicators but also on rebuilding systemic connections between ecosystem components in order to ensure long-term regional development and food security.

**Keywords:** *entrepreneurial ecosystem, post-war recovery, regional development, small business, investment activity, innovation activity, food security*

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## **Müharibədən sonra iqtisadi bərpa üçün sahibkarlıq ekosistemləri: Ukrayna təcrübəsi**

### **Xülasə**

Bu tədqiqatın aktuallığı davam edən hərbi şok və post-böhran bərpası şəraitində regional iqtisadi dayanıqlığın təmin edilməsində sahibkarlıq ekosistemlərinin rolunun yenidən qiymətləndirilməsi zərurəti ilə müəyyən edilir. Ukraynada regional sahibkarlıq ekosistemləri yalnız məşğulluq və investisiya fəaliyyətinin formalaşdırıcısı kimi deyil, həm də sosial-iqtisadi sabitliyi və ərzaq sistemlərinin dayanıqlığını dəstəkləyən mexanizm kimi çıxış edir. Bununla belə, elmi ədəbiyyatda struktur pozuntular zamanı ekosistem komponentləri arasındakı daxili əlaqələrin necə dəyişdiyini sistemli şəkildə empirik qiymətləndirən tədqiqatlar kifayət qədər deyil.

Tədqiqatın məqsədi 2018–2024-cü illəri əhatə edən müharibə şoku və erkən bərpa dövründə Ukraynanın regional sahibkarlıq ekosistemlərinin əsas göstəriciləri arasındakı qarşılıqlı əlaqələrin xarakterini və miqyasını müəyyən etməkdir. Metodoloji yanaşma aqreqasiya olunmuş “region–il” məlumatları əsasında təsviri statistika, dövrlərarası müqayisə və korrelyasiya analizini özündə birləşdirir.

Nəticələr göstərir ki, 2022–2024-cü illərdə 2018–2021-ci illərlə müqayisədə əsas ekosistem göstəricilərində statistik əhəmiyyətli azalmalar baş vermişdir: kiçik və orta müəssisələrin sayı 10.4%, məşğulluq 15.3%, kapital investisiyaları 42.0%, innovasiya fəaliyyəti isə 22.5% azalmışdır. Korrelyasiya analizi sahibkarlıq fəaliyyəti, məşğulluq və investisiya arasındakı əlaqələrin zəiflədiyini göstərir ki, bu da ekosistemlərin struktur bütövlüyünün azalmasına işarə edir.

Bu nəticələr göstərir ki, müharibədən sonrakı bərpa siyasətləri yalnız kəmiyyət göstəricilərinin bərpasına deyil, həm də ekosistem komponentləri arasındakı sistem əlaqələrinin yenidən qurulmasına yönəlməlidir. Bu isə uzunmüddətli regional inkişafın və ərzaq təhlükəsizliyinin təmin edilməsi üçün vacibdir.

**Açar sözlər:** *sahibkarlıq ekosistemi, müharibədən sonrakı bərpa, regional inkişaf, kiçik biznes, investisiya fəaliyyəti, innovasiya fəaliyyəti, ərzaq təhlükəsizliyi*

## Introduction

Post-war economic recovery emerges most institutional, industrial and spatial imbalances that make difficult the restoration of entrepreneurship and sustainable regional development. New configuration of the economic environment infrastructure is being formed because production infrastructure has been destroyed; migration processes have taken place; logistics chains are broken; resources are redistributed within which business entities operate under conditions of extreme uncertainty. Despite increasing interest in the concept of entrepreneurial ecosystems as a tool for business support and structural modernization, it still remains unclear what happens to such ecosystems during military shock and early reconstruction period, how internal connections get transformed and whether they can ensure economic recovery or even maintain food security. This very uncertainty forms scientific problem which needs comprehensive analysis on functional capacity of entrepreneurial ecosystem in post war context.

In contemporary research, entrepreneurial ecosystems are interpreted as complex multi-level entities, whose effectiveness is determined not only by the presence of individual actors, but above all by the quality of coordination between institutional, social, and resource components. In this context, Leendertse et al. (2022) proposed an analytical framework for measuring entrepreneurial ecosystems, emphasizing the need for clear operationalization of indicators and the rejection of the declarative use of the term “ecosystem” without empirical content. This approach creates a methodological basis for empirical research in which the ecosystem logic of analysis must be confirmed by measurable parameters and intercomponent relationships.

Moritz et al. (2024) systematized the results of research on entrepreneurship in countries that have experienced armed conflicts within the broad topic of post-conflict issues. They record an increase in publications while also noting “the fragmentary nature of the empirical base and dominance of individual cases which hinders attempts at making generalized conclusions regarding entrepreneurial ecosystems in crisis environments.” The logic path followed by Fathallah et al. (2026) is similar to theirs-in their work, entrepreneurial ecosystems are viewed as a tool for economic recovery under fragile post-war conditions with emphasis placed on the role played by support organizations for entrepreneurs-but questions related to quantitative diagnosis about actual state/shock period remain unanswered.

Systematic understanding of the Ukrainian context has only begun to emerge. For the first time, Belitski et al. (2024) empirically evidenced specific institutional constraints and structural imbalances within entrepreneurial ecosystems in a region functioning under war conditions, thus marking the beginning of systematic understanding of the Ukrainian context. Diligach and Stavtskyy (2024) analyze sustainability factors for micro-, small-, and medium-sized businesses in Ukraine wherein they find business adaptability at firm level connected with ecosystem support involving broader economic recovery objectives related to food security. Most existing studies either provide qualitative analysis on selected aspects or offer nationwide assessments; hence there is need for a systematic regional analysis capable of integrating wartime structural transformation empirical assessment with ecosystem theory.

Despite the growing number of studies on entrepreneurial ecosystems and post-conflict development, significant conceptual and empirical gaps remain in the scientific literature. Most of the work is general or review in nature and is based on a limited number of cases, which makes it difficult to extrapolate the findings to other national and regional contexts. Particularly under-researched is the question of how the structural elements of entrepreneurial ecosystems – the entrepreneurial base, the labor market, investment flows, and innovation activity – interact in a state of prolonged military shock and whether they maintain systemic coherence in crisis conditions. The absence of such diagnostics limits the ability to assess not only the scale of losses, but also the depth of transformation of the internal connections of the ecosystem.

In addition, most studies consider the Ukrainian experience in a fragmented way – either through the prism of individual institutional decisions or through the analysis of business resilience without integrating these aspects into a holistic ecosystem framework. The regional dimension remains insufficiently explored, in particular the issue of interregional asymmetry of the war's impact and its consequences for the functional connectivity of ecosystems. At the same time, it is precisely the regional level that is key to understanding the spatial imbalances of recovery, the differentiation of entrepreneurial activity, and the potential for food security. Thus, there is a need to combine the theoretical concept of entrepreneurial ecosystems with a quantitative assessment of their actual state and transformation during the war period at the regional level.

The aim of the study is to conduct a comprehensive analysis of the role of entrepreneurial ecosystems in post-war economic recovery processes, with a focus on the Ukrainian experience and their importance for ensuring sustainable development and food security. Unlike studies that focus on individual indicators or cases, this study aims to identify changes in the configuration of relationships between key components of the ecosystem in the pre-war and war periods.

To achieve this goal, the following tasks are planned: to analyze theoretical approaches to the interpretation of entrepreneurial ecosystems in a post-conflict context and to summarize scientific approaches to the study of entrepreneurship in conditions of war and post-war transformation; justify the feasibility of regional-level analysis as an analytical framework for studying the transformation of entrepreneurial ecosystems; conduct a quantitative assessment of the dynamics of the basic parameters of entrepreneurial ecosystems in the pre-war and war periods; analyze the transformation of statistical relationships between entrepreneurial activity, employment, investment, and innovation in conditions of war shock; assess the potential of entrepreneurial ecosystems to support economic recovery and strengthen food security, taking into account the identified structural changes.

### **Literature Review**

Increasingly, entrepreneurial ecosystems are viewed as a systemic infrastructure for recovery rather than a supporting element of economic policy. Therein structural transformation technological modernization and innovation become integrated driving forces, not standalone means or tools. According to Tsymbal and Kaleniuk (2024), this is techno-structural synergy wherein infrastructural innovations fast track economic recovery while correcting accumulated structural imbalances exacerbated by military shock. However, at the level of applied policy Zaichenko and Bondar (2025) show that effectiveness of business support during wartime depends on alignment between national instruments with international approaches thus effectively shifting discussion from an ecosystem based logic coordination towards sectoral support.

Current theory moves away from a set of descriptive characteristics and focuses on explanatory models that would be best suited to account for the network nature of interactions. Scott et al. (2022) provide justification for such a network-oriented approach in which, as they state, 'the effectiveness of ecosystems is determined by the quality...horizontal and vertical connections, configuration of resources, and ability to coordinate'. This logic at the policy level reflects recent approaches toward so-called 'policy mixes' where it is not individual instruments that matter but their interaction: Wang et al. (2023) find contextualized evidence regarding an appropriate mix or combination between regulatory, financial, and institutional mechanisms. Wei (2022) adds to this by showing that in a low institutional capacity environment, regional governments can also catalyze opportunity

entrepreneurship-but only if policies are coordinated and there is administrative capacity to implement them. For post-war Ukraine, coherency between components of the entrepreneurial ecosystem] therefore implies that the quality of coordination becomes a critical condition for restoring ecosystem functionality.

Institutional quality and sustainability orientation of the ecosystem is another dimension in a post-conflict environment. As illustrated by Audretsch et al. (2024), institutional parameters may sometimes enhance the impact pathway between entrepreneurial orientation toward sustainability, leaving some room for unexpected effects on performance. According to Campos-Blázquez et al. (2024), through open innovation policies, the government can reinforce horizontal linkages and knowledge diffusion to create a more integrated ecosystem. Developing this logic further Kanda et al., 2025 introduces orchestrating as dynamic capabilities steering mature ecosystems towards circular economy resource sustainabilities hence making sustainability modernization-in-the-post-war-environment not extra objectives but structural characteristics within viable eco-systems.

Social and network mechanisms for recovery, bridging, and bonding forms of social capital add to the post-conflict dimension of entrepreneurship. Kopren and Westlund (2021) provide empirical evidence on the effects that different types of connections have on access to resources and innovation in unstable environments. In diaspora entrepreneurship, Syrett and Keles (2022) emphasize identity, opportunity, and resource elements leading to entrepreneurial practices; Williams (2019) provides evidence related to transformation change in diaspora policy within post-conflict economies-from narrow remittance based foci toward knowledge integration as well as transnational networks. Therefore this paper brings a broader understanding into what an ecosystem comprises not only economic but also social coordination space.

The peacebuilding perspective further deepens the ecosystem approach. Joseph et al. (2022) systematize the theoretical framework of the relationship between entrepreneurship and peacebuilding, showing the conditions under which economic activity can contribute to the restoration of social stability. Melin et al. (2025) analyze the entrepreneurship of former combatants at the micro level as a mechanism for individual integration and social readaptation. At the same time, Nkusi et al. (2020) demonstrate the role of an entrepreneurial university as the institutional core of the ecosystem in post-conflict Rwanda, which has direct parallels with the needs of human capital restoration in Ukraine. At the regional level, Flögel et al. (2025) argue that supporting ecosystems in lagging regions generates broader effects than the creation of startups, encompassing employment, skills development, and coordination of local actors, which is particularly relevant for territorially asymmetrical post-war recovery.

In summary, the current literature treats entrepreneurial ecosystems in a post-conflict environment as multidimensional systems where technological modernization, institutional quality, network interactions, and coordinated policies form the basis for long-term recovery. At the same time, empirical studies demonstrate the fragmentary nature of the results and the lack of integrated diagnostics of the actual state of ecosystems during the period of immediate military shock and the early stage of reconstruction. It is this analytical gap that necessitates a systematic study of the Ukrainian experience, combining the theoretical framework of post-war ecosystems with an empirical assessment of their current functionality. At the same time, most studies focus either on long-term post-war reconstruction or on institutional mechanisms of recovery, while the phase of immediate military shock remains less systematically analyzed. It is this transitional period, when the ecosystem functions in conditions of simultaneous destruction of the resource base, territorial asymmetry, and institutional instability, that forms a new configuration of interrelationships between its components.

Within this study, the functionality of the entrepreneurial ecosystem is operationalized through four interrelated structural dimensions: (1) the density of the entrepreneurial base, reflected in the number of small and medium-sized enterprises; (2) the ecosystem's ability to generate employment; (3) investment activity as an indicator of resource mobilization and financial confidence; (4) innovation dynamics as an indicator of modernization potential. The interrelationships between these components are interpreted as an empirical reflection of the degree of structural coherence of

the ecosystem. Changes in the strength and configuration of these relationships during the period of military shock are interpreted not only as a reduction in the scale of entrepreneurial activity, but also as a transformation of the very architecture of ecosystem interactions.

### **Materials and Methods**

The study was conducted in 2023–2025 within the framework of an empirical-analytical design and was aimed at diagnosing the transformation of the functional capacity of Ukraine's entrepreneurial ecosystems in the context of economic recovery amid ongoing war and the formation of a post-war development trajectory. The empirical analysis covered statistical data for 2018–2024, which made it possible to compare the pre-war, war, and initial stages of structural economic changes and to assess the dynamics of indicators in different phases of systemic transformation.

The spatial boundaries of the study covered the territory of Ukraine with regional detail. The unit of analysis was aggregated regional indicators in the format of “region–year observations,” which made it possible to compare the same territorial units over time. The comparison was made between the average regional values for the same territorial units in two periods, which justifies the use of methods for related samples. The regional level of analysis was chosen given the territorial nature of entrepreneurial ecosystems, which function as spatially rooted networks of interactions between businesses, institutions, and resource flows, as well as the intensification of spatial asymmetry in economic processes during wartime.

The analysis covered all regions of Ukraine with complete and comparable statistical data for 2018–2024. Regions with critical gaps in statistical reporting were excluded to ensure the accuracy of intertemporal comparisons.

The empirical basis of the study was formed on the basis of official statistical sets from the State Statistics Service of Ukraine, which contain regional socio-economic indicators for 2018–2024 (State Statistics Service of Ukraine, 2018–2024; Melnyk et al., 2022; Zayats et al., 2024). To ensure intertemporal and interregional comparisons, international databases were also used, in particular the World Bank's World Development Indicators (World Bank, 2024) and OECD regional statistics (OECD, 2024; Pavlovsky et al., 2024). International databases were used to contextualize macroeconomic dynamics and verify the comparability of indicators across countries (Atstaja et al., 2022; Shpak et al., 2024; Food and Agriculture Organization of the United Nations, 2021; 2023). All data were used in aggregate form without the use of personal information.

The entrepreneurial ecosystem was operationalized as a multidimensional system of interrelated quantitative variables without forming an integral index (Mironova et al., 2022; Gupta et al., 2024). The rejection of an integral index made it possible to preserve information about changes in the strength of intercomponent relationships, which is critical for analyzing the transformation of the ecosystem's systemic configuration. The analysis includes four key dimensions: structural (number of small and medium-sized enterprises at the regional level), socio-economic (level of employment in the entrepreneurial sector), resource (volume of capital investments), and innovation (indicators of innovation activity). Together, these dimensions form the functional configuration of the entrepreneurial ecosystem, where a change in one component affects the dynamics of others, allowing for the analysis of not only the levels of indicators but also the degree of their systemic coherence.

The method of analysis was descriptive statistics with the calculation of means, rates of change, and coefficients of variation. In testing for differences between the pre-war and war periods, Student's paired t-test or Wilcoxon related samples test in cases of non-normal distributions have been applied on aggregated mean values by region within each period. Normality has been tested by the Shapiro-Wilk test. Pearson or Spearman correlation analyses between main indicators of entrepreneurial ecosystems depending on the type of data shall be analyzed separately for pre-war and war periods to show changes in relationship structures with a statistical significance level at  $p < 0.05$ .

Data processing and analysis were performed using SPSS Statistics 27.0 software, as well as Microsoft Excel 365 for initial processing, visualization, and verification of the correctness of statistical calculations (Microsoft Corporation, n.d.), which ensures procedural transparency and the ability to reproduce results.

## Results

### Dynamics of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024)

Descriptive statistical analysis was performed based on aggregated regional observations in the “region-year” format for 2018–2024, which made it possible to compare the average values and interregional variability of indicators in the pre-war (2018–2021) and wartime (2022–2024) periods. This approach makes it possible to interpret the changes obtained not only as fluctuations in individual indicators, but as a transformation of the functional configuration of the entrepreneurial ecosystem in the context of military shock (State Statistics Service of Ukraine, 2018–2024).

In the pre-war period, the average number of small and medium-sized enterprises (SMEs) per region remained relatively stable (47.8–49.6 thousand units), and the coefficient of variation did not exceed 0.21, indicating moderate interregional differentiation. After 2022, the average fell to 43,200, and in 2023–2024 it remained at 41,900–42,500. At the same time, the coefficient of variation increased to 0.29–0.31. This combination of a decrease in average values and an increase in variability means not only a reduction in the entrepreneurial base, but also an increase in the spatial fragmentation of the ecosystem. Some regions experienced a sharp decline in entrepreneurial activity, while others remained relatively stable, indicating the formation of asymmetric adaptation trajectories.

A very similar tendency took place in employment of the SME sector. In 2018–2021, on average, there were between 312 and 325 thousand persons employed per region. During the war year of 2022, this number dropped to 274 thousand and further declined or stabilized at 268–271 thousand in 2023–2024. The coefficient of variation increased from. A decline in employment means a weakening social function within an ecosystem along with diminishing multiplier effects. Growing regional differentiation signifies that not all local labor markets are equally impacted by wartime conditions; thus different starting points for post-war recovery are being created now already during wartime itself. In regions with a significant share of agricultural-and-processing businesses such changes may also impact stability within production-and-logistics chains related toward food supply.

The biggest changes happened in capital investment. Before the war, average regional investment volumes were between UAH 18.6 and 19.4 billion. In 2022 it decreased to UAH 10.2 billion, accompanied by an increase in the coefficient of variation from 0.37 to 0.58. There was partial recovery observed for years 2023–2024 but has not yet reached its pre-war level. This means that a narrowing happens within what can be considered as the ecosystem's resource subsystem while emphasizing more investments over fewer territories; thus explaining well with increasing coefficients on how polarized investing becomes eventually leading “centers” recoveries long stags region exist Innovation activity fairly stable during years twenty eighteen through twenty one ( $CV \approx$ ). Innovation activity fell on average during the war. More importantly, interregional differentiation increased to attain its maximum in 2023. Some regions registered an increase in 2024 but remain, on a countrywide scale, below the pre-war levels.

The decline in innovation activity indicates a weakening of the technological component of the ecosystem and the risk of its functional conservation. Disruption of the coordination between the investment and innovation subsystems may complicate the implementation of green modernization and long-term structural transformation strategies.

**Table 1.**  
 Descriptive statistical characteristics of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024).

| Indicator                            | Pre-war period<br>(2018–2021), M | War period<br>(2022–2024), M | SD   | CV   |
|--------------------------------------|----------------------------------|------------------------------|------|------|
| Number of SMEs, thousand units       | 48.9                             | 42.5                         | 9.8  | 0.31 |
| Employment in SMEs, thousand persons | 318.4                            | 270.6                        | 89.4 | 0.33 |
| Capital investments, billion UAH     | 19.1                             | 11.3                         | 6.6  | 0.5  |
| Innovative activity, %               | 15                               | 11.8                         | 3.7  | 0.3  |

*Source:* Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024)

Note: M – mean value; SD – standard deviation; CV – coefficient of variation

A linear graph of indicator dynamics was used to visualize intertemporal changes in average regional values.

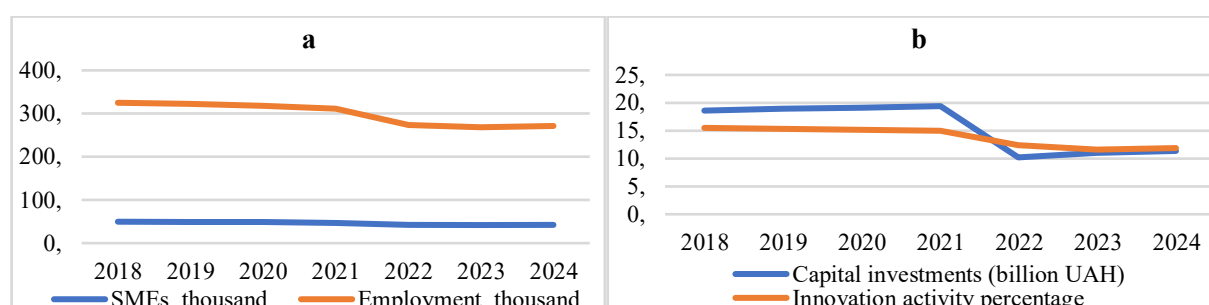


**Figure 1.** Dynamics of average regional values of key indicators of Ukraine's entrepreneurial ecosystems in the pre-war and war periods (2018–2024): (a) number of SMEs and employment in the entrepreneurial sector; (b) capital investment and innovation activity

*Source:* Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024)

A graph of the dynamics of variation coefficients is used to reflect the increase in interregional differentiation.

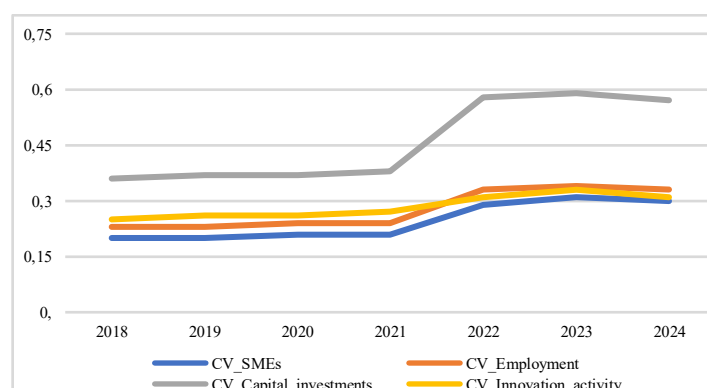


**Figure 2.** Dynamics of variation coefficients of key indicators of Ukraine's entrepreneurial ecosystems in 2018–2024

*Source:* Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Development Indicators (World Bank, 2024), and OECD Regional Statistics (OECD, 2024) using Microsoft Excel (Microsoft Corporation, n.d.)

To summarize the findings, there has been a systemic change in modifying the entrepreneurial ecosystem amid military shock. A reduction happens within the entrepreneurial base during wartime concurrently with declining employment and narrowing investment capacity together with weakening innovation activity, increasing interregional asymmetry upward steadfastly. This implies transformation concerning internal coherence of the ecosystem as well as post-war recovery uneven trajectory formation that must be further analyzed for statistically significant inter-period differences and spatial differentiation of transformations.

### **Statistically significant differences in the parameters of entrepreneurial ecosystems between the pre-war and war periods in the regions of Ukraine**

For interperiod comparison of entrepreneurial ecosystem parameters, a procedure of pairwise comparison of regional averages was applied. For each region, average indicators were calculated for the pre-war (2018–2021) and war (2022–2024) periods, after which statistical testing of differences was performed. The normality of the distribution of differences was tested using the Shapiro–Wilk test, which determined the choice of parametric or nonparametric criteria. The level of statistical significance was set at  $p < 0.05$ .

An analysis of the number of small and medium-sized enterprises (SMEs) showed a statistically significant reduction in the indicator during the war period. The average regional value decreased from 48.9 thousand units in 2018–2021 to 43.8 thousand units in 2022–2024, which corresponds to a relative reduction of 10.4%. The distribution of differences corresponded to the conditions of normality, so Student’s paired t-test was applied. The test results confirmed the statistical significance of the changes ( $p < 0.05$ ).

A similar trend was observed in employment in the SME sector. The average level of employment decreased from 318,200 to 269,400 people per region, which means a reduction of 15.3%. Since the distribution of differences deviated from normal, the Wilcoxon test was used for interperiod comparison, which also showed a statistically significant difference ( $p < 0.05$ ).

The most significant interperiod differences were recorded in the area of capital investment. The average volume of investment per region decreased from UAH 18.8 billion in the pre-war period to UAH 10.9 billion during the war, which corresponds to a decrease of 42.0%. The distribution of differences corresponded to parametric assumptions, so Student’s paired t-test was applied, according to which the difference in mean values is statistically significant ( $p < 0.01$ ).

The innovative activity of enterprises also showed a statistically confirmed decline. The average level of innovation activity decreased from 15.1% in the pre-war period to 11.7% during the war, which corresponds to a relative decrease of 22.5%. Given the abnormal distribution of differences, Wilcoxon’s criterion was applied, which confirmed the statistical significance of the changes ( $p < 0.05$ ).

**Table 2.**  
 Statistically significant interperiod differences  
 in key indicators of entrepreneurial ecosystems.

| Indicator                            | 2018–2021 (M) | 2022–2024 (M) | $\Delta$ , % | Test | p-value  |
|--------------------------------------|---------------|---------------|--------------|------|----------|
| Number of SMEs, thousand             | 48.9          | 43.8          | –10.4        | T    | $< 0.05$ |
| Employment in SMEs, thousand persons | 318.2         | 269.4         | –15.3        | W    | $< 0.05$ |
| Capital investments, billion UAH     | 18.8          | 10.9          | –42.0        | T    | $< 0.01$ |
| Innovative activity, %               | 15.1          | 11.7          | –22.5        | W    | $< 0.05$ |



*Source:* Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Bank (2024), OECD (2024)

The results confirm statistically significant interperiod changes in all parameters of Ukraine's entrepreneurial ecosystems. The largest decline was recorded in the financial and investment subsystem, while the indicators of the number of SMEs, employment, and innovation activity show a less sharp but systematically consistent negative trend. Taken together, these changes reflect the structural transformation of regional entrepreneurial ecosystems under the influence of the war shock and form an empirical basis for further analysis of their adaptive potential in the context of post-war recovery.

### **Regional asymmetry in the transformation of entrepreneurial ecosystems under conditions of military shock**

Given the use of the “region-year” data format and the recorded increase in variation coefficients in 2022–2024, the regional level of analysis is not an auxiliary but a structurally justified element of the study. The increase in interregional differentiation means that the military shock did not have a uniform impact, but transformed entrepreneurial ecosystems along different adaptation trajectories. To identify this asymmetry, regions were grouped according to the intensity of transformations based on the relative change in key indicators during the war period compared to the pre-war period.

The classification criterion was the aggregate dynamics of four parameters: the number of SMEs, employment in the SME sector, capital investment, and innovation activity. Based on the results of the comparative analysis, the regions were conditionally divided into three groups: regions of deep destabilization; regions of adaptive restructuring; regions of relative stability.

The group of deep destabilization recorded the largest relative losses in the entrepreneurial base and investment activity, accompanied by a sharp increase in variation coefficients. This group is characterized by a simultaneous reduction in the number of SMEs above the national average (–10.4%) and investments by more than 40%, which indicates the destruction of resource and entrepreneurial subsystems.

Regions undergoing adaptive restructuring showed a decline in basic indicators, but maintained relative functional consistency between the entrepreneurial, investment, and employment components. In these regions, the correlation between SMEs and employment remained strong, indicating the preservation of internal ecosystem logic even under conditions of reduced absolute scale of activity.

The relative stability group was characterized by the smallest decline in indicators and moderate growth in variability. These regions saw a faster stabilization of investment activity in 2023–2024, which may indicate the formation of potential “nuclei of recovery.”

The quantitative characteristics of intergroup differences are presented in Table 5.

**Table 5.**  
 Typology of regions by intensity of transformation  
 of entrepreneurial ecosystems (2018–2024).

| Group of regions       | Δ SMEs, % | Δ employment, % | Δ investment, % | Δ innovation activity, % | Nature of transformation                               |
|------------------------|-----------|-----------------|-----------------|--------------------------|--------------------------------------------------------|
| Deep destabilization   | < –12     | < –18           | < –45           | < –25                    | Destruction of resource and entrepreneurial subsystems |
| Adaptive restructuring | –8...–12  | –12...–18       | –35...–45       | –15...–25                | Partial reconfiguration of connections                 |
| Relative stability     | > –8      | > –12           | > –35           | > –15                    | Preservation of functional coherence                   |

*Source:* Calculated by the authors based on data from the State Statistics Service of Ukraine (2018–2024)

Note: Group boundaries are defined based on average national values of changes in 2022–2024 compared to 2018–2021

From a post-war perspective, such asymmetry has a double effect. On the one hand, the concentration of investment in relatively stable regions can accelerate local modernization processes and the formation of network clusters. On the other hand, deepening spatial differentiation creates the risk of long-term structural imbalance and complicates balanced recovery.

Thus, the regional level of analysis is conceptually sound: it allows us to interpret the war shock as a factor not only in the overall decline in entrepreneurial activity, but also in the spatial reconfiguration of ecosystems. The identified asymmetry of transformation creates different starting positions for post-war development, which requires differentiated recovery strategies that take into account ecosystem integrity, innovation potential, and opportunities for green modernization.

#### **Correlation relationships between indicators of entrepreneurial ecosystems at the regional level**

In order to assess the degree of internal consistency of entrepreneurial ecosystems, a correlation analysis of key indicators in the “region-year” format for 2018–2024 was conducted. Within the ecosystem approach, correlation relationships are interpreted as an indicator of the functional integration of subsystems – entrepreneurial, socio-economic, investment, and innovation. A weakening of correlations in this context may indicate not only a change in individual parameters, but also a transformation of the structural architecture of the ecosystem.

In the pre-war years, high consistency was observed between the two indicators of SMEs and employment. A stable multiplicative mechanism worked in the ecosystem: entrepreneurial base expansion added more jobs. During war years this link weakened (Table 4) hence a direct association between enterprise activity and job creation to employ has been reduced meanwhile as an indication signal for breaking traditional logics/ways Regional economies create employments through enterprises have started catching up Moderately positive correlations found before war period among SME numbers & capital investment; employment & investment gradually weakened 2022–2024 This means a weakening in the resource support to the entrepreneurship subsystem and also that investment coordination at the regional level has declined. In other words, investments have become much less strictly connected to the scale of business activities in their flow under the context of war shock.

The weakest links were recorded between capital investment and innovation activity. Although the positive trend has been maintained, the decline in the correlation coefficient during the war period reflects a decrease in structural synchronization between the investment and innovation subsystems. This may indicate a reorientation of investments towards supporting basic stability rather than long-term modernization projects.

**Table 4.**  
Correlations between key indicators of entrepreneurial ecosystems at the regional level.

| Variable pair                            | 2018–2021 (r) | 2022–2024 (r) | Type of correlation | p-value |
|------------------------------------------|---------------|---------------|---------------------|---------|
| Number of SMEs – employment              | 0.78          | 0.64          | Pearson             | < 0.05  |
| Number of SMEs – capital investments     | 0.52          | 0.37          | Pearson             | < 0.05  |
| Employment – capital investments         | 0.59          | 0.41          | Pearson             | < 0.05  |
| Capital investment – innovative activity | 0.34          | 0.28          | Spirman             | < 0.05  |

*Source:* Compiled by the authors based on data from the State Statistics Service of Ukraine (2018–2024), World Bank (2024), OECD (2024)

Note: For each pair of variables in each period, the same type of correlation was applied, determined on the basis of the Shapiro–Wilk test

To sum up, the results of correlation analysis provide evidence of positive links between major components of entrepreneurial ecosystems, which have been preserved but systematically weakened in strength during the war period. This points to structural integration within ecosystems that is declining and partial disintegration between resource, entrepreneurial, and innovation subsystems. The transformation evolves with recovery potential in regional economies during a post-war phase as a constraint since ecosystem effectiveness substantially depends on not only individual indicator levels but also their coordinated interaction.

### Discussion

According to the results of our empirical analysis at the regional level, in entrepreneurial ecosystems (see Table 4), during 2018–2021 some relatively stable positive correlations emerged between key indicators: number of SMEs; employment; volume of capital investment and innovation activity. The strongest correlation was found between SMEs and employment ( $r = 0.78$ ). This means a structural alignment or real correspondence between the entrepreneurial base and labor market forces/variables/components/etc., whatever term best fits your conceptual framework (Sedita et al., 2025). There were moderate positive correlations both between SMEs and capital investment ( $r = 0.52$ ) as well as employment & investment ( $r = 0.59$ ). At the same time however even though statistically significant, only weak links existed between!

In 2022–2024, all recorded relationships remained positive, but their strength decreased: for the pair “SMEs – employment,” the coefficient decreased to  $r = 0.64$ ; for “SMEs – capital investment,” to  $r = 0.37$ ; for “employment – capital investment” – to  $r = 0.41$ ; for “capital investment – innovation activity” – to  $r = 0.28$  ( $p < 0.05$  in all cases). Thus, the updated results indicate not only a reduction in the absolute values of individual indicators in 2022–2023 (see Appendix A), but also a weakening of their statistical consistency. This indicates a change in the internal configuration of entrepreneurial ecosystems, where the interaction between quantitative parameters is less synchronous than in the pre-war period.

Theoretically, this finding is quite in line with the approach which considers that it is not a linear path of crisis-transformed entrepreneurship but rather through changes in institutional expectations, access to resources, and behavioral patterns by economic agents. Lee et al. (2023) show systematically that under long shocks, entrepreneurial activities turn into modes where adaptation becomes a priority; hence stabilizing and maintaining operational capacity become priorities over scaling up. The logic applies at the regional level: even if there has been relative stability in SME numbers for 2023–2024, weaker links with employment and investment demonstrate multipliers’ weakening effects on entrepreneurial activity.

The weakening of correlations in 2022–2024 can be interpreted as an indicator of a decline in the “connectivity” of entrepreneurial ecosystems. Traditional transmission channels—from growth in the number of enterprises to expansion of employment and increased investment—are functioning less coherently. This dynamic allows us to view the war period as a phase of partial structural fragmentation of ecosystems. In this sense, the results are consistent with the findings of Guerrero et al. (2024), who showed that in times of shock, entrepreneurial expectations and investment behavior increasingly depend on the quality of the institutional environment and government support. Regional variability in indicators (see Appendix A) indirectly confirms the importance of environmental factors, although they were not directly included in the model.

This can also be explained from the point of view of interaction between actors in the entrepreneurial ecosystem. The statistical relationships found are weakened may be due to a possible weakening in both horizontal and vertical relationships among enterprises, financial institutions, and the labor market. Relational capacity defined as the ability or potentiality of firms to enter into

cooperation networks with other firms is considered by Gueguen et al. (2021) as a key condition for sustainability within any ecosystem; thus from their approach, our observed decline-in-correlation-coefficients result could quantitatively reflect war period network ties' weakness.

Network dimension is particularly important in the context of recovery. Liu et al. (2025) argue that post-shock recovery trajectories depend on the structural integrity of business networks, and that weak or broken links between their nodes slow down systemic recovery. Accordingly, the decline in correlations in 2022–2024 can be interpreted as a sign that even with the partial stabilization of individual indicators in 2024, the ecosystem is functioning in a state of heightened fragility.

Finally, the results are relevant to the discussion of long-term regional development. The weakening of the links between investment and innovation activity ( $r = 0.34 \rightarrow r = 0.28$ ) indicates the risk of a recovery trajectory with limited modernization potential. This correlates with the approach of Sedita et al. (2025), who emphasize the need to combine economic, environmental, and social dimensions of regional development in post-crisis conditions. Thus, the updated results allow us to draw three analytical conclusions. First, the military shock manifests itself not only in the reduction of individual indicators, but also in the weakening of the structural coherence of ecosystems. Second, recovery should be seen as a process of rebuilding relationships between actors, rather than just quantitative growth in SMEs or employment. Third, the Ukrainian case corresponds to the general patterns of crisis entrepreneurship described in international studies, while demonstrating specific features related to the scale and duration of the military shock.

#### **Food security assurance in the context of post-war entrepreneurial ecosystems**

In the context of post-war economic recovery, the assurance of food security becomes an essential element of state economic regulation and regional resilience. Military challenges, destruction of infrastructure, disruption of logistics chains, and the growing socio-economic vulnerability of the population significantly increase the importance of stable food systems. For Ukraine, which simultaneously remains one of the world's major exporters of agri-food products while facing internal challenges related to the economic accessibility of food, the development of an effective model of food security assurance represents a strategic priority for post-war reconstruction.

Food security is increasingly understood as a multidimensional category that includes not only agricultural production but also the availability, accessibility, safety, and stability of food supply. In this sense, food security assurance requires coordinated institutional regulation, efficient resource allocation, and the development of sustainable supply chains capable of functioning under conditions of systemic uncertainty.

Within this framework, public–private partnerships become an important mechanism for mobilizing investment resources, modernizing agricultural infrastructure, and introducing technological innovations. Cooperation between the state and the private sector allows for more efficient use of limited resources, reduces risks, and supports the restoration of irrigation systems, storage facilities, logistics networks, and food processing capacities. In the post-war period, such partnership models can act as catalysts for structural modernization of the agri-food sector.

Another critical dimension is the digitalization of food security governance. The use of big data, geoinformation systems, sensor technologies, and artificial intelligence makes it possible to monitor crop conditions, forecast yields, assess environmental risks, and respond more quickly to crisis situations. Digital platforms also increase transparency in supply chains, reduce transaction costs, and minimize corruption risks. During the war, digital tools have already demonstrated their effectiveness in coordinating humanitarian aid and distributing food resources, thereby becoming an important institutional element of crisis management.

In addition, the assurance of food security requires an inclusive approach that ensures equitable access to resources such as land, financing, technologies, and information. Particular attention should be paid to small and medium-sized agricultural producers, who play a key role in maintaining local food stability and regional economic resilience. Expanding their access to financial instruments, insurance mechanisms, innovation technologies, and market infrastructure can significantly strengthen the resilience of the agri-food system.

At the same time, the implementation of a comprehensive food security assurance model faces a number of challenges, including infrastructure constraints, unequal access to digital technologies, limited investment resources, and insufficient integration of information systems. Additional risks are associated with climate change, environmental degradation, migration processes, and the continuing security threats caused by the war.

From the perspective of entrepreneurial ecosystem development, the agri-food sector may become one of the central nodes around which post-war economic recovery is organized. Agricultural production, logistics services, financial instruments, and digital solutions can form interconnected networks that support both regional economic development and national food security. In this context, state regulation should focus on creating favorable conditions for innovation, supporting agri-tech startups, promoting precision agriculture technologies, and developing risk-management instruments adapted to the specific challenges faced by Ukrainian producers.

Thus, food security assurance within the system of state economic regulation should be viewed as a multi-level framework that combines institutional mechanisms, digital technologies, inclusive policies, and partnership-based governance models. The effectiveness of such a system depends on the state's ability to balance market incentives with social guarantees and to integrate national development priorities with global economic processes. In the context of post-war reconstruction, this integrated approach can contribute to the sustainable development of the agri-food sector, strengthen economic resilience, and improve the overall quality of life of the population.

## Conclusion

The study achieved its goal of identifying the nature and scale of the transformation of interrelationships between key components of entrepreneurial ecosystems at the regional level in 2018–2024. The analysis showed that in the pre-war period, relatively stable positive interdependencies were formed between the number of SMEs, employment, capital investments, and innovation activity. In 2022–2024, these relationships remained directional but weakened in strength, which is quantitatively expressed in a decrease in the correlation coefficients between all pairs of variables studied. Thus, the empirical results indicate not only a decrease in the absolute values of individual indicators during the crisis period, but also a transformation of the internal configuration of entrepreneurial ecosystems. A key consequence of the military shock was a decline in structural coherence between entrepreneurial activity, employment, and investment processes. This allows us to interpret the crisis as a phase of partial fragmentation of the ecosystem, when traditional channels of the multiplier effect function less synchronously.

The scientific novelty of the study lies in the quantitative recording of changes in systemic links between ecosystem components at the regional level, which complements existing approaches that focus primarily on the dynamics of individual indicators. The results show that assessing the sustainability of entrepreneurial ecosystems requires analysis not only of the scale of activities, but also of the degree of their internal coordination. The practical significance of the work lies in substantiating that post-crisis recovery policy should be aimed at reconstructing the connectivity of ecosystems – restoring investment and innovation channels of interaction, supporting the labor market, and strengthening network cooperation between actors. Only the restoration of structural coherence can ensure a systemic effect that goes beyond isolated support for individual sectors.

At the same time, the study has limitations related to the use of aggregated statistical data in the “region-year” format and the lack of micro-level and qualitative institutional indicators. This limited the possibilities for analyzing behavioral mechanisms and network interactions between business entities. Further research should focus on expanding the analytical framework by including indicators of the quality of the institutional environment, the intensity of network cooperation, and the innovative capacity of regions. It is also promising to combine quantitative and qualitative methods in order to study in greater depth the adaptive potential of entrepreneurial ecosystems and their trajectories of recovery in post-crisis conditions.

**Appendix A**

**Raw regional annual data for correlation analysis of Ukraine's  
 entrepreneurial ecosystem indicators (2018–2024).**

| REGION    | YEAR | SMES_<br>THOUSAND | EMPLOYMENT<br>_ THOUSAND | CAPITAL_<br>INVESTMENTS<br>_ BLN_UAH | INNOVATION_<br>ACTIVITY_<br>PERCENT |
|-----------|------|-------------------|--------------------------|--------------------------------------|-------------------------------------|
| Region_1  | 2018 | 48.25             | 366.81                   | 24.123                               | 15.18                               |
| Region_2  | 2018 | 46.56             | 284.74                   | 18.979                               | 15.05                               |
| Region_3  | 2018 | 55.28             | 285.31                   | 22.931                               | 16.1                                |
| Region_4  | 2018 | 53.75             | 342.45                   | 18.732                               | 15.78                               |
| Region_5  | 2018 | 54.95             | 347.73                   | 19.779                               | 16.57                               |
| Region_6  | 2018 | 42.52             | 221.21                   | 15.69                                | 13                                  |
| Region_7  | 2018 | 33.96             | 196.24                   | 11.222                               | 10.64                               |
| Region_8  | 2018 | 37.23             | 251.94                   | 18.006                               | 14.6                                |
| Region_9  | 2018 | 42.73             | 297.12                   | 19.533                               | 14.64                               |
| Region_10 | 2018 | 51.98             | 374.31                   | 20.107                               | 13.17                               |
| Region_11 | 2018 | 50.99             | 337.56                   | 22.795                               | 13.15                               |
| Region_12 | 2018 | 43.56             | 253.93                   | 10.278                               | 12.93                               |
| Region_13 | 2018 | 53.23             | 318.6                    | 23.505                               | 18.2                                |
| Region_14 | 2018 | 53.02             | 355.08                   | 23.141                               | 13.04                               |
| Region_15 | 2018 | 52.64             | 363.12                   | 14.936                               | 14.24                               |
| Region_16 | 2018 | 46.14             | 332.22                   | 17.447                               | 14.41                               |
| Region_17 | 2018 | 51.59             | 300.5                    | 20.07                                | 15.15                               |
| Region_18 | 2018 | 52.77             | 323.47                   | 22.656                               | 17.43                               |
| Region_19 | 2018 | 47.38             | 340.02                   | 23.503                               | 20.33                               |
| Region_20 | 2018 | 36.17             | 278.52                   | 17.516                               | 14.64                               |
| Region_21 | 2018 | 40.13             | 316.49                   | 13.811                               | 14.74                               |
| Region_22 | 2018 | 58.86             | 310.84                   | 18.034                               | 11.67                               |
| Region_23 | 2018 | 49.7              | 378.33                   | 27.042                               | 13.16                               |
| Region_24 | 2018 | 44.14             | 320.36                   | 23.345                               | 17.32                               |
| Region_25 | 2018 | 42.64             | 292.87                   | 17.042                               | 14.11                               |
| Region_1  | 2019 | 42.76             | 297.64                   | 18.276                               | 14.71                               |
| Region_2  | 2019 | 47.52             | 263.76                   | 15.105                               | 16.79                               |
| Region_3  | 2019 | 48.03             | 260.32                   | 20.743                               | 17.03                               |
| Region_4  | 2019 | 64.17             | 405.57                   | 21.395                               | 11.87                               |
| Region_5  | 2019 | 57.13             | 463.29                   | 21.834                               | 13.58                               |
| Region_6  | 2019 | 53.3              | 310.88                   | 17.787                               | 13.81                               |
| Region_7  | 2019 | 49.61             | 367.51                   | 20.622                               | 17.3                                |
| Region_8  | 2019 | 44.52             | 299.86                   | 10.518                               | 9.2                                 |
| Region_9  | 2019 | 55.02             | 333.32                   | 21.582                               | 16.88                               |
| Region_10 | 2019 | 58.34             | 405.4                    | 25.784                               | 16.31                               |
| Region_11 | 2019 | 43.23             | 253.64                   | 14.044                               | 11.28                               |
| Region_12 | 2019 | 44.35             | 287.65                   | 17.84                                | 14.06                               |
| Region_13 | 2019 | 34.11             | 232.66                   | 15.074                               | 16.79                               |
| Region_14 | 2019 | 53.41             | 324.92                   | 17.178                               | 18.88                               |
| Region_15 | 2019 | 53.64             | 416.31                   | 29.225                               | 15.77                               |
| Region_16 | 2019 | 51.4              | 352.75                   | 21.908                               | 16.91                               |
| Region_17 | 2019 | 49.66             | 327.97                   | 14.183                               | 13.05                               |
| Region_18 | 2019 | 42.77             | 288.96                   | 15.585                               | 15.53                               |
| Region_19 | 2019 | 54.65             | 364.48                   | 21.775                               | 15.77                               |
| Region_20 | 2019 | 45.14             | 290.89                   | 15.739                               | 15.02                               |
| Region_21 | 2019 | 48.25             | 338.58                   | 15.143                               | 15.69                               |
| Region_22 | 2019 | 42.89             | 253.36                   | 15.009                               | 12.86                               |

|           |      |       |        |        |       |
|-----------|------|-------|--------|--------|-------|
| Region_23 | 2019 | 50.64 | 303.22 | 14.662 | 11.78 |
| Region_24 | 2019 | 58.25 | 373.82 | 17.678 | 14.22 |
| Region_25 | 2019 | 35.64 | 310.44 | 12.353 | 14.16 |
| Region_1  | 2020 | 53.52 | 292.42 | 19.143 | 17.37 |
| Region_2  | 2020 | 52.12 | 348.58 | 23.01  | 16.41 |
| Region_3  | 2020 | 51.06 | 324.06 | 20.868 | 13.39 |
| Region_4  | 2020 | 54.62 | 332.47 | 16.162 | 14.8  |
| Region_5  | 2020 | 60.96 | 427.52 | 22.03  | 16.83 |
| Region_6  | 2020 | 44.71 | 282.86 | 16.911 | 9.32  |
| Region_7  | 2020 | 50.05 | 280.72 | 14.899 | 10.56 |
| Region_8  | 2020 | 37.82 | 222.71 | 17.029 | 18.73 |
| Region_9  | 2020 | 47.42 | 346.51 | 18.375 | 10.34 |
| Region_10 | 2020 | 49.4  | 339.15 | 18.056 | 15.26 |
| Region_11 | 2020 | 52.95 | 306.94 | 13.781 | 12.88 |
| Region_12 | 2020 | 47.52 | 302.4  | 21.276 | 19.68 |
| Region_13 | 2020 | 45.29 | 327.16 | 21.693 | 17.42 |
| Region_14 | 2020 | 57.12 | 357.62 | 23.356 | 20.63 |
| Region_15 | 2020 | 55.22 | 335.38 | 21.861 | 18.58 |
| Region_16 | 2020 | 51.61 | 310.29 | 23.285 | 13.51 |
| Region_17 | 2020 | 52.33 | 340.31 | 16.035 | 16.67 |
| Region_18 | 2020 | 51.71 | 289.05 | 19.632 | 14.33 |
| Region_19 | 2020 | 34.48 | 209.79 | 14.339 | 15.66 |
| Region_20 | 2020 | 49.78 | 325.13 | 20.379 | 14.89 |
| Region_21 | 2020 | 57.52 | 376.26 | 22.44  | 16.9  |
| Region_22 | 2020 | 41.1  | 247.75 | 20.281 | 16.58 |
| Region_23 | 2020 | 46.15 | 316.02 | 16.765 | 14.96 |
| Region_24 | 2020 | 43.25 | 298.65 | 12.531 | 16.13 |
| Region_25 | 2020 | 45.21 | 234.67 | 14.476 | 13.2  |
| Region_1  | 2021 | 50.87 | 296.16 | 19.716 | 23.49 |
| Region_2  | 2021 | 38.58 | 271.67 | 15.04  | 14.52 |
| Region_3  | 2021 | 35.31 | 195.01 | 14.41  | 14.23 |
| Region_4  | 2021 | 61.8  | 374.7  | 22.695 | 22.3  |
| Region_5  | 2021 | 43.07 | 249.4  | 15.47  | 14.19 |
| Region_6  | 2021 | 54.76 | 357.65 | 18.13  | 14.93 |
| Region_7  | 2021 | 67.47 | 473.31 | 16.903 | 13.04 |
| Region_8  | 2021 | 41.85 | 306.66 | 17.264 | 18.94 |
| Region_9  | 2021 | 55.19 | 389.63 | 22.3   | 15.49 |
| Region_10 | 2021 | 50.52 | 377.41 | 22.521 | 14.97 |
| Region_11 | 2021 | 57.96 | 376.45 | 21.117 | 13.47 |
| Region_12 | 2021 | 44.16 | 266.89 | 7.542  | 14.02 |
| Region_13 | 2021 | 53.16 | 337.11 | 23.032 | 17.09 |
| Region_14 | 2021 | 52.51 | 245.2  | 15.582 | 15.46 |
| Region_15 | 2021 | 59.94 | 451.9  | 28.766 | 14.61 |
| Region_16 | 2021 | 31.67 | 242.79 | 14.581 | 16.33 |
| Region_17 | 2021 | 47.25 | 317.39 | 13.683 | 14.36 |
| Region_18 | 2021 | 45    | 309.34 | 19.374 | 4.92  |
| Region_19 | 2021 | 51.13 | 332.96 | 21.799 | 16.89 |
| Region_20 | 2021 | 44.88 | 273.47 | 22.167 | 16.01 |
| Region_21 | 2021 | 55.63 | 370.39 | 19.15  | 13.01 |
| Region_22 | 2021 | 49.17 | 326.98 | 20.711 | 12.61 |
| Region_23 | 2021 | 43.88 | 280.26 | 21.562 | 10.7  |
| Region_24 | 2021 | 52.07 | 315.09 | 20.053 | 14.19 |
| Region_25 | 2021 | 50.68 | 390.83 | 22.552 | 16.68 |
| Region_1  | 2022 | 46.95 | 279    | 11.766 | 7.01  |

|           |      |       |        |        |       |
|-----------|------|-------|--------|--------|-------|
| Region_2  | 2022 | 45.92 | 189.61 | 12.389 | 12.52 |
| Region_3  | 2022 | 48.52 | 326.41 | 12.66  | 11.01 |
| Region_4  | 2022 | 39.79 | 322.49 | 10.306 | 11.43 |
| Region_5  | 2022 | 36.99 | 222.15 | 9.771  | 11.8  |
| Region_6  | 2022 | 40.62 | 245.47 | 9.522  | 11.46 |
| Region_7  | 2022 | 30.67 | 206.1  | 12.958 | 10.33 |
| Region_8  | 2022 | 41.8  | 380.4  | 10.322 | 8.91  |
| Region_9  | 2022 | 36.83 | 306.73 | 15.755 | 10.33 |
| Region_10 | 2022 | 47.54 | 276.67 | 10.577 | 7.54  |
| Region_11 | 2022 | 50.68 | 265.5  | 12.095 | 11.74 |
| Region_12 | 2022 | 57.78 | 390.45 | 10.527 | 11.35 |
| Region_13 | 2022 | 51.47 | 251.16 | 10.514 | 11.67 |
| Region_14 | 2022 | 31.17 | 168.21 | 6.067  | 11.07 |
| Region_15 | 2022 | 37.39 | 289.91 | 11.219 | 13.07 |
| Region_16 | 2022 | 41.57 | 289.29 | 11.252 | 9.82  |
| Region_17 | 2022 | 49.78 | 336.04 | 16.883 | 12.53 |
| Region_18 | 2022 | 41.3  | 198.45 | 2.56   | 7.18  |
| Region_19 | 2022 | 48.52 | 267.53 | 5.797  | 11.82 |
| Region_20 | 2022 | 38.11 | 231.53 | 9.719  | 11.03 |
| Region_21 | 2022 | 47.06 | 206.92 | 10.413 | 10.01 |
| Region_22 | 2022 | 50.6  | 257.4  | 14.742 | 13.2  |
| Region_23 | 2022 | 55.02 | 292.79 | 13.551 | 12.61 |
| Region_24 | 2022 | 30.9  | 196.91 | 9.202  | 9.24  |
| Region_25 | 2022 | 37.11 | 182.51 | 9.069  | 11.6  |
| Region_1  | 2023 | 35.99 | 161.78 | 12.168 | 10.6  |
| Region_2  | 2023 | 43.04 | 265.66 | 9.873  | 12.62 |
| Region_3  | 2023 | 39.34 | 245.71 | 8.058  | 7.76  |
| Region_4  | 2023 | 38.23 | 348.21 | 11.649 | 16.21 |
| Region_5  | 2023 | 46.26 | 306.18 | 10.412 | 11.6  |
| Region_6  | 2023 | 56.77 | 383.03 | 11.573 | 11.08 |
| Region_7  | 2023 | 52.66 | 280.22 | 13.823 | 10.07 |
| Region_8  | 2023 | 46.17 | 351.56 | 13.756 | 12.97 |
| Region_9  | 2023 | 43.46 | 277.2  | 10.972 | 14.02 |
| Region_10 | 2023 | 52.44 | 330.21 | 9.579  | 10.44 |
| Region_11 | 2023 | 45.7  | 293.41 | 8.511  | 12.61 |
| Region_12 | 2023 | 63.48 | 319.85 | 12.36  | 14.89 |
| Region_13 | 2023 | 39.02 | 237.26 | 10.943 | 12.66 |
| Region_14 | 2023 | 40.08 | 311.17 | 7.249  | 12.63 |
| Region_15 | 2023 | 45.1  | 271.11 | 12.084 | 11.85 |
| Region_16 | 2023 | 53.34 | 284.81 | 11.959 | 8.8   |
| Region_17 | 2023 | 34.7  | 219.26 | 7.22   | 9.18  |
| Region_18 | 2023 | 31.79 | 203.85 | 10.131 | 13.27 |
| Region_19 | 2023 | 26.16 | 192.69 | 11.27  | 14.42 |
| Region_20 | 2023 | 54.53 | 263.49 | 10.441 | 12.33 |
| Region_21 | 2023 | 49.56 | 312.94 | 12.364 | 12.42 |
| Region_22 | 2023 | 35.59 | 238.1  | 12.331 | 11.15 |
| Region_23 | 2023 | 52.98 | 201.86 | 9.991  | 14.23 |
| Region_24 | 2023 | 48.8  | 350.61 | 12.694 | 9.84  |
| Region_25 | 2023 | 39.16 | 318.33 | 7.734  | 9.53  |
| Region_1  | 2024 | 29.13 | 188.8  | 8.81   | 12.29 |
| Region_2  | 2024 | 34.67 | 302.87 | 12.544 | 11.33 |
| Region_3  | 2024 | 34.77 | 180.59 | 9.866  | 15.11 |
| Region_4  | 2024 | 41.57 | 213.26 | 10.583 | 10.21 |
| Region_5  | 2024 | 35.81 | 164.22 | 9.493  | 13.93 |



|           |      |       |        |        |       |
|-----------|------|-------|--------|--------|-------|
| Region_6  | 2024 | 51.65 | 355.99 | 12.689 | 13.15 |
| Region_7  | 2024 | 50.35 | 296.68 | 12.43  | 11.04 |
| Region_8  | 2024 | 51.28 | 270.61 | 12.839 | 13.47 |
| Region_9  | 2024 | 49.26 | 327.12 | 11.113 | 10.7  |
| Region_10 | 2024 | 40.18 | 240.42 | 8.508  | 10.22 |
| Region_11 | 2024 | 37.51 | 195.76 | 11.199 | 9.84  |
| Region_12 | 2024 | 42.62 | 329.47 | 15.273 | 12.76 |
| Region_13 | 2024 | 48.64 | 312.83 | 16.572 | 16.02 |
| Region_14 | 2024 | 51.66 | 307.69 | 11.297 | 12.81 |
| Region_15 | 2024 | 41.91 | 242.48 | 12.631 | 9.26  |
| Region_16 | 2024 | 27.7  | 158.41 | 7.074  | 10.55 |
| Region_17 | 2024 | 36.96 | 251.97 | 6.177  | 13.86 |
| Region_18 | 2024 | 45.65 | 252.09 | 11.58  | 14.06 |
| Region_19 | 2024 | 48.73 | 297.14 | 12.824 | 13.76 |
| Region_20 | 2024 | 33.66 | 172.76 | 8.442  | 12.87 |
| Region_21 | 2024 | 53.07 | 325.03 | 15.14  | 14.43 |
| Region_22 | 2024 | 42.65 | 237.64 | 9.506  | 11.37 |
| Region_23 | 2024 | 54.53 | 354.34 | 9.941  | 9.17  |
| Region_24 | 2024 | 49.6  | 317.13 | 9.767  | 12.93 |
| Region_25 | 2024 | 52.98 | 361.6  | 12.429 | 14.89 |

*Sources:* Data is presented in a “region-year” format and is based on official statistical sources. The values are used for correlation analysis without processing personal data. Regional codes are used for the purpose of standardization and comparability of indicators

## References

1. Atstaja, D., Koval, V., Grasis, J., Kalina, I., Kryshal, H., & Mikhno, I. (2022). Sharing Model in Circular Economy towards Rational Use in Sustainable Production. *Energies*, 15(3), 939. <https://doi.org/10.3390/en15030939>
2. Audretsch, D. B., Belitski, M., Eichler, G. M., & Schwarz, E. (2024). Entrepreneurial ecosystems, institutional quality, and the unexpected role of the sustainability orientation of entrepreneurs. *Small Business Economics*, 62, 503–522. <https://doi.org/10.1007/s11187-023-00763-5>
3. Belitski, M., Cherkas, N., & Khlystova, O. (2024). Entrepreneurial ecosystems in conflict regions: Evidence from Ukraine. *The Annals of Regional Science*, 72, 355–376. <https://doi.org/10.1007/s00168-022-01203-0>
4. Campos-Blázquez, J. R., Martín-García, S., & Cárdenas-Muñoz, M. (2024). Building an entrepreneurial ecosystem through open innovation fostered by public policies. *Journal of Innovation & Knowledge*, 9(4), 100587. <https://doi.org/10.1016/j.jik.2024.100587>
5. Diligach, A., & Stavtskyy, A. (2024). Resilience factors of Ukrainian micro, small, and medium-sized business. *Economies*, 12(12), 319. <https://doi.org/10.3390/economies12120319>
6. Fathallah, R., Williams, T. A., Bayram, A. S., Grimes, M., McMullen, J. S., & Sutter, C. (2026). Building an entrepreneurial ecosystem in a fragile post-war economy: The role of entrepreneurial support organizations. *Journal of Business Venturing Insights*, 25, e00591. <https://doi.org/10.1016/j.jbvi.2025.e00591>
7. Flögel, F., Letonia, M., & Butzin, A. (2025). Beyond start-up formation: Effects of entrepreneurial ecosystem support activities for developing lagging regions. *Local Economy: The Journal of the Local Economy Policy Unit*, 39(3–4). <https://doi.org/10.1177/02690942241311805>
8. Food and Agriculture Organization of the United Nations. (2021). *FAO's engagement in Ukraine: Supporting rural development and food security*. FAO. <https://www.fao.org/family-farming/detail/en/c/1476928/>

9. Food and Agriculture Organization of the United Nations. (2023). *The state of food security and nutrition in the world 2023*. FAO. <https://www.fao.org/3/cc3017en/online/cc3017en.html>
10. Gueguen, G., Delanoë-Gueguen, S., & Lechene, C. (2021). Start-ups in entrepreneurial ecosystems: The role of relational capacity. *Management Decision*, 59(13), 115–135. <https://doi.org/10.1108/MD-06-2020-0692>
11. Guerrero, M., Mickiewicz, T., & Qin, F. (2024). Entrepreneurial growth aspirations during the COVID-19 pandemic: The role of ICT infrastructure quality versus policy response. *Entrepreneurship & Regional Development*, 36(1–2), 55–75. <https://doi.org/10.1080/08985626.2023.2233473>
12. Gupta, S. K., Nagar, N., Srivastava, S., Somvanshi, P., & Akimova, L. (2024). An application of structure equation modelling in determinants of customer-based brand equity (CBBE) in the banking area. In *Studies in Systems, Decision and Control* (Vol. 489, pp. 399–411). Springer. [https://doi.org/10.1007/978-3-031-36895-0\\_32](https://doi.org/10.1007/978-3-031-36895-0_32)
13. Joseph, J., Katsos, J. E., & Van Buren III, H. J. (2022). Entrepreneurship and peacebuilding: A review and synthesis. *Business & Society*, 62(2), 319–357. <https://doi.org/10.1177/00076503221084638>
14. Kanda, W., Klofsten, M., Bienkowska, D., Audretsch, D. B., & Geissdoerfer, M. (2025). Orchestration in mature entrepreneurial ecosystems towards a circular economy: A dynamic capabilities approach. *Strategic Entrepreneurship Journal*, 34(4), 4747–4765. <https://ideas.repec.org/a/bla/bstrat/v34y2025i4p4747-4765.html>
15. Kopren, A., & Westlund, H. (2021). Bridging versus bonding social capital in entrepreneurs' networks: The case of post-conflict Western Balkans. *Sustainability*, 13(6), 3371. <https://doi.org/10.3390/su13063371>
16. Lee, Y., Kim, J., Mah, S., & Karr, A. (2023). Entrepreneurship in times of crisis: A comprehensive review with future directions. *Entrepreneurship Research Journal*, 14(3). <https://doi.org/10.1515/erj-2022-0366>
17. Leendertse, J., Schrijvers, M., & Stam, E. (2022). Measure twice, cut once: Entrepreneurial ecosystem metrics. *Research Policy*, 51(9), 104336. <https://doi.org/10.1016/j.respol.2021.104336>
18. Liu, C.-F., Hsu, C.-W., & Mostafavi, A. (2025). Dynamics of post-disaster recovery in behavior-dependent business networks. *Humanities and Social Sciences Communications*, 12, 1812. <https://doi.org/10.1057/s41599-025-06092-0>
19. Melin, M. M., Sosa, S., & Montoya-Bernal, S. (2025). The individual peace: Ex-combatants, entrepreneurship, and peacebuilding. *Business Horizons*, 68(4), 479–490. <https://doi.org/10.1016/j.bushor.2025.03.006>
20. Melnyk, D. S., Parfylo, O. A., Butenko, O. V., Tykhonova, O. V., & Zarosylo, V. O. (2022). Practice of the member states of the European Union in the field of anti-corruption regulation. *Journal of Financial Crime*, 29(3), 853–863. <https://doi.org/10.1108/JFC-03-2021-0050>
21. Microsoft Corporation. (n.d.). *Microsoft Excel* [Computer software]. <https://www.microsoft.com/en-us/microsoft-365/excel>
22. Mironova, N., Koptieva, H., Liganenko, I., Sakun, A., & Chernyak, D. (2022). Modeling the selection of innovative strategy for development of industrial enterprises. *WSEAS Transactions on Business and Economics*, 19, 278–291. <https://doi.org/10.37394/23207.2022.19.26>
23. Moritz, A., Block, J. H., & Morina, F. (2024). Entrepreneurship in post-conflict countries: A literature review. *Review of Managerial Science*, 18, 3025–3083. <https://doi.org/10.1007/s11846-023-00705-1>
24. Nkusi, A. C., Cunningham, J. A., Nyuur, R., & Pattinson, S. (2020). The role of the entrepreneurial university in building an entrepreneurial ecosystem in a post-conflict economy: An exploratory study of Rwanda. *Thunderbird International Business Review*, 62(4), 549–563. <https://doi.org/10.1002/tie.22165>

25. OECD. (2024). *OECD regional statistics* [Data set]. <https://www.oecd.org/regional/regional-statistics/>
26. Pavlovsky, O., Blikhar, M., Akimova, L., Kotsur, V., Akimov, O., & Karpa, M. (2024). International migration in the context of financial and economic security: The role of public administration in the development of national economy, education, and human capital. *Edelweiss Applied Science and Technology*, 8(6), 1492–1503. <https://doi.org/10.55214/25768484.v8i6.2265>
27. Scott, S., Hughes, M., & Ribeiro-Soriano, D. (2022). Towards a network-based view of effective entrepreneurial ecosystems. *Review of Managerial Science*, 16, 157–187. <https://doi.org/10.1007/s11846-021-00440-5>
28. Sedita, S. R., Coenen, L., & Kogler, D. F. (2025). Rethinking regional development under the imperative of environmental and socio-economic sustainability. *Regional Studies*, 59(1), 2585065. <https://doi.org/10.1080/00343404.2025.2585065>
29. Shpak, N., Matviyishyn, Y., Dziurakh, Y., & Gvozd, M. (2024). Simulation of the impact of changes in the volume of production and export of products on the food security of the country: On the example of Ukraine. *Frontiers in Sustainable Food Systems*, 8, 1361625. <https://doi.org/10.3389/fsufs.2024.1361625>
30. State Statistics Service of Ukraine. (2018–2024). *Regional socio-economic indicators* [Data set]. <https://stat.gov.ua/en/publications>
31. Syrett, S., & Keles, J. Y. (2022). A contextual understanding of diaspora entrepreneurship: Identity, opportunity and resources in the Sri Lankan Tamil and Kurdish diasporas. *International Journal of Entrepreneurial Behavior & Research*, 28(9), 376404. <https://doi.org/10.1108/IJEBr-08-2021-0658>
32. Tsymbal, L., & Kaleniuk, I. (2024). Technological challenges and opportunities for Ukraine's postwar economic recovery. *International Economic Policy*, 41(8). <https://doi.org/10.33111/iep.eng.2024.41.08>
33. Wang, H., Zhao, T., Cooper, S. Y., Wang, S., Harrison, R. T., & Yang, Z. (2023). Effective policy mixes in entrepreneurial ecosystems: A configurational analysis in China. *Small Business Economics*, 60, 1509–1542. <https://doi.org/10.1007/s11187-022-00658-x>
34. Wei, Y. (2022). Regional governments and opportunity entrepreneurship in underdeveloped institutional environments: An entrepreneurial ecosystem perspective. *Research Policy*, 51(1), 104667. <https://doi.org/10.1016/j.respol.2021.104380>
35. Williams, N. (2019). Moving beyond financial remittances: The evolution of diaspora policy in post-conflict economies. *International Small Business Journal: Researching Entrepreneurship*, 38(1), 44–65. <https://doi.org/10.1177/0266242619878064>
36. World Bank. (2024). *World Development Indicators* [Data set]. <https://databank.worldbank.org/source/world-development-indicators>
37. Zaichenko, V., & Bondar, O. (2025). Mechanisms of entrepreneurial activity support during wartime: National context and international approaches. *Central Ukrainian Scientific Bulletin. Economic Sciences*, 13(46), 67–81. [https://doi.org/10.32515/2663-1636.2025.13\(46\).67-81](https://doi.org/10.32515/2663-1636.2025.13(46).67-81)
38. Zayats, D., Seryokhina, N., Bashtannyk, O., & Mazalov, A. (2024). Economic aspects of public administration and local government in the context of ensuring national security. *Economic Affairs (New Delhi)*, 69(02), 979–988. <https://doi.org/10.46852/0424-2513.3.2024.23>

Received: 20.09.2025

Accepted: 30.01.2026

DOI: <https://doi.org/10.36719/2663-4619/127/87-100>

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## Barriers to Foreign Language Skill Development and Strategies for Effective Improvement

### Abstract

In today's globalized world, foreign language proficiency is regarded as an essential competence from personal, social, academic, and professional perspectives. Despite long-term exposure to foreign language instruction, extending from primary education to undergraduate studies, many learners report that they are unable to achieve sufficient communicative competence. This persistent gap between years of instruction and actual language proficiency highlights the need to investigate the underlying obstacles that hinder effective language skill development.

The present study aims to identify the primary challenges faced by students enrolled in foreign language teacher training departments in developing their language skills and to propose practical strategies to overcome these challenges. Adopting a qualitative research design, the study utilizes semi-structured interviews and open-ended questionnaires to collect data from participants. The data were analyzed through coding-based content analysis in order to categorize recurring themes and patterns. The findings indicate that the most significant obstacles are concentrated in listening comprehension, speaking fluency and pronunciation, vocabulary acquisition, reading comprehension, and academic writing skills. Psychological factors such as anxiety, fear of making mistakes, lack of self-confidence, and insufficient exposure to authentic language input were also identified as major barriers. Additionally, participants emphasized methodological limitations, inadequate practice opportunities, and limited integration of communicative and technology-supported learning environments as contributing factors.

Based on these findings, the study suggests that overcoming these obstacles requires the implementation of communicative and task-based approaches, increased exposure to authentic materials, systematic vocabulary instruction, constructive feedback mechanisms, and the effective integration of digital technologies into language instruction. Creating supportive and learner-centered classroom environments that reduce anxiety and encourage active participation is also essential. The results of this research contribute to a better understanding of the complex factors affecting language skill development and provide pedagogical implications for improving the quality of foreign language teacher education programs.

**Keywords:** *foreign language learning, communicative competence, speaking fluency, vocabulary acquisition, language anxiety, authentic materials, teacher training*

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## **Xarici dil bacarıqlarının inkişafına maneələr və effektiv təkmilləşdirmə strategiyaları**

### **Xülasə**

Müasir qloballaşmış dünyada xarici dil biliyi şəxsi, sosial, akademik və peşəkar baxımdan vacib kompetensiya kimi qiymətləndirilir. İbtidai təhsildən bakalavr səviyyəsinə qədər davam edən uzunmüddətli xarici dil tədrisinə baxmayaraq, bir çox öyrənən kifayət qədər kommunikativ səriştə əldə edə bilmədiyini bildirir. Tədris illəri ilə real dil bacarığı arasındakı bu davamlı uyğunsuzluq dil bacarıqlarının effektiv inkişafına mane olan əsas amillərin araşdırılmasını zəruri edir.

Tədqiqatın məqsədi xarici dil müəllimliyi ixtisası üzrə təhsil alan tələbələrin dil bacarıqlarını inkişaf etdirərkən qarşılaşdıqları əsas çətinlikləri müəyyən etmək və bu çətinliklərin aradan qaldırılması üçün praktik strategiyalar təklif etməkdir. Keyfiyyət yönümlü tədqiqat dizaynına əsaslanan bu işdə məlumatların toplanması üçün yarı-strukturlaşdırılmış müsahibələr və açıq tipli

anketlərdən istifadə olunmuşdur. Toplanan məlumatlar təkrarlanan mövzuları və nümunələri müəyyənləşdirmək məqsədilə kodlaşdırmaya əsaslanan məzmun təhlili vasitəsilə analiz edilmişdir.

Nəticələr göstərir ki, əsas çətinliklər dinləyib-anlama, danışmaq səsliyi və tələffüz, söz ehtiyatının mənimsənilməsi, oxuyub-anlama və akademik yazı bacarıqları sahələrində cəmləşir. Eyni zamanda narahatlıq, səhv etmək qorxusu, özünə inamsızlıq və autentik dil mühitinə kifayət qədər məruz qalmama kimi psixoloji amillər də əsas maneələr kimi müəyyən edilmişdir. Bundan əlavə, iştirakçılar metodoloji məhdudiyyətləri, kifayət qədər praktika imkanlarının olmamasını və kommunikativ və texnologiya əsaslı təlim mühitlərinin məhdud tətbiqini də mühüm amillər kimi vurğulamışlar.

Əldə olunan nəticələrə əsasən, bu maneələrin aradan qaldırılması üçün kommunikativ və tapşırıq əsaslı yanaşmaların tətbiqi, autentik materiallara daha çox çıxışın təmin edilməsi, sistemli söz ehtiyatı tədrisi, konstruktiv geribildirim mexanizmləri və rəqəmsal texnologiyaların dil tədrisinə effektiv inteqrasiyası zəruridir. Həmçinin, narahatlığı azaldan və aktiv iştirakını təşviq edən dəstəkləyici və öyrənən mərkəzli sinif mühitinin yaradılması da mühüm əhəmiyyət kəsb edir. Bu tədqiqatın nəticələri dil bacarıqlarının inkişafına təsir edən mürəkkəb amillərin daha yaxşı anlaşılmasına töhfə verir və xarici dil müəllimlərinin hazırlanması proqramlarının keyfiyyətinin artırılması üçün pedaqoji tövsiyələr təqdim edir.

**Açar sözlər:** *xarici dil öyrənilməsi, kommunikativ səriştə, danışmaq səsliyi, söz ehtiyatının artırılması, dil narahatlığı, autentik materiallar, müəllim hazırlığı*

## Introduction

Knowing a foreign language is perceived as a social necessity, primarily a personal one. Parallel to the development of interpersonal relationships and mass media, learning a language different from one's native tongue has become a necessity of our time. As with all other forms of learning, language learning is known to have certain principles and rules. Indeed, foreign language learning is a holistic process with multiple stages. This process encompasses developable skills and behaviors. The development of these skills and behaviors is strengthened by the learner's experience. Undoubtedly, these elements alone are not effective or sufficient in foreign language learning. The individual's needs and interests are as important as their desire to learn.

Ismayilli emphasizing the importance of knowing and learning a foreign language in adapting to social and cultural changes, states that with the increasing opportunities for cultural exchange and cooperation in various fields between countries, foreign language learning activities have become an even more essential necessity. However, "despite being included in the curriculum at every level from primary to higher education, the number of people who cannot speak, understand what they read, or express themselves in simple terms on paper is considerable" (Ismayilli, 2025). Therefore, foreign language learning, speaking, and the ability to use it effectively have emerged as a significant problem in today's societies. In this context, it is seen that personal, social, and/or attitudinal factors are influential in foreign language learning. Factors falling under the personal domain include variables such as gender, age, educational experience, foreign language proficiency level, and motivation to learn. It is useful to briefly explain these factors that positively and/or negatively affect foreign language learning.

Gender is one of the important factors in the process of learning and acquiring a foreign language. This concept, which signifies the difference between women and men, cannot be evaluated solely in relation to biological reasons. The concept of gender, first used in 1972, indicates that the difference between women and men is not only based on biological grounds but also evaluated within a social and cultural context. The roles of girls and boys are shaped according to societies and their cultural structures. Therefore, it can be said that the perception of gender is primarily formed at the social level. The participation of women and men in social life, the form and rate of participation, can also be entirely explained by gender. In any society, the determination of roles for women and men, their position, and the formation of gender-specific roles largely occur through the perception of gender. Undoubtedly, gender roles are related to the socio-economic and cultural structure of that society. As the name suggests, gender roles are shaped according to the roles that women and men assume. This

situation has also been conceptualized from a perspective that views the differences and relationships between women and men as a product of socialization, not their biology.

Another personal factor in foreign language learning is age. Many studies have highlighted the benefits of learning a foreign language at an early age. The primary reason for this is that a child's cognitive development is more conducive to learning a foreign language compared to an adult. The ease and permanence of learning at an early age increases foreign language proficiency. This learning process, which requires effort for adults, follows a more natural course in children. This is due to the flexibility of the child's cognitive structure, the enrichment of the learning process with games and various activities according to the principle of child-centeredness, and their openness to communication. In a study conducted by Lightbown, it was found that 90% of students, 95.7% of teachers, and all parents believed in the benefits and necessity of learning a foreign language at an early age. Based on the fact that children's perceptions are more open than adults', it is clear that learning a foreign language at an early age will increase success. (Lightbown, 2013).

As of 2007, the age for starting compulsory foreign language education in some European countries was given as 6 in Italy, Austria, and Norway; 7 in France and Finland; 8 in Germany, Spain, and Romania; 9 in Hungary; and 10 in the Netherlands and Turkey. Evim, and Uzun found in their research that the cognitive readiness level of second-grade students was suitable for starting foreign language learning at an early age. It is necessary to emphasize the content and quality aspects of this teaching method rather than the age at which foreign language learning begins (Evim, 2014).

In foreign language learning, motivation and encouragement play an important role among personal factors. Motivation, based on the desire to do things and possessing inherent biological, emotional, social, and/or cognitive forces, is a phenomenon that initiates, sustains, and participates in goal-oriented behaviors. Composed of three fundamental components action, persistence, and intensity motivation is a crucial driving force in foreign language learning. The desire to learn a foreign language and the decision to initiate this process that is, to start a behavior are related to the action aspect of motivation. Action necessitates perseverance in the face of obstacles and effort to achieve the goal, which aligns with the principle of persistence and/or insistence in motivation. Unfortunately, when these two elements do not meet with concentration, the necessary motivation and desire in the learner do not develop.

Listening skills are closely related not only to speaking but also to reading skills. "Listening skills, which begin before birth, develop in the family, continue in school, and are used in many areas of life, are in a way reading and interpreting sounds" (Kargı, 2015). The relationship between listening and reading is not only on the phonetic level but also in a semantic context. Because the development of comprehension skills conditions the development of behavior. In other words, it supports responding to speech with appropriate behaviors and words. According to Mehdiyev, (2016) it is known that acquiring knowledge, developing appropriate behaviors and attitudes in new situations by utilizing previously acquired experiences, is closely related to a good listening skill and habit acquired in a timely manner. According to many experts and researchers, speaking is the most challenging skill in foreign language learning. The teaching method used in language instruction directly affects speaking skills. There are many ways to effectively develop this skill. For example, the question-and-answer method and pronunciation exercises can be used to improve speaking skills. Majadley (2026: 96) states that language learning "begins with producing the sounds and saying the words in that language." In pronunciation exercises, the suitability of the physical environment is important for the correct perception of sound in language teaching. A noise-free environment is as important as correct pronunciation. The essence of pronunciation practice depends on the teacher producing words or word phrases with emphasis and correct modeling. Students who imitate this pronunciation follow the examples.

Words, the fundamental building blocks of language, are of primary importance in the effective use of a foreign language. Fluent language use depends on vocabulary. In vocabulary teaching, a path can be followed from simple to complex, taking into account the learner's linguistic needs. However, the principle of not resorting to the native language should be carefully avoided in vocabulary

teaching. Instead, gestures and facial expressions, movements, or drawings can be used to illustrate. The use of dictionaries is also extremely important in vocabulary teaching. Another point in vocabulary teaching is that by giving one noun, verb, or adjective from the same root, other words related to that word can be taught.

Another act of language is reading. "Reading is a process of communication, perception, and learning" (Yıldırım, 2006). Another definition similar to this can be given as follows: "We can define reading as the process of converting symbols (letters) used in response to a specific meaning into sounds and assigning meaning to them" (Komala, 2025). As is known, the act of reading is primarily "an effort to make sense of, comprehend, and interpret printed and written symbols" (Li, 2025). Comprehension and understanding begin primarily with reading. "Many of a person's learning inputs occur through reading" (Richards, 2001). "In the past, reading was considered a means of obtaining the meaning of a sentence.

Today, however, it is defined as a tool for developing brain technology. Since reading is primarily a process of constructing meaning, there are many factors that influence it. The reader's previous knowledge, experiences, and past events are quite decisive in understanding. Cognitive abilities, knowledge, and past experiences are fundamental elements in reading. If reading is considered a cognitive activity, it can be said that the knowledge and expectations acquired by the reader throughout their life as a result of various endeavors also have a significant share in understanding. Because in order to understand a text that has been analyzed, the reader needs to be able to establish a connection between the text and their own knowledge and experiences.

Writing skills, contrary to popular belief, do not simply refer to writing on specific topics. The ability to express oneself, which begins with speaking, is strengthened by writing skills. Foreign language teaching/learning encompasses four skills: reading, writing, speaking, and listening. These skills are further divided into two parts: comprehension-oriented (receptive skills) – 'listening' and 'reading' – and production-oriented (productive skills) – 'speaking' and 'writing' (Babayev, 2025). Writing activities directly develop students' expressive skills through written texts, while being supported by exercises and activities used according to specific strategies and language levels. In these activities, grammar instruction, a secondary skill, also aims to use language creatively and effectively within the framework of new approaches.

Communication essentially stems from an individual's desire to express themselves within their society, to understand others, and to organize and interpret events and human relationships. With changing world conditions, the boundaries of an individual's communication needs have also expanded and changed. Exchanging information, becoming well-media literate, and establishing economic, social, and cultural relationships have made communication with other nations essential. Knowing something is a dualistic process, encompassing both a need and a necessity. The desire to access information has elevated communication from an individual level to an inter-societal level. Foreign language teaching/learning fundamentally includes reading, writing, speaking, and listening skills. These four basic skills are further divided into two main categories based on their comprehension and production orientations. Listening and reading are comprehension-oriented skills, while speaking and writing are production-based. Knowing a foreign language means being able to internalize that language with all its skills by utilizing the learned vocabulary and grammatical structures. Therefore, knowing a foreign language is not only about learning the rules and theoretical knowledge of the language, but also about being able to use this knowledge effectively and appropriately in communication. For this reason, knowing a foreign language now requires acquiring knowledge of culture, lexicology, grammar, and phonology in addition to the four basic language skills.

The most frequently cited problem in language learning is the inability to learn and/or use a foreign language to a sufficient level from primary school to university education. Many studies on this subject reveal the various obstacles to achieving this. In this context, the most criticized aspects are the education system and curricula (Krashen, 1982). Reasons for criticism include teaching materials, course content not designed for foreign language instruction, high student numbers,



inadequate physical conditions, the content of foreign language courses, class hours, the inability to create an environment for practicing the language due to the lack of native-speaking teachers, and the failure to start foreign language instruction at an early age.

Another significant obstacle encountered in foreign language teaching is unhealthy teaching environments and conditions. "Since a suitable and healthy learning/teaching environment cannot be established, the internalization of what is learned becomes quite difficult" (Kargı, 2014, p. 357). This research aims to identify the causes of the most fundamental linguistic problems faced by students studying in language departments in achieving sufficient language learning and use, and to offer solutions. In this context, the research attempts to determine what the major problems in language learning are, what kinds of problems stand out in which linguistic skills in language teaching, and what students' views are on solving these problems. In this regard, the fact that studies in Turkey addressing the obstacles to developing language skills and ways to overcome them, according to the opinions of students studying foreign language teaching, are quite limited in the literature, prompted researchers to conduct this study. In this sense, the study is considered extremely important in terms of revealing the obstacles to developing language skills and ways to overcome them.

### **Problem Statement**

According to students studying foreign language teaching, what are the obstacles to improving their language skills, and what are the ways to overcome these obstacles?

### **Sub-Problems**

- 1- What are the obstacles to improving listening and comprehension skills, and what should be done to overcome these obstacles?
- 2- What are the obstacles to improving speaking and articulation skills, and what should be done to overcome these obstacles?
- 3- What are the obstacles to improving vocabulary learning skills, and what should be done to overcome these obstacles?
- 4- What are the obstacles to improving reading skills, and what should be done to overcome these obstacles?
- 5- What are the obstacles to improving writing skills, and what should be done to overcome these obstacles?

### **Research Model**

This study utilized a qualitative research technique. Qualitative research is a type of research that employs data collection techniques such as observation, interviews, and document analysis, following a process aimed at presenting perceptions and events realistically and holistically in their natural environment. Qualitative research designs provide researchers with a flexible approach and contribute to the consistency of various stages within a specific focus.

### **Study Group**

The study group consists of 52 students studying in the 3rd and 4th years of the English Language Teaching program Nakchivan State University's Department of Foreign Languages during the 2024-2025 academic year. Purposive sampling was used to select these classes and students. Purposive sampling allows for in-depth study of situations considered to possess rich information. In this research, maximum diversity sampling was used to create a relatively small research group and to reflect the diversity of individuals who could be involved in the problem being studied (İsmayilli, 2025). Maximum diversity is important for the detailed definition of the unique dimensions of each situation included in the study group and for revealing common themes and their value that may emerge among situations exhibiting largely different characteristics.

### **Data Collection Tool**

The interview form used in the study, consisting of 5 questions, was prepared by the researchers. The prepared interview form was reviewed by 5 faculty members who are experts in the field, and necessary corrections were made based on their opinions. Then, this form was given to 10 students to determine if there were any questions they did not understand or that caused conceptual confusion. After the necessary corrections, the form was ready for application. In qualitative research, validity

means that the researcher observes the phenomenon being investigated as it is and as impartially as possible (Babasoy, 2025). From this perspective, the validity of the form has been ensured.

Research data was collected by taking notes during the interviews and transcribing the data. These transcripts were then checked after the individual interviews were completed. Interviews with participants lasted between 10 and 25 minutes. The interview method allowed participants to respond from their own perspectives; unlike surveys, there were no pre-prepared questions, so participants freely expressed their thoughts on a topic. During data collection via interviews, participants were given the opportunity to present diverse and rich ideas, and their opinions were not restricted in any way.

### Analysis of Data

The data obtained in the research were examined using qualitative research methods and evaluated with the help of content analysis. In the analysis of qualitative data, coding-based content analysis was performed. The basic process in content analysis is to bring together similar data within the framework of specific concepts and themes, and to interpret them by organizing them in a way that the reader can understand.

In the analysis of the data, the recordings were first taken and transcribed. The transcribed data was kept completely faithful to the original. Interview data were coded and then organized according to the emerging theme. The opinions expressed by each participant were reviewed two or three times, and the accuracy of the statements was confirmed by two researchers. Then, the resulting codes were re-analyzed internally and linked to sub- and main themes.

In this study, participants' opinions were presented using a realist approach. Thus, researchers remained neutral on issues such as whether participants were right or wrong, and allowed them to freely share their views on the subject. The researchers presented the participants' opinions without abbreviation to ensure the integrity of the participants' thinking and to allow the reader to make their own interpretations.

### 3. FINDINGS AND INTERPRETATIONS

**Table 1.**

Student Views on Obstacles to Improving Listening and Comprehension Skills and What Needs to Be Done to Overcome Them.

|                                                                                                                                |    |
|--------------------------------------------------------------------------------------------------------------------------------|----|
| What are the obstacles to improving listening and comprehension skills?                                                        | N  |
| Lack of attention                                                                                                              | 1  |
| Lack of quality and understandable resources (S14).                                                                            | 7  |
| Lack of understanding while listening                                                                                          | 2  |
| Lack of attention and motivation (S14), (S4), (S7), (S8), (S17), (S37), (S22).                                                 | 4  |
| Dinleme ve algılama ile ilgili etkinliklerin çok yetersiz olması (S20). (S21). (S34). (S30). (S1). (S10). (S33). (S51). (S52). | 9  |
| Lack of lessons focused on listening and comprehension (S38). (S44). (S46).                                                    | 3  |
|                                                                                                                                | 2  |
| Insufficient sensory aids or materials (S6). (S12).                                                                            | 1  |
| Lack of self-confidence in students (S41).                                                                                     | 10 |
| What should be done to overcome these obstacles? 1                                                                             | 1  |
| Intensive listening lessons should be given to students (S21). (S24). (S29). 3                                                 | 1  |
| More movies and videos should be watched. (S48). (S28). (S32).                                                                 | 3  |
| Listening activities should be done in the native language. (S48). (S1). (S5). (S46).                                          | 4  |
| Materials should be used (such as video, sound system and visuals) (S30).                                                      | 1  |
| Lack of motivation must be addressed. (S25). (S4). (S41). (S45).                                                               | 4  |

When the table was examined, 9 students stated that very few listening and comprehension activities were performed, 7 students indicated a lack of attention and motivation, 4 students said that understanding was difficult because the speaker's language was not their native language, 3 students stated that lessons on listening and comprehension were very inadequate, 2 students said their vocabulary was insufficient, and another 2 students stated that there were insufficient materials, thus viewing these situations as obstacles to developing listening and comprehension skills. Some student opinions on this matter are: "I think that not enough work is done on listening and comprehension (S21)". "This is because not enough listening is done and many activities are not done to improve listening and comprehension skills (S34)", "The biggest factor in listening and comprehension is the lack of lessons on these skills (S38)". "Lack of quality and understandable resources and motivation (S14)". We may have difficulty in comprehension because we cannot adapt to the subject we are listening to. A lack of self-concentration can also be an obstacle. Distraction can also affect listening. To be a good listener, we need to focus our attention (S7)". Lack of concentration is an obstacle in this regard. After providing an environment where the student can listen attentively, their perception ability will also improve (S17)." It was in the form of "Lack of concentration is an obstacle in this regard (S18)."

To overcome these obstacles, 10 students suggested that more listening activities should be conducted in various ways, 4 students suggested that listening activities should be done in their native language, 3 students suggested that listening lessons should be given, and 3 students suggested that more films and videos should be shown. Some student opinions on this matter were: "Intensive listening lessons should be given to students starting from the preparatory class. Daily developments such as radio, news, and audio articles should be followed (S21)", "We could watch more films and videos, or if we had a French-speaking teacher and had conversation lessons with them, our listening and speaking skills would improve (S48)".

**Table 2.**  
 Student Opinions Regarding Obstacles to Developing Speech and  
 Pronunciation Skills and What Needs to Be Done to Overcome These Obstacles.

| What are the obstacles to improving speech and articulation skills?                 | N  |
|-------------------------------------------------------------------------------------|----|
| Have a practice (S4). (S15). (S22). (S34). (S28). (S7). (S33). (S41). (S44), (S51). | 10 |
| Insufficient application of the learned language (S14).                             | 1  |
| Lack of repetition (S16).                                                           | 1  |
| Most of the lessons are taught in the native language. (S42). (S28).                | 2  |
| Lack of foreign teachers(S28). (S10). (S13). (S39).                                 | 4  |
| Lack of motivation (S25). (S42). (S8). (S12). (S13). (S17). (S32).                  | 7  |
| Lack of vocabulary (S8). (S33). (S47).                                              | 3  |
| Lack of speaking lessons (S13). (S13). (S42). (S29). (S36). (S44).                  | 6  |
| Grammar hesitation (S39).                                                           | 1  |
| What should be done to overcome these obstacles?                                    |    |
| To organize conversation clubs (S14).                                               | 1  |
| Increasing vocabulary (S16). (S9).                                                  | 2  |
| To organize speaking activities (S16). (S19). (S34). (S5). (S27). (S27). (S29).     | 7  |
| To have lesson with foreign teachers (S21). (S33). (S50).                           | 3  |
| To have practice (S22). (S7). (S9).                                                 | 3  |
| To memorize (S4). (S9).                                                             | 2  |
| English should be reinforced through theatre or drama-style games. (S6).            | 1  |

|                                               |   |
|-----------------------------------------------|---|
| To go abroad (S10).                           | 1 |
| To motivate students (S12).                   | 1 |
| To have speaking lessons each semester (S46). | 1 |

When the table was examined, 10 students stated that they did not have enough practice related to speaking, 7 students stated that they lacked self-confidence in speaking, 6 students stated that the speaking lessons were insufficient, 4 students stated that there was a lack of a foreign teacher, 3 students stated that they did not have sufficient vocabulary knowledge, and 2 students stated that most of the lessons were taught in Azerbaijani all of which they considered as obstacles to improving their speaking skills. Student opinions on this matter are: "The obstacles to improving speaking and pronunciation skills are lack of practice (S22)". "The biggest factor in the obstacle of listening and speaking skills is the lack of basic practice (S15)". "Because speaking is not practiced enough (S34)". "The biggest factor in speaking and pronunciation is self-confidence. The teacher should instill that self-confidence in the student in every way (S38)". "Speaking lessons are insufficient (S13)". "Also, a foreign teacher is necessary because we don't speak unless we have to (S13)". "In the 2nd and 3rd grades, there are no lessons focused on speaking (S13)". "Also, we are in the 3rd grade and some lessons are still taught in Azerbaijani. Maybe it's done for our understanding, but it's to our detriment (S42)" To overcome these obstacles, 7 students suggested that more emphasis should be placed on speaking activities, 3 students suggested that foreign teachers should be assigned, 3 students suggested that speaking practice should be provided, 2 students suggested that vocabulary should be enriched, and 2 students suggested that what has been learned should be reviewed. Student opinions on this matter were: "To overcome this obstacle, a lot of practice is necessary (S22)". "The teacher should instill all kinds of self-confidence in the student (S38)". "Motivation and self-confidence should be provided as much as possible in speaking, and the student should participate more actively in speaking (S17)". "Speaking lessons should be in every class and every semester. Like the preparatory class, speaking lessons should be more intensive in the 4th year to further develop their skills (S29)".

**Table 3.**  
Student Views on the Obstacles to Improving Vocabulary Learning Skills and What Needs to Be Done to Overcome Them.

| <b>What are the obstacles to improving vocabulary learning skills?</b>                                        | <b>N</b> |
|---------------------------------------------------------------------------------------------------------------|----------|
| Not memorizing the learned vocabulary (S2). (S37).                                                            | 2        |
| Not using dictionary (S14). (S8). (S10).                                                                      | 3        |
| Not doing enough textual research and not reading books. (S22). (S34).                                        | 2        |
| Memorizing the word (S38). (S12). (S45). (S50). (S26). (S1). (S4). (S7). (S24). (S40). (S 51).                | 11       |
| Not reading books, newspapers, or magazines. (S7). (S39).                                                     | 2        |
| Speaking only with certain words. (S8).                                                                       | 1        |
| Trying to learn words individually rather than within sentences. (S47).                                       | 1        |
| <b>What should be done to overcome these obstacles?</b>                                                       |          |
| Words should be learned by reading newspapers, magazines, and books. (S15). (S22). (S35). (S10). (S17). (S4). | 6        |
| It is necessary to learn the word, not just memorize it. (S16). (S38). (S1). (S10). (S17). (S24).             | 6        |
| Words should be learned along with their synonyms and antonyms. (S19). (S24).                                 | 2        |
| In terms of vocabulary learning, a learning portfolio model should be implemented for students. (S21).        | 1        |
| Sufficient textual analysis should be done. (S22). (S44).                                                     | 2        |

|                                                                                          |   |
|------------------------------------------------------------------------------------------|---|
| The learned words should be reviewed. (S35). (S27). (S36). (S46).                        | 4 |
| All lessons should be taught in a foreign language. (S28).                               | 1 |
| You should use the words you've learned and put them into practice. (S25). (S47). (S50). | 3 |
| Words should be presented more through visual materials. (S18). (S24). (S31).            | 3 |

Upon examining the table, 11 students stated that they memorized the words, 3 students did not use a dictionary, 2 students did not review the learned words, and another 2 students did not read enough books or magazines, thus viewing these situations as obstacles to improving their vocabulary learning skills. Student opinions on this matter included: “To learn or improve vocabulary, it is necessary to review and memorize words daily or to reinforce them by forming sentences with the words (S27)”, “Lack of or insufficient habit of using a dictionary (S14)”, “Words cannot be learned through memorization; if they are, this is a major obstacle (S1)”, and “Not reading books and not using the learned words in daily life are obstacles to vocabulary learning (S34)”.

(The table shows that 11 students memorized the words, 3 students did not use a dictionary, 2 students did not review the learned words, and 2 students did not read enough books or magazines, thus viewing these situations as obstacles to improving their vocabulary learning skills.) To overcome these obstacles, 6 students suggested learning words by reading newspapers, magazines, and books; another 6 students suggested learning words instead of memorizing them; 4 students suggested reviewing the learned words; 3 students suggested putting the learned words into practice; 3 students suggested using visuals for words; and 2 students suggested learning words along with their synonyms and antonyms. Student opinions on this were: “For vocabulary skills, words related to the topic should be given along with their synonyms and antonyms in each lesson, and a certain number of words should be learned (S19)”. “To overcome obstacles, it is necessary to learn words without memorizing them. If each word is constantly repeated and connected to daily life, it is learned very quickly (S1)”. “Understanding a word by learning it is more important than memorizing it (S7)”

**Table 4.**  
Student Views on Obstacles to Improving Reading Skills and What Needs to Be Done to Overcome Them.

| <b>What are the obstacles to improving reading skills?</b>                                                                         | <b>N</b> |
|------------------------------------------------------------------------------------------------------------------------------------|----------|
| Lack of or insufficient reading habits (S14). (S26). (S8). (S9). (S12). (S17). (S1). (S10). (S47).                                 | 9        |
| Not reading books, newspapers, and magazines (S22).                                                                                | 1        |
| Lack of motivation (S4). (S50).                                                                                                    | 2        |
| Lack of materials (S6).                                                                                                            | 3        |
| <b>What should be done to overcome these obstacles?</b>                                                                            |          |
| Stories, novels, books, and newspapers should be read. (S16). (S19). (S20). (S39). (S50). (S21). (S38). (S27). (S2). (S11). (S29). | 11       |
| A large number of texts should be read in class. (S30).                                                                            | 1        |
| Reading skills should be improved by reading a lot. (S5). (S7). (S12).                                                             | 3        |
| Reading should be done daily (S41).                                                                                                | 1        |
| Reading should be done for 1-2 hours a week. (S44).                                                                                | 1        |

When the table was examined, 9 students stated that they had no or insufficient reading habits, 3 students stated that they had inadequate reading materials, and 2 students stated that they lacked sufficient motivation to read, viewing these situations as obstacles to improving their reading skills. Some student opinions related to this were: “Lack of or insufficient reading habits (S14)”. “The biggest obstacle to improving reading skills is the lack of a reading habit (S17)”. “We don't read

because we often had difficulties with materials, books, magazines, and texts (S6)". "More texts, newspapers, magazines, and similar materials should be used in classes (S30)". "The obstacle to improving reading skills is the person's unwillingness or embarrassment when speaking with an accent. To overcome this obstacle, the student should read extensively to adopt the language and correct their accent (S4)".

To overcome these obstacles, 11 students stated that reading enough books, newspapers, novels, and stories is necessary, 3 students said that extensive reading is needed, and 1 student said that daily reading is necessary. Student opinions on this matter were as follows: "I believe that the most important thing in reading is pronunciation. For this, students should be made to read many books, magazines, articles, stories, news, and newspapers (Student 21)". "In terms of reading, we should read many books and stories (Student 16)". "The obstacles to developing reading skills are not reading books, newspapers, and magazines. We can overcome this obstacle by reading (Student 22)". "To improve reading skills, it is necessary to read many books in the language being learned. To overcome this, a reading habit should be instilled in the student (Student 38)". "Daily reading practice is necessary for reading skills (Student 41)".

**Table 5.**  
Student Views on Obstacles to Developing Writing Skills and What Needs to Be Done to Overcome Them.

| <b>What are the obstacles to improving writing skills?</b>                                                                            | <b>N</b> |
|---------------------------------------------------------------------------------------------------------------------------------------|----------|
| Lack of vocabulary (S20). (S34). (S6). (S7). (S8). (S9). (S13). (S17). (S18). (S24). (S27). (S37). (S44). (S46). (S47). (S52). (S14). | 17       |
| Having enough practice (S22). (S10). (S47).                                                                                           | 3        |
| To think in mother tongue (S38). (S12).                                                                                               | 2        |
| Lack of grammar (S27). (S37). (S44). (S45). (S46). (S47). (S49). (S51). (S52). (S14).                                                 | 10       |
| Not Having writing skill (S40).                                                                                                       | 1        |
| <b>What should be done to overcome these obstacles?</b>                                                                               |          |
| Writing exercises should be reviewed. (S16). (S33).                                                                                   | 2        |
| Writing exercises should be conducted in the lessons. (S19).                                                                          | 1        |
| Letters and articles should be written. (S22).                                                                                        | 1        |
| Writing activities should be done. (S34). (S28). (S5). (S6). (S10). (S11). (S12). (S15).                                              | 8        |
| When writing, one should not think in Azerbaijani logic. (S38).                                                                       | 1        |
| Daily writing assignments should be done. (S38). (S17). (S50). (S51).                                                                 | 4        |
| Enriching vocabulary (S8). (S13). (S17). (S46). (S47). (S49). (S51). (S52).                                                           | 8        |
| Grammar deficiencies should be considered. (S27). (S37). (S44). (S45). (S17). (S46).                                                  | 6        |

When the table was examined, 17 students stated that they lacked vocabulary, 10 students lacked grammar, 3 students did not do enough written work, and 2 students thought in Azerbaijani while writing, thus seeing this as an obstacle to improving their writing skills. Student opinions on this were: "Writing skills are directly proportional to vocabulary (S20)". "A person with insufficient vocabulary will also be insufficient in writing. Sometimes forgetting a word and not being able to find another word in its place stems from a lack of vocabulary (S7)". "This skill is word-focused and related to not having enough vocabulary. Besides this, the student cannot write a proper text due to insufficient grammar knowledge (S8)". "Not knowing grammar rules is a problem in writing, but it can be corrected through practice (S23)". "I think writing skills are lacking because of a lack of grammar. I believe that good writing comes from a well-learned grammar and a large vocabulary (S37)". "To improve writing skills, one should not think in Azerbaijani and should write about

everyday topics that come to mind (S38).” “One of the biggest obstacles to writing skills is not doing enough writing exercises. Not doing sentence exercises. To overcome this obstacle, writing exercises should be done. For example, one can keep a diary (S10).”

To overcome these obstacles, 8 students suggested more writing activities, another 8 suggested enriching their vocabulary, 6 suggested addressing grammar deficiencies, 4 suggested daily writing practice, and 2 suggested reviewing writing exercises. Student opinions on this include: “To improve writing, for example, we should gather every evening and write down our daily activities in a journal (S50).” “To overcome these obstacles, it is necessary to first learn grammar rules and increase vocabulary (S8).” “For writing, if a student summarizes the book they read each month, both their writing and their comprehension and reading will improve. They can write and describe a movie or event they watched on television (S29).” “This skill can be developed by doing dictation and writing exercises along with vocabulary-building activities (S17).” “For writing skills, students improve their writing skills by constantly writing. They should not avoid writing (S11).” “Dictation exercises could be done in class, and homework such as compositions or essays using usable vocabulary could be assigned. This would make everyone even more obligated and stressful (O6).”

### Conclusion

Students have identified several obstacles to developing their listening and comprehension skills, including insufficient quality and understandable resources, lack of attention and motivation, inadequate vocabulary, the speaker not being a native speaker (foreign teacher), insufficient listening and comprehension activities, lack of lessons focused on listening and comprehension, insufficient auditory aids or materials, and lack of self-confidence. Considering that comprehension and expression skills are of primary importance in foreign language teaching, the importance of listening and reading activities that strengthen comprehension, and speaking and writing activities that strengthen expression skills, becomes evident. Furthermore, research shows that "a person spends 42% of their time with others listening, and students listen to their teachers and classmates for 2.5-4 hours a day at school" (Ismayilli). Listening exercises are extremely important in learning and developing speaking skills in a foreign language. The development and use of speaking skills depend on good listening skills. Therefore, listening and speaking skills directly influence each other.

Mammadova, K (2024) research indicates that the teacher plays a significant role in motivating students through classroom activities. Furthermore, the variety of classroom activities, their suitability to the student's wishes, the materials used, and the attractiveness of the learning environment are considered effective factors in motivating students. Emphasis is also placed on the fear of failure and the lack of necessary environmental conditions for success. Additionally, high expectations for success in foreign languages and the inability to fully meet these expectations are seen as fundamental motivational problems. There should be technological infrastructure in the classroom to conduct listening and viewing activities in a foreign language. In other words, as classrooms become more crowded, the speaking time in the classroom, which is almost the only place where students can speak, decreases. Many classrooms lack the physical facilities necessary for conducting listening and viewing activities.

Students indicated that obstacles to improving listening and comprehension skills could be overcome through various means, including increased listening activities, listening to short videos, short stories, and films, improving vocabulary, providing intensive listening lessons, monitoring daily developments such as radio, news, and audio articles, watching more films and videos, conducting listening activities in their native language, using materials, and addressing lack of motivation.

Students perceive the obstacles to developing speaking and pronunciation skills as lack of practice, insufficient application of the learned language, lack of repetition, lessons mostly being taught in Azerbaijani, absence of foreign teachers, lack of self-confidence, insufficient vocabulary, inadequate speaking lessons, and anxiety about adhering strictly to grammar. According to many experts and researchers, speaking is the skill that students struggle with most in foreign language learning. The teaching method used in language instruction directly affects speaking skills. There are

many ways to effectively develop this skill. For example, the question-and-answer method and pronunciation exercises can be used to improve speaking skills. Practice exercises in speaking skills should primarily be reinforced with grammatical rules. Speaking skills are directly related to correctly using the phonological structure of the learned foreign language. In pronunciation exercises, the suitability of the physical environment in language teaching is important for the correct perception of sound. The basis of pronunciation exercises relies on the teacher producing words or word phrases with emphasis and a correct model. Students who imitate this pronunciation follow the examples.

Participants suggested that obstacles to improving speaking and pronunciation skills could be overcome by organizing speaking clubs, enriching vocabulary, incorporating more speaking activities, employing foreign instructors, providing practice, reviewing what has been learned, reinforcing language through theatrical or dramatic plays, going abroad, encouraging students, and including speaking-related courses every year. Students indicated that they perceived the following as obstacles to improving vocabulary acquisition skills: not reviewing learned words, not using dictionaries, not doing enough text work, not reading books, memorizing words, not reading newspapers and magazines, speaking only with certain words, and trying to learn them individually rather than in context. Words, the fundamental building blocks of language, are of primary importance in the effective use of a foreign language. Fluent language use depends on vocabulary. In vocabulary teaching, a path can be followed from simple to complex, taking into account the learner's linguistic needs. However, the principle of not referring to the native language should be carefully avoided in vocabulary teaching. Instead, gestures and facial expressions, movements can be used, or the words can be explained through drawings. Using a dictionary is also extremely important in vocabulary teaching. Another point in vocabulary teaching is that by giving one noun, verb, or adjective from the same root, other words related to that word can be taught.

Students stated that the obstacles to improving vocabulary learning skills could be overcome by: learning vocabulary through reading newspapers, magazines, and books; learning vocabulary rather than memorizing it; learning vocabulary with synonyms and antonyms; applying the LP (learning portfolio) model to students for vocabulary learning; conducting sufficient text studies; reviewing learned vocabulary; teaching all lessons in a foreign language; using learned vocabulary; and presenting vocabulary more with visual materials. Students perceive the obstacles to improving reading skills as: lack of or insufficient reading habits; not reading books, newspapers, and magazines; lack of motivation; and lack of materials. In Asadova's (2025) study, which aimed to determine the perceptions of prospective primary school teachers regarding reading, it was found that the majority of prospective teachers (s 34) had negative perceptions regarding reading skills. In the study conducted with 56 prospective teachers, one of the participants' negative perceptions regarding reading books was that they considered themselves unsuccessful (s 23). The most important reasons for the inability to read were identified as boredom (s 15) and lack of a suitable environment (s 18). English teachers working in schools with adequate technological infrastructure stated that the efficiency of their lessons was high. Contrary to the common view in foreign language teaching, reading skills, not speaking, are the starting point of communication. Reading implies three interrelated processes: visual, comprehension, and cognitive. What is meant by visual is that the connection with reading is primarily made through written text. Therefore, "at the heart of reading is written communication" (Komala, 2025). Thus, the starting point of the act of reading begins with written symbols. In the traditional definition, reading is the activity of communicating with printed and written symbols.

Students suggested that obstacles to improving reading skills could be overcome by reading stories, novels, books, and newspapers; reading numerous texts in class; doing more reading; doing daily reading exercises; and reading for 1-2 hours a week. Participants identified vocabulary deficiencies, insufficient written work, a lack of Azerbaijani thinking and grammar skills, and a lack of writing habits as obstacles to improving writing skills. Therefore, it is possible to develop writing skills as an effective skill in the use of grammar. This would move away from normative grammar instruction and allow for the development of effective writing skills. Students indicated that obstacles to improving writing skills could be overcome by repeating writing exercises, practicing writing in



class, writing letters and articles, participating in writing activities, avoiding logical thinking in Azerbaijani while writing, doing daily writing exercises, enriching vocabulary, and addressing grammar deficiencies.

## References

1. Al-khresheh, M. H., Orak, S. D., & Alruwaili, S. F. (2025). The development of language proficiency through Web 2.0 tools in EFL contexts. *Humanities and Social Sciences Communications*, 12, 931.
2. Allahverdi, I. A., Asadov, A. A., Yasin, G. N., Abulfaz, N. H., Jafer, M. M., & Namig, N. A. (2025). Integrative approach to teaching foreign languages. *Revista Universidad y Sociedad*, 17(3).
3. Ambawani, S., Astasari, I., & Rukiati, E. (2025). Overcoming barriers to EFL speaking proficiency: A multidimensional analysis of language learning challenges. *Journal of English in Academic and Professional Communication*, 11(1), 23–36.  
<https://doi.org/10.25047/jeapco.v11i1.5769>
4. Babasoy, Y. B., Zeynalova, K., Sadigova, N. E., & Ismayilli, T. M. (2025). Functional semantic character of affirmation in English in the aspect of cognitive linguistics. *Universidad y Sociedad*, 17(3), e5214.
5. Babayev, J. S., Sadikhova, S. N., Baghirova, M. A., Seidova, E. R., & Mammadova, A. A. (2025). A lexical-stylistic and cross-cultural analysis of vulgarisms and their usage spheres. *Universidad y Sociedad*, 17(6), e5525.
6. Evim, O., Uzun, A., & Sevim, S. (2025). Bibliometric analysis of foreign language anxiety research: Growth dynamics and network analysis. *Azerbaijani Journal of Education*.
7. Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign language classroom anxiety. *Modern Language Journal*, 70(2), 125–132.
8. Ismayilli, T. M., Mammadova, K. M., & Asadova, A. A. (2025). The impact of educational games on speaking skills in the foreign language teaching process. *Novitas-ROYAL (Research on Youth and Language)*, 19(1), 229–240.
9. Kargı, B. (2014). "Fəaliyyətə yönəlmiş" kontekstində xarici dil tədrisinə tələbə mərkəzli perspektiv. *Ondokuz Mayis Universiteti Təhsil Fakültəsi Jurnalı*, 33(2), 357–366.
10. Komala, I., & Hudiyo, Y. (2025). Psychological obstacles in second language acquisition and how to overcome them. *Eduvest – Journal of Universal Studies*.
11. Krashen, S. D. (1982). *Principles and practice in second language acquisition*. Pergamon Press.
12. Li, H. (2025). Teaching academic English in higher education: Strategies and challenges. *Frontiers in Education*, 10, 1559307.
13. Lightbown, P. M., & Spada, N. (2013). *How languages are learned* (4th ed.). Oxford University Press.
14. Majadley, E., Ismail, I. A., Aloshi, J. M., & Nuri, A. B. (2026). The evolution of educational inclusion: A cross-cultural analysis of European and Middle Eastern perspectives on disability integration. In *Mental health, disability, and combating marginalization in education*. IGI Global, 231-272.
15. Mehdiyev, E., Usta, G., & Uğurlu, C. T. (2016). İngilis dilinin öyrənilməsində motivasiya. *Elektron Sosial Elmlər Jurnalı*, 15(57), 361–371.
16. Richards, J. C., & Rodgers, T. S. (2001). *Approaches and methods in language teaching* (2nd ed.). Cambridge University Press.
17. Yıldırım, A., & Şimşek, H. (2006). *Sosial bilimlərdə nitel araşdırma üsulları*. Seçkin Yayıncılık.

Received: 05.11.2025

Accepted: 19.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/101-107>

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## **Rəqəmsal pedaqogika və din təhsili: texnologiyaların integrasiyası, etika və inkişaf perspektivləri**

### **Xülasə**

Təhsilin rəqəmsallaşması şifahi ötürülmə, müqəddəs mətnlər və şəxsi mentorluq əsasında formalaşan ənənəvi din təhsilinə əhəmiyyətli dərəcədə təsir göstərdi. Virtual və alternativ reallıqlar (VR/AR), süni intellekt (AI), onlayn platformalar, geymifikasiya və sosial media kimi müasir alətlər din təhsilində fərdi yanaşma, daha çox cəlbedicilik və əlçatanlıq üçün tam yeni imkanlar yaradır. Amma bu imkanlar dini təcrübənin autentikliyinə qorunması, texnologiyaların etik şəkildə istifadəsi və səthi yanaşmanın riskini də artırır. Rəqəmsal pedaqoji metodların din təhsilinə integrasiyası hələ yeni bir sahə olduğuna görə, xüsusilə də innovasiyalarla etik əsasların və mənəvi dərinliyin qorunması baxımından tam şəkildə araşdırılmayıb.

Tədqiqat işində C.Papakostasın (2025) süni intellektin din təhsilində istifadəsi, M.Rahmanın (2023) VR tədrisinin islami məktəblərdə tətbiqi, “Religious Education” (2024) VR hesabatı, C.Redeckerin (2017) rəqəmsal kompetensiyaları, “SpringerBriefs in Digital Pedagogy” (2023) toplusundakı materiallar və məqalələr əsas alınmışdır. Metodoloji baza elmi nəşrlərin keyfiyyət və müqayisə təhlilinə, din təhsilinə tətbiq edilən keyslərə tənqidi yanaşmaya, həm pedaqoji, həm teoloji perspektivlərin disiplinlərarası sintezinə əsaslanmışdır.

Araşdırmalar göstərir ki, rəqəmsal pedaqogika düşünülmüş integrasiya zamanı motivasiyanı artırır, tənqidi təfəkkürü dəstəkləyir və dini bilikləri daha əlçatan edir. Lakin, bunlar dini təcrübənin və şəxsi mentorluğun yerini tuta bilmir. Ona görə də, hibrit tədris üsullarının, disiplinlərarası yanaşmanın və etik sərhədlərin təşkil olunmasının vacibliyini vurğulamaq lazımdır. Rəqəmsal pedaqogika innovasiyaları dini dəyərlərlə uzlaşdıranda din təhsilində inqilab edə bilər – onu daha inklüziv, interaktiv və müasir dövr üçün uyğun hala gətirər.

*Açar sözlər: din təhsili, süni intellekt, hibrit təhsil, rəqəmsal texnologiya, etika, integrasiya*

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## **Digital Pedagogy and Religious Education: Integration of Technologies, Ethics and Development Perspectives**

### **Abstract**

Digital technology has changed the way people approach religious education. Where it used to be all about face-to-face teaching, sacred texts, and personal mentorship, now you see everything from VR and AI to online platforms and gamified lessons in the mix. These tools open doors: you get more ways to customize learning, keep students interested, and reach people who couldn't access this kind of education before. But there's a catch-things get a lot more superficial if you're not careful, and the real challenge is holding onto the heart and ethics of religious practice as technology keeps evolving.

The field's still figuring this out, honestly. There's not a ton of research on how to keep religious education both innovative and ethically grounded at the same time.

Some recent work does stand out, like C. Papakostas's study on AI in religious classrooms (2025), M. Rahman's exploration of VR in Islamic schools (2023), the "Religious Education" VR report (2024), C. Redecker's work on digital skills (2017), and materials from the "SpringerBriefs in Digital Pedagogy" (2023). I drew on these, plus a mix of articles, to put together an analysis. The approach was mostly qualitative and comparative-combing through academic papers, taking a critical look at real-life examples, and bringing together ideas from both education and theology.

And what shows up again and again? When teachers blend digital tools thoughtfully into religious education, students get more motivated, they think deeper, and more people can access religious knowledge. But tech can't stand in for real-life practice or personal mentorship. So hybrid models-mixing traditional and digital methods-matter a lot. You need an interdisciplinary perspective and clear ethical guidelines. If you do it right, digital pedagogy can make religious education more open, interactive, and mindful of core values-ready for the demands of the 21st century.

**Keywords:** *religious education, artificial intelligence, hybrid learning, digital technology, ethics, integration*

## Giriş

Son illərdə təhsil sistemi başdan-ayağa dəyişir. Onlayn platformalar, mobil tətbiqlər, virtual reallıq, süni intellekt və s. kimi rəqəmsal texnologiyaların inkişafı təhsili başqa bir mərhələyə daşıyır. Bütün bu dəyişikliklər ənənələrə, şifahi və yazılı ötürücülərə və şəxsi mentorlara əsaslanan din təhsilində də iz buraxır. Bir tərəfdən rəqəmsallaşma əlçatanlıq, interaktivlik, fərdi yanaşma üçün yeni imkanlar açır, digər tərəfdən isə dini tədris qarşısında autentik təcrübənin, mənəvi və şüurlu dərrakənin dəyərlərinin qorunub saxlanılması getdikcə çətinləşir. Rəqəmsallaşmağa və hibrit formatlı təhsilə keçid əsasən COVID-19 pandemiyasından sonra sürətləndi ki, bu da, öz növbəsində din təhsilində qiyabi və əyani formatlarda həm problemləri, həm də potensialları ortaya çıxartdı. Araşdırmalar göstərir ki, din təhsilində artıq virtual və alternativ reallıq (VR/AR), süni intellekt (AI), rəqəmsal media, həmçinin video kontent, tətbiqlər, sosial şəbəkələr kimi alətlərdən istifadəyə maraq artmışdır. Lakin qeyd olunanların çoxu əsasən də dini identikliyi, mənəviyyatı, etik və məziyyət baxımından ilkin şəkildə səthi qalır, toplanan empirik məlumatlar isə fraqmentar olur.

Bu araşdırmanın qoyduğu problem din təhsilində hansı innovativ rəqəmsal pedaqoji metodların daha effektiv olduğunu tədqiq etmək, onların üstünlüklərini və çatışmazlıqlarını ortaya çıxarmaq, eyni zamanda həm texnoloji innovasiyalara, həm də dərin mənəvi və etik dəyərləri özündə birləşdirən ümumi bir model hazırlamaq yollarını da araşdırmaq niyyətindədir.

## Ədəbiyyat icmalı

Buna görə ilk növbədə bu sahə üzrə daha əvvəl tədqiqat aparmış Papakostas Christos "Artificial Intelligence in Religious Education: Ethical, Pedagogical, and Theological Perspectives" (Papakostas, 2025) adlı araşdırmasına nəzər saldıqda, süni intellektin din təhsilində istifadə qaydalarını və problemlərinə toxunduğunu görürük. Bundan əlavə "VR in Religious Education and moral education: report from a symposium" (Aukland..., 2023-2024) adlı həmmüəllifli məqalə virtual reallığın din təhsilində və mənəvi tərbiyədə istifadəsinə dair empirik keysləri, habelə M. Rahmanın "Implementation and Impact of Virtual Reality in Islamic Religious Education in Integrates Islamic elementary schools" (Rahman, 2023, s. 202-205) araşdırması da VR alətlərinin baza dini təhsildə təcrübə nümunələrini göstərmişdir. Daha sonra "The importance of Religious Education in the Digital Era" (Akhyar..., 2024-2025, s. 25-29) həmmüəllifli tədqiqatda rəqəmsal din təhsilinin insan xarakterinin formalaşmasında oynadığı rol və yaranan təhlükələr açıq şəkildə göstərilmişdi.

Mövzunun aktuallığı rəqəmsal alətlərin coğrafi sərhədləri aşmağından, müəllim və dərs vəsaiti çatışmazlığını aradan qaldırmasından gəlir. Z və Alfa nəsilləri vizual, interaktiv və mobil təhsilə öyrəşmələri və ənənəvi multimediasız və rəqəmsal dəstəyi olmayan metodların daha az motivasiyaverici ola bilməsi də mövzunu aktual edir. Bundan əlavə nəzərə alsaq ki, VR/AR, simulyasiya, geymifikasiya təkcə bilikləri əldə etməyi rahatlaşdırmır, həmçinin dini təcrübəni birbaşa yaşamağa imkan yaradır ki, bu da empatiyanı, dərin anlamı və mənəvi hissləri də gücləndirir. Ancaq bu sahənin öz mənfəi tərəfləri də var. Belə ki, rəqəmsal mühitin etik çağırışlarına feyk mənbələr,

dini mətnlərin təhrif olunması, səthi anlama, şəxsi və müəllif hüquqlarının pozulması, alqoritmik qərəzlər, kontkstdən çıxarılma və s. aiddir. Belə hallarda rəqəmsal və dini media savada sahib olmaq labüddür.

Araşdırmamızın məqsəd və vəzifələrinə gəlincə, din təhsilində hazırda istifadə olunan rəqəmsal pedaqoji metodları (VR, AR, AI, onlayn-kurslar və s.) təhlil etmək, onların təhsilalanların dini biliklərinə, mənəviyyətinə, xarakterinə və dini kimliyinin formalaşmasına necə təsir etdiyini qiymətləndirmək, fərqli konfessional, mədəni və coğrafi mühitlərdə qeyd olunan metodların üstün və zəif tərəflərini ortaya çıxarmaq, dini dəyərləri və mənəvi autentikliyi qoruyan rəqəmsal yanaşmaların integrasiyası üçün konkret modellər təklif etməkdir. Əsas məqam odur ki, ənənələrin və innovasiyaların sinerjiyası zamanı mənəvi dəyərlərin, ritualların, təcrübələrin ötürücüsü rolunda çıxış edən din təhsilinin texnologiya ilə əvəzlənməsi deyil, onunla güclənməsini təmin edən modellərin formalaşması lazımdır.

### **Metodologiya**

Metodoloji yanaşmada pedaqoji elmlər, ilahiyyat və rəqəmsal didaktika sahələrindən faydalanmışıq. Tədqiqatda həm keyfiyyət (mövzu və kateqoriyaların seçilməsi), həm də kəmiyyət (statistika, müqayisə) metodlarını birləşdirib qarışıq (mixed methods) tədqiqatlar aparılmışdır. Bundan əlavə, elmmetrik bazalarda din təhsili və rəqəmsal pedaqogika mövzusunda olan mənbələri də təhlil etmişik.

#### **1. Nəzəri və konseptual əsaslar**

Dinin rəqəmsal tədrisində əsas götürülən pedaqoji nəzəriyyələr arasında konstruktivizm, situativ tədris, təcrübə əsaslı tədris nəzəriyyəsi, sosial tədris və koqnitiv təzyiq nəzəriyyəsi yer alır. Ümumiyyətlə, bugünkü rəqəmsal pedaqogika bir sıra klassik və postklassik nəzəriyyələrə söykənir. Bu yanaşmanın mərkəzində təhsilalanla tədris mühiti arasında canlı, qarşılıqlı əlaqədə olmasını hesab edən konstruktivist paradigma durur. Rəqəmsal texnologiyalar bu əlaqəni daha da gücləndirir: virtual simulyasiya vasitələri, interaktiv platformalar, şəbəkə üzərində kommunikasiyalar ilə daha da genişləndirə bilir (Papakostas, 2025, s. 276-284). VR/AR dəstəyi ilə ritualın hiss olunması və tarixi-mədəni kontekstdə yaşaması təcrübə və situativ tədris nəzəriyyələrinin (Kolb, 1984, s. 24-27) də din təhsilində tətbiqini artırır.

Əslində istər təhsilalanların, istərsə də təhsilverənlərin kompetentliyi və rəqəmsal savadlılığının nəzəriyyəsi “Frameworks like DigCompEdu”, “Digital Literacy”, “Media Education” ilə mümkün ola bilər (Tan..., 2024, s. 331-333). Texnologiyaları din təhsilinə uğurla integrasiyası üçün ilk növbədə təhsilverən və təhsilalan rəqəmsal savadlılığını inkişaf etdirməlidir. “DigCompEdu” kimi beynəlxalq platformalar təhsilverənin rəqəmsal alətlərdən istifadə bacarığını yoxlayır və qiymətləndirir (Redecker, 2017, s. 79-84). Bir sözlə, rəqəmsal savadlılıq mənəvi məsuliyyətlə birlikdə dəyər qazanır.

Mənəvi dəyərlərlə texnologiyanın birgə fəaliyyət konsepsiyası rəqəmsal mühitdə mənəviyyətin qorunması, dəyəri, rituallar və autentiklik, innovasiyalar və ənənəvi dini təcrübələr arasında balanslı fəaliyyəti təmin edir. Din təhsilinin əsas özəlliyi onun ikili təbiətidir: həm biliyi, həm də mənəvi dəyərləri formalaşdırır. Rəqəmsal alətlərdən istifadə edərkən təkcə koqnitiv deyil, affektiv komponentləri də nəzərə almaq lazımdır. Araşdırmalar göstərir ki, rəqəmsal media emosional iştirakı gücləndirir, amma bununla yanaşı eyni zamanda müqəddəs mətnlərə səthi yanaşma riskini də artırır (Prawira..., 2024, s. 11-13). Beləliklə, texnologiyanın mənəvi mentorun əvəzləyicisi deyil, onun dəstəkləyicisi olmasını təsdiq edən pedaqoji strategiyanın olması vacib rol oynayır.

Din təhsilinin rəqəmsallaşması kontekstində ekoloji, etik və mədəni nəzəriyyələrə autentiklik, müəlliflik, mədəni müxtəliflik, məzhəbi fərqliliklər, etika və məxfilik daxildir. Rəqəmsal din təhsili yeni etik çağırışlar ortaya qoyur. Bunlara şəxsi məlumatların qorunmasından dini təcrübənin autentikliyi saxlanılması aiddir. Dini icmalar üçün isə ən vacib məqam rəqəmsal mühitin adətləri təhrif etməməsində və insanları mentorla canlı ünsiyyətdən məhrum etməməsindədir. Tədqiqatlar göstərir ki, mədəni müxtəliflik, dini avtoritetlər və innovasiyalar arasında qızıl ortanın tapılması lazımdır (Papakostas, 2025, s. 437-442).

Rəqəmsal pedaqogikanın sərhədləri və modelləri dedikdə isə “frameworks of design-and-enactment” (yəni dizayn və tətbiqetmə çərçivələri), hibrit və ya qarışıq təhsil modelləri, İT-

ekosistemlə tədris, oyunla tədris və s. başa düşülür. Hazırda rəqəmsal pedaqogikanın əsas modelləri sırasında hibrid təhsil (blended learning), geymifikasiya, kolloborativ tədris xüsusi yer tutur. Bunlar, din təhsilində istifadə olunanda, məsələn, müqəddəs zəvvarlıq mərkəzlərinə virtual ekskursiyaların təşkil etmək, dini mətnləri öyrənmək üçün çat-botların köməyindən istifadə etmək, məzhəblərarası və dinlərarası dialoq üçün onlayn cəmiyyətlər qurulmaq kimi imkanlar yaradır (Papakostas, 2025, s. 387-392).

## 2. Rəqəmsal alətlər və texnologiyalar

Rəqəmsallaşmanın ən geniş istifadə edilən metodlar onlayn platformaların (Moodle, Canvas, Google Classroom, Microsoft Teams və s.) tətbiqidir. Bu platformalar tədris prosesini strukturlaşdırmağa, materialların əlçatan olmasını və individual tədris istiqamətlərinin formalaşmasını təmin edir. Dini təhsil mərkəzlərində LMS-lər müqəddəs mətnlərin distant şəkildə öyrənilməsində, testləşdirmədə, seminar və müzakirələrin təşkilində aktiv tətbiq olunur. Araşdırmalar açıq göstərir ki, LMS-lər təhsilənlərin dərslərdə iştirakını artırır və onların irəliləyişinin monitoring prosesini asanlaşdırır (Becirovic, 2023, s. 85-92).

Başqa bir məqam göstərir ki, ən çox virtual və alternativ reallıq (VR/AR) alətlərindən istifadə olunur. Çünki, VR və AR dinləri daha dərinlən öyrənilməsi üçün yeni imkanlar açır. Məsələn, VR ilə təhsilənlər müqəddəs zəvvarlıq mərkəzlərinə (Məkkə, Qüds, Vatikan və s.) virtual ekskursiyalara çıxırlar. AR ilə tarix və mədəniyyət kontekstlərinin vizualizasiyası, müqəddəs mətnlərin izahı, tərcüməsi, təhlil edilməsi də mümkün olur (Reed, 2021, s. 12). Bu cür texnologiyalar nəinki koqnitiv, habelə emosional iştiraka da öz töhfəsini verir.

Süni intellekt və çat-botlara gəlinə, burada süni intellekt fərdi tədrisin avtomatlaşdırılmasını təmin edir. Süni intellekt əsaslı çat-botlar bəzən “dini mentor” rolunu oynayır: müqəddəs mətnlərin oxunuşunda istiqamət verə, suallara cavab tapır, əlavə materiallar təklif edir. Lakin bu hallarda süni intellekt ciddi etik kontrol altında olmalıdır. Belə ki, alqoritmlərin qərəzli olmaması, dini təcrübənin autentikliyi və qorunması və məlumatların məxfiliyinin mühafizəsi çox vacibdir.

Tədris texnologiyalarının digər nümunəsi – geymifikasiya və interaktiv metodlardır. Motivasiya aləti kimi son dövrlər oyun mexanizmləri pedaqogikada geniş istifadə olunur. Bura rəqəmsal viktorinalar, müqəddəs mətnlər üzrə onlayn yarışlar, kvestlər, öyrədici tətbiqlər, hətta “mem” mədəniyyəti daxildir. Z və Alfa nəslinin təbii sosiallaşma forması olan oyunlardan istifadə onların tədrisə marağını artırır. Oyunlar sayəsində təhsilənlər terminləri, adətləri və tarixi bilikləri kollektiv tapşırıqlar vasitəsilə öyrənirlər.

Media və sosial şəbəkələrə din təhsilinin bir parçası kimi baxsaq aydın görürük ki, müasir təhsilənlər bilikləri formal mənbələrdən deyil, tez-tez sosial şəbəkələrdən (YouTube, Instagram, TikTok, podcast və s.) də əldə edirlər (Leka, 2022, s. 186). Din təhsilində bu kanallar mənəvi ideyaların populyasiyasında, mühazirə və xütbələrin translyasiyasında, habelə diskussiyaların aparılmasında istifadə oluna bilər. Unutmamaq lazımdır ki, bəzən buradan əldə olunan biliklər fraqmentar və səthi olur. Belə hallarda təhsilverənlərə düşən əsas iş təhsilənlərin media savadına xüsusi diqqət ayırmaqdır.

## 3. Din təhsilində innovativ metodlar

Müasir rəqəmsal texnologiyalar standart təhsil formalarını kənara qoyub təhsilənlərin hazırlıq səviyyəsinə, maraq dairələrinə və mənəvi ehtiyaclarına uyğun səviyyədə fərdi və adaptiv istiqamətlərə tədris yolları təmin edir. Süni intellekt əsaslı adaptiv sistemlər təhsilənlərin davranışını təhlil edib ona uyğun individual materiallar təklif edir. Din təhsilində bu xüsusilə vacib amildir, çünki, mənəvi maraqlar və cəlbətmə dərəcəsi hər kəsdə fərqlidir. Ən çox tələbatı olan innovativ istiqamətlərdən biri də, həm ənənəvi təcrübəni, həm də rəqəmsal resursları ehtiva edən, hibrid tədris metodu hesab oluna bilər. Bu cür model təhsilənlərə şəxsi mentorla işləmək və rituallarda iştirak etmək imkanı saxlayır, eyni zamanda onlayn materiallara və interaktiv tapşırıqlara çıxış verir. Araşdırmalar göstərir ki, hibrid formalı tədris modeli təhsilənlərin iştirakını artırır və din təhsilini daha geniş coğrafiyalara yayır (Becirovic, 2003, s. 118-124).

Rəqəmsal texnologiyalar məzhəblərarası və dinlərarası dialoqun qurulması və əlaqələrin inkişafı üçün bənzərsiz imkanlar yarada bilər. Onlayn forumlar, virtual konfranslar və birgə layihələr

təhsilalanlara müxtəlif dini adətləri, görüşləri bölüşmək və təcrübələri paylaşmaq şansı verir. Nəticədə, bu tolerantlığın formalaşmasına, tənqidi düşüncənin inkişafına və dini müxtəlifliyi daha dərinləndirən anlamağa gətirib çıxarır. Din təhsilində belə dinlərarası layihələr rəqəmsal mühitdə dialoq mədəniyyətinin əsas aləti sayılır.

Rəqəmsal mühitdə dini kontent müxtəlif cür interpretasiya olunur. Ona görə də tənqidi təfəkkürün formalaşmasına və dini media savadına apriori sahib olmaq lazımdır. Rəqəmsal pedaqoji metodlar təhsilalanlara mənbələri yoxlamağı, feyk xəbərləri üzə çıxarmağı və müqəddəs mətnlərin manipulyativ şərhlərini tanımağı öyrədir.

Müasir rəqəmsal pedaqogika isə mənəvi ideyaların adaptasiyası üçün gənc nəslin qavrayışına uyğun olan multimediyaya layihələrindən, rəqəmsal “storytelling”dən (nəqlətmə), podcast və qısa videoformatlardan (TikTok, Instagram Reels və s.) istifadə edir. Bu interaktiv tədris formalarının integrasiyası deməkdir.

### **Müzakirə**

Etik və pedaqoji çağırışlara gəlinə, yeni texnologiyaların din təhsilinə integrasiyası bir neçə problem yaratdığını müşahidə edə bilərik. Əvvəlcə, dini təcrübənin autentiqliyinin qorunması çətinləşir. Rəqəmsallaşmanın əsas problemlərindən biri dini təcrübənin autentiqliyinin itmə riskidir. Ənənəvi dini təcrübədə təhsilənlə təhsilalan arasında canlı ünsiyyət, mərasimlərdə şəxsi və sakral anlarda ortaq iştirak nəzərdə tutulur. Rəqəmsal mühitin VR/AR vasitələri belə bu təcrübəni tam əvəz edə bilmir. Tədqiqatçılar qeyd edirlər ki, texnologiya yalnız əlavə vasitə kimi istifadə edilməli, əsas rolunu tutmamalıdır (Rahman, 2023, s. 205-207).

İkinci problem səthi yanaşmadır. Rəqəmsal media din təhsilində geniş istifadə olunanda, biliklər parçalanaraq səthi mənimsənilir. Qısa video format üzərində qurulan platformalar məlumatların dərin qavrayışına imkan vermir.

Digər problem rəqəmsal iz yaradan məlumatların məxfiliyi və təhlükəsizliyidir (Yamaç..., 2024, s. 240). Təhsilalanların şəxsi məlumatlarının qorunması etik məsələdir. LMS, çat-botlar və digər onlayn platformalar informasiyanın sızmasına, rəqəmsal izlərin yaranmasına və dini məlumatların qeyri-qanuni (icazəsiz) istifadəsinə səbəb olur. Buna görə də süni intellekt din təhsilinə tətbiq olunanda konkret və sərt etik qaydalar müəyyən edilməli və təhlükəsizlik standartları ciddi şəkildə qorunmalıdır.

Bundan başqa, texnologiya və mədəniyyət arasında tarazlıq qorunmalıdır. Texnologiyadan həddindən artıq istifadə edilmə mədəni məzmunun əvəzlənməsi ilə nəticələnir. Məsələn, rəngarəng vizual və immersiv vasitələr emosional cəlbədarlığa gətirib çıxara bilər. Təhsilənlərin vəzifəsi bundan ibarətdir ki, texnologiyayı yalnız mədəni təcrübənin gücləndirmək üçün istifadə etsin.

Son olaraq məzhəblərarası və dinlərarası fərqlilikləri də problemlər sırasına daxil edə bilərik. Din təhsilinin rəqəmsallaşması məzhəblərarası və dinlərarası fərqliliklərlə bağlı problemlərlə rastlaşması mümkündür. Bəzi dini ənənələr yeniliklər daha açıq, digərləri isə daha konservativdirlər. Bu da pedaqoji dilemmaya gətirib çıxarır: *“Ənənələri pozmadan və icmanın görüşlərinə hörmət edərək rəqəmsal metodları necə tətbiq etmək olar?”* sualı yaranır. Bu problemin həlli kimi hibrid yanaşmadan istifadə oluna bilər.

### **Nəticə**

Gələcək Web 3.0 metadünyaların inkişafı din təhsilinə yeni üfqlər vəd edir. Artıq bu gün ilahiyyat sahəsində mühazirələrin, seminarların, diskussiyaların keçirilməsi üçün virtual məkanların yaradılması mümkündür. Gələcəkdə dindarların və təhsilalanların növbəti adətləri öyrənmələri, həmçinin ümumi təcrübələri yaşamaları üçün “rəqəmsal icmalar”ın və xüsusi dəstəyin (insanabənzər robotlar Ameca, Mika, Sophia, Marbot və s.) formalaşması gözləniləndir (Yamaç..., 2024, s. 242). İnternet və rəqəmsal platformalar din təhsilini lokal icmalardan çıxarıb, daha geniş, global bir şəbəkəyə çevirə bilər. Bu, tolerantlıq və qarşılıqlı hörmət üzərində qurulan beynəlxalq tədris imkanları yarada bilər.

Din təhsilinin rəqəmsal transformasiyası disiplinlərarası əməkdaşlıq əlaqələrin yaranmasını tələb edir. Keyfiyyətli rəqəmsal alətlərin meydana gəlməsi təhsilənlər, dinşünaslar, ilahiyyatçılar, AI və

İT mütəxəssislərinin birgə fəaliyyəti nəticəsində mümkündür. Bu bilik və əlaqələrin sintezi innovasiyaların dini spesefikliyə uyğunlaşdırmağa və etik riskləri minimuma endirə bilər.

Rəqəmsal əlaqələrin etik kodekslərinin formalaşması din təhsilinin vacib parçasına çevriləcək. Bu standartlar məxfiliyin mühafizəsi və autentikliyin qorunmasını nəzərə, dini kontentlə manipulyasiyanın da qarşısını almalıdır. Əsas məsələ təkcə təhsilalanlara dini təcrübəni öyrətmək deyil, rəqəmsal savadın artırılması olacaq ki, bu da öz növbəsində tənqidi təfəkkürə və informasiyanın filtrasiyasına imkan verəcək.

Nəhayət, kreativ və multimedia formatların potensialının inkişafı da nəzərdə tutulur. Din təhsilinin gələcəyi rəqəmsal “storytelling”in, interaktiv tətbiqlərin, podkastların, VR sənədli filmlərin və digər multimedia alətlərinin tətbiqi ilə bağlıdır. Qeyd olunan yeniliklər gənc nəslin tələbatına uyğun olaraq mənəvi ideyaları daha əlçatan və maraqlı formada çatdırmağa imkan verir (Rahman, 2023, s. 209).

Rəqəmsal pedaqoji metodlar ənənəvi mənəvi təcrübələrlə müasir texnologiləri uyğunlaşdıraraq din təhsili üçün yeni imkanlar açır. Aparılan təhlil göstərir ki, VR/AR, onlayn platformalar, AI, geymifikasiya və multimedia formatları təhsilalanların marağını daha çox cəlb edə, dini dəyərlərin anlayışını dərinləşdirə və tədris resurslarını əlçatan edə bilər. Bununla yanaşı texnologiyaların uğurlu integrasiyası innovasiyalar ilə mənəvi təcrübənin autentikliyinə qorunması arasında balans vasitəsi ilə mümkün olduğu ortaya çıxmışdır. Əsas çağırışlar isə təcrübənin autentikliyinə mühafizəsi, koqnitiv yükləmələrin qarşısının alınması, şəxsi məlumatların qorunması və dinlərarası həssaslığın nəzərə alınması ilə bağlıdır.

Tədris prosesinin məzhəbi və mədəni xüsusiyyətlərini nəzərə alaraq hibrit modellərinin əyani və rəqəmsal formatlarının tətbiqi, ciddi etik normaların və məlumatların mühafizəsi şərti ilə fərdiləşmiş tədris istiqamətlərini AI və adaptasiya olunmuş platformaların yaradılması, interaktiv formatların (podkast, VR ekskursiyalar, “storytelling”) fəal istifadəsi, səthi yanaşmanın qarşısını almaq üçün tənqidi təfəkkürün və rəqəmsal savadın artırılması, keyfiyyətli rəqəmsal həllər üçün disiplinlərarası komandalara təşkil məqsədə uyğun hesab edilir.

Beləliklə, texnologiya din təhsilinin dərrakəli yanaşma və etik məsuliyyət şərtləri daxilində rəqəmsal transformasiyası ənənələrinin qorunması, mənəviyyatın inkişafı və yeni nəslin tərbiyəsi istiqamətində effektiv alət kimi istifadə oluna bilər.

### Ədəbiyyat

1. Akhyar, M., Deliani, N., & Khadijah, K. (2025). The importance of religious education in the digital era. *International Journal of Islamic Educational Research*, 2(1), 15–30. <https://doi.org/10.61132/ijier.v2i1.146>
2. Asril, Z., Syafril, S., Engkizar, E., & Arifin, Z. (2023). Advancing educational practices: Implementation and impact of virtual reality in Islamic religious education in integrated Islamic elementary schools. *Jurnal Pendidikan Islam*, 9(2), 199–210. <https://journal.uinsgd.ac.id/index.php/jpi/article/view/20567>
3. Aukland, K., Andersland, I., Smith-Gahrsen, M., Lindhardt, E. M., Kvia, S. A., & Hansen, S. S. (2023). VR in RE and moral education: Report from a symposium at the NCRE 2022. *Journal of Beliefs and Values*, 45(4), 713–727. <https://www.tandfonline.com/doi/full/10.1080/13617672.2023.2207149>
4. Becirovic, S. (2023). *Digital pedagogy: The use of digital technologies in contemporary education*. Springer. <https://doi.org/10.1007/978-981-99-0444-0>
5. Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
6. Leka, A. (2022). Religion and the modern education. *Academicus International Scientific Journal*, 14(27), 176–205.
7. Papakostas, C. (2025). Artificial intelligence in religious education: Ethical, pedagogical, and theological perspectives. *Religions*, 16(5), 563. <https://www.mdpi.com/2077-1444/16/5/563>

8. Prawira, A. W., Mahelvi, A., & Bilqis Mufidah, B. (2024). Digital media in religious education: Challenges and opportunities. *Green Philosophy Journal*, 1(2), 9–15.  
<https://philosophy.ifrel.org/index.php/GreenPhilosophy/article/view/19>
9. Rahman, M. (2023). Implementation and impact of virtual reality in Islamic religious education in integrated Islamic elementary school. *Jurnal Pendidikan Islam*, 9(2), 199–210.  
<https://doi.org/10.15575/jpi.v9i2.20567>
10. Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. <https://doi.org/10.2760/159770>
11. Reed, R. (2021). AI in religion, AI for religion, AI and religion: Towards a theory of religious studies and artificial intelligence. *Religions*, 12(401), 2–16.  
<https://doi.org/10.3390/rel12060401>
12. Tan, S. C., Voogt, J., & Tan, L. (2024). Introduction to digital pedagogy: A proposed framework for design and enactment. *Pedagogies: An International Journal*, 19(3), 327–336.  
<https://doi.org/10.1080/1554480X.2024.2396944>
13. Yamaç, M., & İşbilen, N. (2024). Religion paradigm of artificial intelligence. *İlahiyyat Studies*, 15(2), 233–253. <https://doi.org/10.12730/is.1444746>

Daxil oldu: 03.10.2025

Qəbul edildi: 08.02.2026



DOI: <https://doi.org/10.36719/2663-4619/127/108-114>

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## Ədəbi dil və dialekt münasibətləri

### Xülasə

Dil bir cəmiyyətin mədəni, tarixi və sosial həyatının əsas ifadə vasitəsidir. Ədəbi dil və dialektlər isə bu geniş dil sisteminin iki əsas təzahür formasıdır. Ədəbi dil dilin normativ və sistemləşdirilmiş formasıdır ki, o, təhsil, rəsmi sənədlər, ədəbiyyat və mediada istifadə olunur. Dialektlər isə regionlara və sosial qruplara, fonetik, leksik, sintaktik və üslub xüsusiyyətlərinə xas olan dil faktlarıdır. Ədəbi dil və dialektlər arasında mürəkkəb və dinamik bir münasibət mövcuddur. Tarixi baxımdan dialektlər ədəbi dilin formalaşmasında əsas rol oynayır. Onlar leksik material, frazeologiya, deyim və folklor nümunələri ilə ədəbi dilin zənginləşməsində böyük rol oynayır. Digər tərəfdən, ədəbi dil dialektlər üzərində normativ təsir göstərir, onların bəzi elementlərini standartlaşdıraraq ictimai qəbulda olan forma halına gətirir. Sosiolingvistika baxımından dialektlər və ədəbi dil arasındakı münasibət həm də nüfuz, dəyər və cəmiyyət tərəfindən qəbul edilmə məsələləri ilə bağlıdır. Dialektlərin ədəbi dilə keçməsi və onların ədəbi üslubda istifadəsi yeni standart formaların yaranmasına səbəb olur ki, bu da dilin canlılığını təmin edir. Ədəbi dil və dialekt münasibətləri həmçinin bölgələrin və mədəniyyətin dil varlığının qorunması baxımından əhəmiyyətlidir. Dialektlər, həm də mədəni və tarixi dil daşıyıcısı kimi qiymətlidir. Buna görə də, ədəbi dildə işlənən dialektlər funksional baxımdan qiymətləndirilməlidir. Nəticə etibarilə, ədəbi dil və dialektlər arasında qarşılıqlı təsir prosesi dilin həm standart, həm də bölgələrə xas olan üslublarının tarazlaşdırılmasını təmin edir. Bu münasibətlər dilin zənginliyini qoruyur, sosial və mədəni təzahürləri ədəbi mətnə ifadə etməyə imkan verir, eyni zamanda, cəmiyyətin dil siyasəti və normativ tələbləri ilə uzlaşır.

*Açar sözlər: ədəbi dil, dialekt, mədəni təzahür, milli kimlik, mənəvi dəyər*

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## Literary Language and Dialect Relations

### Abstract

Language is a primary means of expressing a society's cultural, historical, and social life. Literary language and dialects constitute two main manifestations of this broader linguistic system. Literary language represents the normative and codified form of language, employed in education, official documents, literature, and media.

Dialects, in contrast, are linguistic varieties associated with specific regions and social groups, distinguished by phonetic, lexical, syntactic, and stylistic features. A complex and dynamic relationship exists between literary language and dialects.

Historically, dialects have played a crucial role in the formation of literary language, providing lexical material, phraseology, idioms, and folklore elements that enrich its expressive capacity. Conversely, literary language exerts a normative influence over dialects, standardizing certain features and shaping them into socially accepted forms. From a sociolinguistic perspective, the relationship between dialects and literary language also involves considerations of prestige, value, and social acceptance. The integration of dialectal elements into literary language and their use in literary style contributes to the emergence of new standard forms, thereby ensuring the vitality of the language. The interactions between literary language and dialects are also significant for preserving regional linguistic diversity and cultural heritage. Dialects serve not only as forms of spoken communication but also as carriers of cultural and historical identity. Therefore, dialectal elements incorporated into literary language should be evaluated not only normatively but also functionally. In conclusion, the reciprocal influence between literary language and dialects ensures a balance between standard and regionally specific styles, preserving the richness of the language, enabling the expression of social and cultural phenomena in literary texts, and aligning with societal language policies and normative requirements.

**Keywords:** *literary language, dialect, cultural manifestation, national identity, moral value*

## Giriş

Azərbaycan dili müxtəlif ictimai-siyasi və mədəni mərhələlərdən keçərək müasir ədəbi norma səviyyəsinə yüksəlmişdir. Bu inkişaf prosesində dialekt və şivələrin rolu xüsusi əhəmiyyət daşıyır. Xalq danışığı dili əsasında formalaşan ədəbi dil daim dialektlərdən qidalanmış, onların leksik, fonetik, morfoloji və sintaktik imkanlarından istifadə edərək zənginləşmişdir. Azərbaycan dilçiliyində dialektlərin sistemli şəkildə öyrənilməsi və onların ədəbi dilə təsirinin araşdırılması bir sıra görkəmli alimlərin fəaliyyəti ilə bağlıdır. Bu baxımdan Məmmədəğa Şirəliyev, Bəkir Çobanzadə və Əbdüləzəl Dəmirçizadə kimi tədqiqatçıların dialektologiya sahəsindəki araşdırmaları xüsusi əhəmiyyət kəsb edir. Çağdaş dövrümüzdə İ.Bayramov və M.Hüseynovanın araşdırmaları diqqəti cəlb edir (Bayramov, 2022; Hüseynova, 2020). Məlumdur ki, dialektlə ədəbi dil arasında fərqlər mövcuddur. Dialekt müəyyən bir ərazidə yaşayan əhəlinin danışığı xüsusiyyətlərini əks etdirən dil formasıdır, ədəbi dil ümumxalq ünsiyyət vasitəsi olmaqla, normativ xarakter daşıyır və yazılı-mədəni ənənəyə əsaslanır. Lakin ədəbi dillə dialektlər arasında qarşılıqlı əlaqə mövcuddur. Belə ki, ədəbi dilin dialektlər əsasında zənginləşməsi haqqında çoxlu faktlar vardır, dialektlər isə ədəbi dilin təsiri ilə müəyyən qədər normallaşır. Azərbaycan dilinin dialektləri əsasən dörd böyük qrupa bölünür: şərq, qərb, şimal və cənub dialektləri. Hər bir dialekt qrupu özünəməxsus fonetik və leksik xüsusiyyətlərə malikdir. Bu müxtəliflik ədəbi dil üçün zəngin material bazası rolunu oynayır. Məqalənin bu mövzuya həsr olunması bu iki anlayışla bağlı bir sıra məsələlərin aydınlaşmasında əhəmiyyət kəsb edir.

## Ədəbiyyat icmalı

Dialektlər xalqın tarixi yaddaşını, etnoqrafik xüsusiyyətlərini, məişətini və dünyagörüşünü əks etdirir. Onlar yalnız dil hadisəsi deyil, həm də mədəniyyət faktıdır. Hər bir dialekt bölgənin tarixini, coğrafiyasını və sosial münasibətlərini özündə daşıyır. Azərbaycan ədəbi dili bu müxtəliflik əsasında vahid milli dil səviyyəsinə yüksəlmişdir. Dialektlər isə ədəbi dilin canlılığını və təbii inkişafını təmin edən əsas mənbələrdən biri olaraq qalır. Müasir dövrdə kütləvi informasiya vasitələrinin və təhsilin təsiri ilə dialekt xüsusiyyətləri müəyyən qədər zəifləsə də, onların ədəbi dilə təsiri davam edir. Xüsusilə folklorun, atalar sözlərinin, məsəllərin və yerli ifadələrin toplanması və tədqiqi dialekt leksikasının qorunmasına xidmət edir. Dialektoloji lüğətlərin tərtibi və regional nitq materiallarının toplanması ədəbi dilin zənginləşməsi üçün mühüm elmi bazadır. Beynəlxalq elmi mənbələrdə dialektlərə münasibət göstərilmiş, onlar müxtəlif prizmalardan dəyərləndirilmişdir. “Standard dil və regional dialektlər arasındakı qarşılıqlı təsir, dilin sosial funksiyasını dəyişdirir; standart forma mərkəzi mədəniyyət və institutlar tərəfindən dəstəklənərkən regional variantlar gündəlik ünsiyyətdə

və sosial identitetin ifadəsində öz rolunu qoruyur” (Treccani, Rossi, 2023, s. 120). Treccani və Rossi, ədəbi dil ilə dialekt istifadəsinin müasir kontekstdə sosial faktorlar, identitet və nitq vəziyyətləri əsasında necə formalaşdığını sistemli şəkildə araşdırır, standart və regional variasiyaların qarşılıqlı təsiri ədəbi dilin sabitliyinə və dəyişkənliyinə dair ətraflı diskussiya verir (Treccani, Rossi, 2023, s. 115-128). Tədqiqatlarda dialekt ilə ədəbi dil arasında əlaqələrin yaranması müsbət hal kimi qəbul edilir. “Dialekt kontaktları ilə standartlaşma prosesləri arasında dinamika qurmaq, dilin ədəbi normativləşdirilməsi və regional variantların nüfuz səviyyəsini anlamaqda əhəmiyyət daşıyır; bu qarşılıqlı təsir qlobal variasiyalar kontekstində dil siyasəti və sosial strukturla sıx bağlıdır” (Henderson, Lee, Park, 2024, s. 467). Henderson, Lee və Park tərəfindən aparılan tədqiqat, müxtəlif ingilis dili variasiyalarının (dialektlərin) ədəbi standartlaşma prosesinə təsirini müqayisəli nümunələrlə göstərir və dialekt-ədəbi dil münasibətlərinin qlobal kontekstdə dinamikasını ortaya qoyur (Henderson, Lee, Park, 2024, s. 461-475). Elmi əsərlərdə dialekt və ədəbi dil normativləri arasındakı sosial qiymətləndirmədə dialektlərin nüfuzunun artma səviyyəsi müəyyən edilmiş və nəticədə standart dilin nüfuzu ilə dialekt dəyişkənliyi arasında kompleks münasibətlər ortaya çıxarılmışdır (Kim, Villa, 2022, s. 893). Kim və Villa dialektlərin ədəbi dil standartları qarşısında qəbul səviyyələrini və sosial status təsirlərini geniş şəkildə təhlil edir.

Dialekt mövzusunda yazılmış əsərlərin çoxunda dil normaları ilə dialekt münasibətlərinə toxunulur. “Standart və dialekt arasındakı münasibət, dilin diaxron, diatopik və diastratik parametrləri çərçivəsində təhlil edildikdə, neo-standartın formalaşmasında dialektlərin struktur və funksional təsirinin əhəmiyyəti aydın görünür” (Zholudeva, 2022, s. 786). Yeni standart dildə regional dialekt elementlərinin işlənməsi dilin funksional zənginliyini artıran vasitə kimi təqdim edilir. Araşdırmaçılar normativ dil-dialekt məsələlərinə aydınlıq gətirməyə çalışır və bu barədə maraqlı elmi-nəzəri fikirlər irəli sürürlər. “Müasir rabitə vasitələrinin geniş istifadəsi regional dialektlərin standart dil üzərindəki təsirini gücləndirir və dialektal variasiyaların leksik və qrammatik nüanslarının standart dilə daxil olmasına şərait yaradır” (Ryskulova, Tagaykul Kyzy, 2025, s. 4). Beləliklə, regional dialektlərin ədəbi dil normalarına təsiri müasir ünsiyyət materialları ilə izah edilir. I Made Budiarsa dil, dialekt və dəyişkənlik kimi anlayışların ədəbi dil və dialekt münasibətlərinə sosiolinqvistik baxımdan təsirini müzakirəyə çıxarır (I Made Budiarsa, 2015). Məqalə dialekt və standart dil arasında xətt keçidinin kommunikasiyaya və sosial kontekstə təsirini analitik şəkildə araşdırır (Zeng, Shea, Beckman, Kutlu, 2024). Tədqiqatlarda dialektlərin dildə necə əks olunması və dəyişmələr yaratması (Alexander, Maïke, 2025), ədəbi dil və dialektlərin birlikdə bir sistem kimi necə işlənməsi (Məmmədov, 2019) məsələlərinə də rast gəlirik. Trudgill ədəbi dil-dialekt münasibətlərinin ideoloji və sosial tərəflərini araşdırmaq üçün nəzəri baza təqdim edərək ədəbi dil və dialekt anlayışlarını sosiolinqvistik aspektdən qiymətləndirir, ədəbi dilin sosial əsaslar nəticəsində formalaşdığını və dialektlərin isə struktur baxımdan ondan geri qalmadığını göstərir və qeyd edir ki, ədəbi dil siyasi və sosial güc strukturları ilə əlaqəli şəkildə standartlaşdırılır, dialektlər isə struktur baxımından müstəqil və sistemli dil formalarıdır (Trudgill, 2020, s. 415). Auer (2018) dialekt dəyişməsi və standart dilin bu prosesdə rolunu araşdırır, dialektlərin ədəbi dilə yaxınlaşması və ya ondan uzaqlaşması proseslərini izah edir, dialekt və ədəbi dil arasında sərhədlərin sabit olmadığını və bu münasibətin dinamik xarakter daşdığını vurğulayır (Auer, 2018, s. 189). Bu araşdırma ədəbi dil və dialekt münasibətlərinin zamanla necə dəyişdiyini göstərmək baxımından əhəmiyyətlidir. Elmi tədqiqatlarda ədəbi dilin dialektlərə təsir mexanizmləri və regional variantların dəyişmə istiqamətləri izah edilir, ədəbi dil-dialekt münasibətlərinin struktur və sosial dinamikasını anlamaq üçün əhəmiyyətli nəzəri model verilir (Hinskens, Auer, Kerswill, 2019, s. 530). Araşdırmalar göstərir ki, dialekt və ədəbi dil arasındakı münasibət dilçilik, sosiolinqvistika və ədəbiyyatşünaslıq sahələrində uzun müddətdir mərkəzi tədqiqat obyektlərindən biri olmuşdur.

### **Tədqiqat**

Dilçilikdə ədəbi dil və dialekt münasibətləri məsələsi uzun müddət tədqiq edilmişdir. Bu sahədə müxtəlif leksik-qrammatik materiallar əsasında aparılan araşdırmalar göstərir ki, dialektlər ədəbi dilin formalaşmasında mühüm rol oynayır. Ədəbi dil çox vaxt müəyyən dialekt və ya dialekt qrupunun əsasında yaranır və zaman keçdikcə ümummilli dil norması kimi qəbul edilir. Azərbaycan dilinin

tarixində də bu proses aydın şəkildə müşahidə olunur. Müxtəlif bölgələrdə mövcud olan dialekt və şivələr xalq dilinin zənginliyini əks etdirir və onların müəyyən elementləri ədəbi dilə daxil olur. Bu baxımdan dialektlər yalnız regional ünsiyyət vasitəsi deyil, həm də ədəbi dilin inkişafına təsir edən mühüm mənbədir. Eyni zamanda, ədəbi dilin normativ xarakteri dialektlərdən fərqlənir. Ədəbi dil yazılı və şifahi ünsiyyətin əsas vasitəsi olmaqla yanaşı, təhsil, elm, mətbuat və rəsmi kommunikasiya sahələrində istifadə olunur.

### **Metodologiya**

Tədqiqat zamanı müxtəlif dilçilik metodlarından istifadə edilmişdir. Ədəbi dil və dialektlərin tarixi və funksional xüsusiyyətlərinin müqayisəli şəkildə təhlilində analitik üsul, dialektlərin sosial nüfuz baxımından qiymətləndirilməsində sosiolinqvistik yanaşma, dialekt nümunəsi işlənmiş ədəbi mətnlərin analizində mətn təhlili metodlarından istifadə edilmişdir. Bu metodlar ədəbi dil faktları ilə dialektlərin müqayisə edilməsinə, dialekt materialları və ədəbi dil nümunələrinin sistemli şəkildə təsvirinə imkan yaratmış, onların dil sistemindəki funksional rolunu müəyyən etməyə kömək etmişdir. Tədqiqatın materialını Azərbaycan dilinin müxtəlif dialekt və şivələrinə aid nümunələr, həmçinin ədəbi dilin yazılı və şifahi mətnləri təşkil edir.

### **Analiz**

Dil hər bir xalqın mədəniyyətini, tarixini və dünyagörüşünü əks etdirən ən mühüm ünsiyyət vasitəsidir. Dilin inkişafı prosesində onun müxtəlif formaları meydana gəlir ki, bunların arasında ədəbi dil və dialektlər xüsusi yer tutur. Ədəbi dil ümummilli ünsiyyət vasitəsi kimi normalaşdırılmış və sabit qaydalarla tənzimlənən dil formasıdır. Dialektlər isə müəyyən ərazi və sosial qruplara məxsus olan, özünəməxsus fonetik, leksik və qrammatik xüsusiyyətləri ilə seçilən dil variantlarıdır.

Ədəbi dil və dialektlər arasında qarşılıqlı əlaqə daim mövcud olmuşdur. Bir tərəfdən, dialektlər xalq dilinin zənginliyini və rəngarəngliyini əks etdirir, digər tərəfdən isə ədəbi dil bu zənginlikdən bəhrələnməklə inkişaf edir. Ədəbi dil adətən milli dilin yazılı ünsiyyətdə, təhsil sistemində və rəsmi diskursda istifadə olunan normallaşdırılmış və rəsmi şəkildə sistemləşdirilmiş forması kimi qəbul edilir. Dialektlər isə dilin fonetik, leksik, qrammatik və üslubi baxımdan fərqlənən regional, sosial və ya etnik variantlarıdır. Bu iki forma arasındakı qarşılıqlı əlaqə dinamik xarakter daşıyır. Ədəbi dil çox vaxt müəyyən bir dialekt bazası əsasında formalaşsa da, dialektlər onun inkişafına, zənginləşməsinə və yenilənməsinə davamlı şəkildə təsir göstərir. ədəbi dilin standartlaşması prosesi, adətən, aşağıdakı mərhələləri əhatə edir:

1. Müəyyən dialektin norma kimi seçilməsi.
2. Qrammatika və lüğətlər vasitəsilə norma və ya qaydaların sistemli şəkildə yazılı formaya salınması və rəsmi olaraq təsdiqlənməsi.
3. Təhsil və inzibati sahələrdə funksional genişlənmə.
4. Geniş toplum tərəfindən qəbul edilmə.

Dil materialları göstərir ki, standartlaşmadan sonra belə, dialekt formaları aradan qalxmır, əksinə, onlar dilin yenilənməsi üçün aktiv mənbə olaraq qalır. Bu baxımdan, dialektlərdən Azərbaycan ədəbi dilinə keçən “kəhriz”, “tərəcə”, “qənşər”, “qəlbi” sözləri səciyyəvidir.

Dialektlərin ədəbi dilə təsirinin ən aydın təzahür formalarından biri leksik zənginləşmədir. Regional söz və ifadələr ədəbi dilə müxtəlif yollarla daxil olur. Bu baxımdan, aşağıdakılar səciyyəvidir:

1. Folklor və şifahi ənənələr.
2. Kənd və regional həyatı təsvir edən ədəbi əsərlər.
3. Kütləvi informasiya vasitələri və ümumxalq mədəniyyəti.

Dialekt sözləri çox vaxt güclü emosional və ekspressiv çalar daşıyır. Azərbaycan ədəbi-bədii dili dialektlərin rolunu yüksək səviyyədə üzə çıxaran mənbədir. Yazıçı və şairlər öz əsərlərində dialektizmlərdən də istifadə etməklə dilin zənginliyini üzə çıxarırlar, obrazların daxili aləminin açılmasına şərait yaradır. Dialektizmlər bədii əsərlərin dilinə xəlqilik, obrazlılıq, yerli kaloritlilik gətirir (Bayramov, 2022, s. 2). Müxtəlif zamanlarda yazıb-yaratmış yazarların dilindəki dialektlər bu fikri təsdiq edir:

Əllərində əllərim, gözlərində gözlərim...  
Asılaydı sözlərim  
Könlünün qulağından bir qızıl tana kimi,  
Günəş doğana kimi

(Müşfiq, 2004, s. 176).

Tarixən dilin fəal leksikasına aid olan “tana” sözü hazırda dialekt kimi işlənərək öz yerini “sırğa” sözünə vermişdir.

Araşdırma göstərir ki, dialektal leksikası mədəni özünəməxsusluq yaradır və milli dünyagörüşünü əks etdirir, məcazi və bədii ifadə imkanlarını genişləndirərək ədəbi dilin ifadə imkanlarını artırır. Azərbaycan ədəbi-bədii dil materialları dialektlərin milli ədəbi ənənələrin formalaşmasında mühüm rol oynamasını təsdiq edir. Yazıçılar tez-tez bölgələrin nitq faktlarına müraciət edərək orijinal kollektiv kimlik hissi yaradırlar. Dialekt elementlərinin ədəbi dil ilə sintezi “müxtəliflikdə birlik” ideyasını ifadə edir. Bu baxımdan, dialekt təsiri yalnız lingvistik deyil, həm də ideoloji xarakter daşıyır; o, mədəni yaddaşı və tarixi davamlılığı möhkəmləndirir. Bu mənada, İsmayıl Şıxlının dilindəki frazem səviyyəli dialekt örnəkləri diqqəti cəlb edir.

- Bircə belə dur, görüm, kişi özünə təzəcə paltar alıb, sən də onu bələm-bələm eyləyibsən (Şıxlı, 2005, s. 16).

- Mən sənə toxa vuran qızlardan deyiləm ki, saçımdan tutub horabel çəkəsən (Şıxlı, 2005, s. 55).

- Ay qız, özünü faqqılığa niyə qoyursan? (Şıxlı, 2005, s. 126).

Yazıçının el-elat ağzından alıb xüsusi sığalla ədəbi dilimizə gətirdiyi bu ifadələr xaslığı ilə seçilir (Həsənova, 2020, s. 114).

Uzun müddət dilimizdə fəal leksik-qrammatik vahid kimi işlənən və “günah” sözünün qarşılığı olan “suç” sözü sonradan dialektlərə keçsə də, hazırda o qədər fəallaşmış ki, yenidən ədəbi dilimizə keçməyinə inam yaranır. Zəlimxan Yaqubun dili bu inamı çoxaldır:

Aldanmışam sərvətinə dünyanın,  
Ömrüm-günüm, yalan mənim, puç mənim.  
Nahaq yerə yaxasından yapışdım,  
Təqsir mənim, günah mənim, suç mənim

Nur içində açılaydı hər sabah  
Dan yerində yuyulaydı suç, günah,  
Bu dünyadan getdiyim gün, ay Allah,  
Bu dünyaya gəldiyim gün olaydı!

Sosiolinqvistik baxımdan dialekt və ədəbi dil arasındakı münasibət güc və nüfuz münasibətlərini də əks etdirir. Standart dil çox vaxt ictimaiyyət və mütəxəssislər tərəfindən nüfuz və etibarlılığa malik olur, dialektlər isə bəzən cəmiyyətin əsas nitq fəaliyyətindən kənarlaşdırılmış hesab edilir. Lakin ədəbiyyat çox zaman bu fikri sarsıdan mənbə rolunu oynayır. Dialektlərin ədəbi dilə təsiri çoxşaxəli və davamlı prosesdir. Tarixi baxımdan ədəbi dil müəyyən dialekt bazasında formalaşmış, lakin sonrakı mərhələlərdə də regional variantlarla qarşılıqlı əlaqədə inkişaf etmişdir. Dialektlər ədəbi dili leksik zənginləşmə, sintaktik yenilik, üslubi dərinlik və ictimai-mədəni təmsilçilik baxımından zənginləşdirir. Onları qarşı-qarşıya qoymaq əvəzinə, vahid dil sisteminin bir-birini tamamlayan tərəfləri kimi qiymətləndirmək daha məqsədəuyğundur. Ədəbi dilin dialekt müxtəlifliyinə yol verməsi onun canlılığına müsbət təsir edir.

Aparılan analiz göstərir ki, ədəbi dil və dialektlər arasında qarşılıqlı təsir prosesi daim davam edir. Dialektlərdə mövcud olan bir sıra leksik vahidlər və ifadələr zamanla ədəbi dilə daxil olur və onun leksik fondunu zənginləşdirir. Dialektlərdə müşahidə olunan bəzi səciyyəvi xüsusiyyətlər isə ədəbi dildə normativ xarakter daşıyır və yalnız regional ünsiyyət çərçivəsində qalır. Bununla belə,

dialektlər dilin canlı və dinamik inkişafını göstərən mühüm mənbədir. Leksik səviyyədə dialektlərdə qorunub saxlanılan qədim sözlər və ifadələr xalqın tarixi və mədəni irsini əks etdirir. Bu sözlərin bir qismi bədii ədəbiyyatda və folklor nümunələrində istifadə olunaraq ədəbi dilin üslubi imkanlarını genişləndirir. Beləliklə, dialektlər yalnız dilin regional forması deyil, həm də ədəbi dilin inkişafına təsir edən mühüm mənbə kimi çıxış edir.

Analiz göstərir ki, ədəbi dil və dialektlər bir-biri ilə sıx bağlı olan dil formalarıdır. Dialektlər xalq dilinin zənginliyini və tarixi inkişafını əks etdirir, ədəbi dil isə bu zənginlik əsasında formalaşaraq ümummilli ünsiyyət vasitəsinə çevrilir. Dialektlər ədəbi dilin leksik və üslubi imkanlarının genişlənməsində mühüm rol oynayır. Eyni zamanda ədəbi dilin normativ sistemi dialektlərin müəyyən xüsusiyyətlərini tənzimləyərək ümumi dil vahidliyini təmin edir. Beləliklə, ədəbi dil və dialektlərin qarşılıqlı əlaqəsi dilin inkişafında mühüm amil olmaqla yanaşı, milli mədəniyyətin qorunması və zənginləşməsinə də xidmət edir.

### Nəticə

“Ədəbi dil və dialekt münasibətləri” mövzusunda aparılan araşdırma göstərir ki, ədəbi dil ilə dialektlər arasında qarşıdurma deyil, qarşılıqlı təsir və tamamlanma münasibəti mövcuddur. Ədəbi dil ümumxalq ünsiyyətinin normativ və sabit forması kimi çıxış etsə də, onun zənginləşməsi və dinamik inkişafı məhz dialekt və şivələrin daxili potensialı hesabına mümkün olur. Dialektlər xalqın tarixi yaddaşını, etnoqrafik xüsusiyyətlərini və regional mədəni təcrübəsini qoruyub saxlayan canlı dil qatıdır. Bu baxımdan, ədəbi dil dialektlər üçün ümumiləşdirici və tənzimləyici funksiya daşıyarsa, dialektlər də ədəbi dil üçün yeniləşdirici və zənginləşdirici mənbə rolunu oynayır. Tədqiqat nəticələri sübut edir ki, ədəbi dilin formalaşması və normallaşması prosesi dialekt materialı əsasında baş verir. Tarixən Azərbaycan ədəbi dilinin təşəkkülündə müxtəlif regional şivələrin, xüsusilə mərkəzi dialekt qrupunun mühüm rolu olmuşdur. Dialektlərdə qorunub saxlanılan arxaik sözlər, fonetik və leksik xüsusiyyətlər ədəbi dilin tarixi inkişaf mərhələlərinin öyrənilməsində mühüm mənbə kimi çıxış edir. Bu isə göstərir ki, dialektlər yalnız yerli, məhdud əraziyə aid danışq forması deyil, həm də dil tarixinin canlı arxividir. Eyni zamanda, qeyd edilməlidir ki, qloballaşma və kütləvi informasiya vasitələrinin təsiri nəticəsində ədəbi dilin mövqeyi daha da möhkəmlənsə də, dialektlərin istifadəsi məhdudlaşma təhlükəsi ilə üz-üzə qalır. Buna görə də dialektlərin diqqətlə toplanması, yenidən və elmi şəkildə tədqiqi aktual vəzifə kimi qalır. Dialektoloji araşdırmalar həm dilin vahidliyinin, həm də onun daxili müxtəlifliyinin elmi əsaslarla dəyərləndirilməsinə imkan verir.

Araşdırma nəticəsində belə qənaətə gəlinir ki, ədəbi dilin sabitliyi ilə dialektlərin rəngarəngliyi arasında tarazlıq qorunmalıdır. Ədəbi dil ümummilli birlik və özünəməxsusluq amili kimi çıxış etdiyi halda, dialektlər milli mədəniyyətin zənginliyini və çoxqatlılığını əks etdirir. Bu baxımdan, dil siyasətində məqsəd dialektlərin aradan qaldırılması deyil, onların elmi şəkildə öyrənilməsi və milli dil sisteminin tərkib hissəsi kimi qorunması olmalıdır.

Beləliklə, ədəbi dil və dialekt münasibətləri dilin daxili inkişaf qanunauyğunluqlarını, sosial funksiyalarını və mədəni əsaslarını əks etdirən mürəkkəb, lakin harmonik bir sistemdir. Bu münasibətlərin düzgün dəyərləndirilməsi Azərbaycan dilçiliyində həm nəzəri, həm də praktik baxımdan mühüm əhəmiyyət kəsb edir.

### Ədəbiyyat

1. Auer, P. (2018). Dialect change and the role of standard language. *Language in Society*, 47(2), 181–203. <https://doi.org/10.1017/S0047404518000171>
2. Bayramov, I. (2022). *Dialectology*. İksad Publishing.
3. Budiarsa, I. M. (2019). Language, dialect and register: Sociolinguistic perspective. *RETORIKA: Jurnal Ilmu Bahasa*, 1(2), 379–387. <https://doi.org/10.22225/jr.1.2.42.379-387>
4. Henderson, A., Lee, S., & Park, J. (2024). Dialect contact and literary standardization: Evidence from Global Englishes. *Language in Society*, 53(4), 455–478. <https://doi.org/10.1017/S0047404524000158>

5. Hinskens, F., Auer, P., & Kerswill, P. (2019). The study of dialect convergence and divergence: Conceptual and methodological considerations. *Journal of Linguistics*, 55(3), 521–560. <https://doi.org/10.1017/S0022226719000123>
6. Hüseynova, M. (2020a). Integration of nominal dialectisms of Azerbaijani language into Turkic languages. *Linguistics Problems*, 1(4), 17–25.
7. Hüseynova, M. (2020b). *Interintegration of dialects of Turkic languages*. ADPU Publishing House.
8. Kim, H., & Villa, V. (2022). Urban dialects and literary norms: The role of social evaluation in language prestige. *International Journal of Bilingualism*, 26(7), 889–907 <https://doi.org/10.1177/13670069211012345>
9. Lykke, A. K., & Rocker, M. H. (2025). A comparative perspective on language shift and language change: Norwegian and German heritage varieties in North America. *Languages*, 10(10), 256. <https://doi.org/10.3390/languages10100256>
10. Mammadov, R. S. (2019). The dialectical unity of matter and function in language. *International Journal of Language and Awareness*. <https://doi.org/10.33390/homeros.2019148827>
11. Müşfiq, M. (2004). *Selected works*. Şərq-Qərb.
12. National poetry phenomenon. (n.d.). <https://news.milli.az/culture/906451.html>
13. Qurbanova, I. (2014). *Ethnolinguistic analysis of Azerbaijani dialects and subdialects*. Bilik Publishing.
14. Ryskulova, N., & Tagaykul Kyzy, E. (2025). The influence of regional dialects on standard language in modern communication. *Bulletin of Science and Practice*, 3(11). <https://doi.org/10.33619/2414-2948/112/77>
15. Shikhli, I. (2005). *Selected works* (Vol. 1). Şərq-Qərb.
16. Treccani, F., & Rossi, M. (2023). Standard language vs. dialect use: Contemporary sociolinguistic perspectives. *Journal of Sociolinguistics*, 27(2), 113–132. <https://doi.org/10.1111/josl.12456>
17. Trudgill, P. (2020). Dialects and standard languages in the modern world. *Journal of Sociolinguistics*, 24(4), 412–428. <https://doi.org/10.1111/josl.12412>
18. Yaqoub, Z. (n.d.). Selected poems. Retrieved from <https://edebiyat-az.com/?p=36499>
19. Zeng, W., Shea, C., Beckman, J., & Kutlu, E. (2024). Bidialectal variety switching: The effects of language use and social contexts. *Frontiers in Language Sciences*, 2, 1302027. <https://doi.org/10.3389/flang.2023.1302027>
20. Zholudeva, L. I. (2022). Italian neo-standard in the light of E. Coseriu's theory of language variations. *RUDN Journal of Language Studies, Semiotics and Semantics*, 13(3), 784–799. <https://doi.org/10.22363/2313-2299-2022-13-3-784-799>

Daxil oldu: 16.09.2025

Qəbul edildi: 02.01.2026

DOI: <https://doi.org/10.36719/2663-4619/127/115-132>

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## The Depiction of Holiness: A Hagiographical Examination of Two Icon Panels in Bursa Archaeological Museum

### Abstract

The guiding principles of behavior driven by devotion to Jesus Christ and His followers have triggered a form of life to which the faithful commit themselves. The life stories of saints have taken deep root in Christian society. For believers, these individuals have become symbols, and the lifestyle they maintained gave rise to the presence of figures who could be regarded as idols or, in other terms, icons. The idealization of saints has endowed sacred iconography with a place in Christian theology. Icons, which reinforce the spatial organization of churches, have also become objects of worship displayed in the central places of homes. This article concentrates on two icons housed within the Bursa Archaeological Museum. The purpose of examining these icons, depicting Saint George and Saint Nicholas, is to investigate the place of the icon concept within Christian theology and its reflection in art. To adopt a method suitable to the aim, a retrospective approach was developed to compare similar and different examples. The study indicates that the legends surrounding the figures depicted on the icons remain fresh through repetition in every period. Despite changes in technique and materials, the core theme has been constructed around similar plotlines and has continued to exert widespread influence. Based on the form and technical characteristics of the Bursa Museum's works, as well as comparisons with similar examples, there is a growing view that these could be Greek Orthodox Icons dating to the period spanning the 18th to the 20th century.

**Keywords:** Hagiography, Christian Art, Icon, Saint Nicholas, Saint George

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## Müqəddəslik təsviri: Bursa Arxeoloji Muzeyində yerləşən iki ikon panelinin hagioqrafik tədqiqi

### Xülasə

İsa Məsihə və Onun davamçılarına sədaqət əsasında formalaşan davranış prinsipləri möminlərin özlərini həsr etdikləri bir həyat forması yaratmışdır. Müqəddəslərin həyat hekayələri xristian cəmiyyətində dərin kök salmışdır. Möminlər üçün bu şəxslər simvola çevrilmiş, onların həyat tərzini isə büt və ya başqa ifadə ilə desək, ikon kimi qəbul edilə biləcək fiqurların yaranmasına səbəb olmuşdur. Müqəddəslərin ideallaşdırılması müqəddəs ikonqrafiyaya xristian teologiyasında xüsusi bir yer qazandırmışdır. Kilsələrin məkan təşkilini gücləndirən ikonalar evlərin mərkəzi yerlərində də ibadət obyektini kimi yerləşdirilmişdir.

Bu məqalə Bursa Arxeoloji Muzeyində saxlanılan iki ikon üzərində fokuslanır. Müqəddəs Georgi və Müqəddəs Nikolayı təsvir edən bu ikonaların araşdırılmasında məqsəd ikon anlayışının xristian teologiyasındakı yerini və onun incəsənətdəki təzahürünü tədqiq etməkdir. Məqsədə uyğun metod kimi retrospektiv yanaşma seçilərək oxşar və fərqli nümunələrin müqayisəsi aparılmışdır.



Tədqiqat göstərir ki, ikonlarda təsvir olunan fiqurlarla bağlı əfsanələr hər dövrdə təkrarlanaraq canlılığını qoruyur. Texnika və materiallardakı dəyişikliklərə baxmayaraq, əsas mövzu oxşar süjet xətti üzərində qurulmuş və geniş təsirini davam etdirmişdir. Bursa Muzeyinə aid əsərlərin forma və texniki xüsusiyyətləri, eləcə də oxşar nümunələrlə müqayisə əsasında onların XVIII–XX əsrlərə aid Yunan Ortodoks ikonaları ola biləcəyi ehtimalı güclənir.

*Açar sözlər:* Hagioqrafiya, xristian incəsənəti, ikon, Müqəddəs Nikolay, Müqəddəs Georgi

## Introduction

It is worth noting that there are several significant processes in the emergence and shaping of the Christian faith. It is evident that a large body of research exists on the formation and development stages of these processes. However, given the considerable breadth of the topic and the need for in-depth analysis and conclusions within specialized disciplines, this breadth should not be overlooked. The tendencies and literatures of different disciplines exhibit a complex situation in terms of defining the process. The values shaped by a concept as abstract as belief ultimately translate into worship and acquire concrete meaning. It is precisely at this juncture that the attitudes and behaviors prompting a turning point give rise to worship practices of their own, with relatively clear rules and easier comprehensibility.

The chronological development and the stages through which Christian theology has evolved require a notably wide-ranging investigation. To adequately address the aims and scope of our study, it may be beneficial to specify a clearly defined area. Before addressing the technical aspects of icons, a thorough analysis of the underlying factors of the icon concept and the historical milieu on which it is constructed is essential. These criteria, in terms of determining the research aim, suggest that not only the methodology and scope but also the surrounding issues can serve the ultimate objective. The study rests on evaluating, from technical and iconographic perspectives, two icon samples cataloged in the Bursa Archaeology Museum's inventory. Prior to discussing the examples in the museum, adopting a retrospective approach to examine the place and importance of icons within Christian belief, developing technical discourses through the examples, interrogating the concept of the icon, and questioning its theological context would be more aligned with the purpose of the topic. This study, which aims to analyze the two icon samples in the Bursa Archaeology Museum within a hagiographic framework, will attempt to treat the identities of the figures depicted on the icons, their iconographic characteristics, and the compositional arrangements, and to address the life narratives of the portrayed saints in their theological dimension. In this way, the icons will be discussed not only as artistic objects but also as visual carriers of the cult of saints and as elements of faith practice, carrying meanings that merit examination.

The method established for the article is based on the combined application of iconographic analysis and hagiographic interpretation. In the initial phase, a general definition of the icon is provided, and its place within Christian theology as well as its pivotal turning points are discussed. The hagiographic narratives reflected in the iconographic art are delineated through the two specified examples. Through iconographic analyses, the life histories, miracles, and devotional practices of the saints are examined.

When examining the stages of the emergence of the icon, it becomes clear that a multitude of factors contributed to the process. This inference necessitates the development of a multifaceted perspective. Given the meaning that icons represented for Christian laity, it can be said that they left an imprint on a particular era. As the process progressed, reflections in religious, social, and cultural life brought about certain tensions. Naturally, Christian art was adversely affected by these developments. The period in which all forms of religious depiction were prohibited is referred to as Iconoclasm (716–843). This stance against sacred representations has been the subject of numerous studies capable of developing a panoramic view that questions the concept of the icon and its place in Christian theology. Beyond the debates about origin, studies focusing on production techniques and iconographic analyses have facilitated a reevaluation of the relationship between religion and art. The icons in Bursa Museum, examined in terms of production techniques, regional characteristics,

and comparisons with similar examples, have been dated accordingly. The applied method oriented toward technical and iconographic analysis leads to the conclusion that the icons may belong to the 18th–20th centuries.

### **Multidimensional Methodological Issues in Iconography**

There is no doubt that the factors triggering the transformation of the concept from image to symbol are multiple and varied in their incentives. The fact that icons have acquired not only theological significance but also social and even political representational power has turned them into a potent symbol apparatus beyond mere image art. When the emergence of icons and the motivations sustaining their development are foregrounded, developing an analytical mode of thinking becomes imperative. Treating this issue exclusively within the discipline of art history would narrow the contextual framework and risk inadequately capturing the developments that occurred across historical processes. Among the main difficulties encountered in defining icons is the multiplicity of meanings attributed by believers and the potential for icons to evolve into several different symbols depending on expectations. Another challenge lies in the formal variations produced by newly emerging interpretations that shift with different historical periods. The attitudes that kept icons current in the minds of believers throughout history thus present a problem of interpretation.

The theological, chronological, and artistic dimensions of the topic are discussed through methods and approaches whose variability itself brings the challenge of developing different perspectives for each process. Differences in the methodologies applied to identify the materials and techniques used in icon production, and the efforts at categorization, give rise to the possibility of formulating a formal analytical approach. To move beyond a superficial stance and achieve a deeper analysis, a scientific methodological model that requires a broad conceptual framework is necessary. The fact that icons relate to multiple domains leads to similar implications in terms of terminology. The general problem concerning terminology can be described as the insufficiency of terms used to explain theory when positioning icons—concretized on the ground through practical applications—on a specific footing. Some of the methodological issues that may arise in studies centered on icons can be enumerated in this way. Rather than perceiving icons merely as artistic objects, it is necessary to assess them simultaneously with a clear sense of their historical continuity and points of rupture, while remembering that they are not only visual but also sacred symbolic instruments. The suggested considerations can contribute to determining appropriate methods and methodologies for the study.

#### **1. Icon: From Image to Symbol**

The attitude of humanity toward nature has also shaped its life journey. In order to overcome encountered difficulties or to adapt to its environment, it has utilized images in the stages of transforming the processes it has designed in the mind into concrete data. By reflecting the vast world of thought gained through images onto its perceptions and fabrications, it has managed to enter the production phase. The stance adopted toward nature continues to shape consciousness and guide the daily life cycle. These changes in the realm of emotions and thoughts have given rise to various myths and archetypes in belief. The forms in which religious beliefs with different ritual systems are performed have driven the emergence of the concept of liturgy. All of these activities can be associated with images as their point of origin. Alongside pagan beliefs, the envisaged notion of the creative principle in the monotheistic religions has taken shape throughout history through various objects. The personification of divinity, formed through images and gradually loaded with symbolic meaning, has become a culture.

When image culture began to spread widely, it could, in addition to its real or known origin, be related to an object that carried associations it awakened, thereby possessing a residual or relic-like quality. Most of the initial notices concern worship or other ceremonial practices directed at images. The image's own innate and intrinsic power of suggestion was given great importance (whether one claims it to be merely a man-made ordinary object or not, or whether it is associated with any sacred person or object); this power was particularly influential among Greeks and Hellenized Semitic communities in the Eastern Mediterranean. Among broad audiences, belief in divine powers within religious images had deeply rooted itself in pagan beliefs. This deeply rooted animistic attitude,

regardless of whether there is a special connection to a sacred relic, naturally re-emerged in Christian imagery and soon became a subject of profound philosophical speculation (Kitzinger, 1954).

Sacred icons are a significant part of liturgy in Eastern Churches, and because liturgy has remained unchanged for centuries, it is natural to assume that the images used during liturgy preserve the same meaning and consistently convey the same message. The main factor that positions icons between Tradition and Modernity is not merely the invariance of their meaning, but also what makes them spiritually valid both in Byzantium and in the present day (Vasilescu, 2010). From the perspective of an art historian or theorist, the most up to date and current definition of the traditional image can be described as an image containing an ikonical presence that yields the impression of existence. On the other hand, in Christian iconography, the participation of both the depicted image and the prototype of the icon itself in its actions conveys not an impression but the holiness or sacredness of a being in the depicted form. This situates it as a manifestation of “spiritual reality.” After this point, because the icon is honored during a religious rite and represents a broader expression of believers’ reverence, it also entails an optical and tactile experience in the same way (Zarra, 2022).

In the early Christian intellectual horizon, images remained a problem and continued to occupy the minds of Christian thinkers and teachers. Even the belief in the invisibility of God, and consequently the impossibility of depicting God, did not eradicate the persistent sense of peril dwelling within the icon. When considered in the historical context of the early fourth century, symbols and figures reflected the division between two classes of images, and in a sense the two great cultural traditions and religious attitudes encountered and fused within Christianity. In newly transformed versions, perhaps we witness, on the one hand, a Hellenistic stance toward ritual images, and on the other hand, a theology of an invisible God rooted in the concepts of Sacred Scripture (Barasch, 1992).

The icon, in its non-representational aspect, is not neutralized; however, its power is distinct from the Eucharist (Communion) and worship. Even though the emperor and the Christ are not physically present within the icon, they are perceived there. They share a space without reference to another place or time. Indeed, no event as such is depicted in this image. Instead, we witness a symbol of the fulfillment of the longing in worship. The situation implies a physical and spiritual encounter with the holy that is absent, yet this encounter exists only within the constraints of the visual language employed. The icon does not merely display the desire within worship; it also sustains that desire (Barber, 1993).

In the eyes of the Byzantines, the ikon was a true portrait that revealed all aspects of the depicted holy person. In this context, it is appropriate to invoke the 82nd Canon of the Quinisext Council (692). It condemns the older tradition of depicting Jesus in the guise of a lamb and, by contrast, advocates portraying Jesus in human form, thereby placing the image against the symbolic (typos). It argues that the icon can be in agreement with the Old Testament’s mode of revelation, where truth can be shown only through pale signs and shadows, whereas the New Testament requires no symbol at all: Truth and Grace are present for everyone to behold in the human form of Jesus (Mango, 2016).

According to the Greek ethnography, the image, or the representation of an object, the icon that denotes a portrait, also signifies a symbol or sign. In this context, Saint John constructs a refined, filtrated arrangement of different sign groups. This arrangement possesses a modern and up-to-date order appropriate for our era of semiotics studies. The first group of signs or images by Saint John encompassed God as images, namely Jesus and the Holy Spirit. The second group consists of mnemonic images, and “these images are of two kinds: either the words written in books—in which case the written word is an image—or the material images ‘the reverence shown for the image is transmitted to its prototype.’ This implies that the elevation of the ikon is achieved by passing through the ikon to its prototype. The ikon is a instrument, not a goal; yet it also represents the true version of the four Gospels in the New Testament (Abel, 2005).

Understanding the direct background of changes in images and ikonology theories requires a careful grasp of historical conditions. Among these, the most important is the situation that can be described as the “politi-zation” of the ikon; this has placed the icon at the center of intense political

debates. As is well known, this condition underwent a deep-rooted transformation in the eighth century. The Iconoclastic Controversy became, in the eighth and ninth centuries, a central event in Eastern Christianity, turning the icon into an object of political struggle and a central political symbol. Numerous groups, including scholars, commentators, and preachers across generations, contributed to expressing and firmly establishing the victorious ideology that ultimately led to the veneration of famous Byzantine icons (Barasch, 1992).

Undoubtedly, reflections of pre-Christian and post-Christian traditions in Byzantine society brought with them certain tendencies. The inclination to render mental images into perceptible visibilities constitutes a systematic behavioral model nourished by all these habits. The resulting phases, for the Christian world and especially for the Orthodox rite, have standardized liturgical activities and prompted a fundamental shift. The meaning attributed to icons has significantly contributed to their symbolic character.

## **2. The Meaning Attributed to Icons and Its Place in Christian Theology**

The process of turning image-power into design and its gradual transformation into a symbolic expressive mode is naturally underpinned by a variety of factors. The shift of belief into a concrete behavioral pattern brings with it long and arduous stages. When the idea of the ikon and the underlying reasons are examined, the necessity to ground the subject in theological and philosophical foundations constitutes a prerequisite that shapes the main framework. For Orthodox believers, this form of worship, which has become a very important liturgical activity, can be seen as incorporating certain allegorical and analogical elements.

The question of when icons were first created has given rise to various opinions. According to some of these views, the oldest icon example is argued to have been produced using techniques employed in Egyptian mummies. A recent piece of evidence suggests that one of the six-century icons found at the Monastery of Bayyuit in Middle Egypt belonged to the monastery's abbot Abraham. This wax-painting icon shows similarities to the Egyptian tradition of depicting the deceased (Yücel, 2020). After Egyptians mummified their dead, they placed a portrait of the deceased, made while the person was alive, on top of the coffin that protected the mummy, thereby conveying the person and their memory to future generations. A few of these portraits were found in Egypt's Fayum region, on wooden panels painted with wax-based colors. These funeral portraits, dated to the 2nd and 3rd centuries CE under Roman rule in Egypt, reflecting a blend of Egyptian, Greek, and Roman styles, are believed to represent models for the earliest icons (Başgömez, 1989).

The term "icon" has been in use since antiquity. In ancient Greek, it derives from the verb *eiko* meaning "to resemble" or "to signify." The first icons of Byzantine art were created to commemorate revered figures from holy scriptures: Christ, Mary, prophets, saints, and significant scenes from their lives. According to the doctrinal framework established by Church Fathers, an icon is an intelligible representation of the visible world; thus it is a reflection of the real world and holds a unique place due to its resemblance to the archetype or the original model. For this reason, the icon stands as a sacred prototype for Byzantine painters (Chatzidakis, 2021). Icons are religious images. They not only depict individuals and events of religious significance, but also articulate their compositions and convey a statement about the relationship between the created world and its Creator. The icon is a microcosm of the relationship between the material world, humanity, and the divine power believed to have created them. It expresses even more; it can be seen as a form of sacramental communication with that divine power (Kenna, 2024).

The artistic, stylistic, and, for some, spiritual origins of icons should be sought in a historical period that extends several centuries before the emergence of Christianity and continues into the early centuries of the Common Era, up to the beginning of the 4th century CE. From the late periods of Jesus' life, Christians were not widely prominent on the historical stage; socially and culturally, their influence was not broadly evident until Christianity became the official religion of the Romans in 313 CE (Temple, 1990). In the early centuries of Christianity, references to symbols are scattered (and perhaps sometimes imagined), but there is no concrete evidence that any number of icons were produced. Figurative art in Christian tradition began to take on serious significance only in the 3rd

century, but from the 4th century onward icons became a much larger part of believers' daily lives (Cormack, 2014).

The Monastery of Sinai possesses the largest collection of tempera and encaustic icons in the world; however, no medieval source emphasizes how this collection was assembled or whether any of the works were produced on site. The earliest panels are considered to have been imported from Constantinople. Other early icons are regarded as having been produced in Jerusalem or Egypt. Yet, even in the seventh century, an icon depicting the Prophet Elijah demonstrates an interest in the local topography of Sinai (Pentcheva, 2015).

Although it is believed that the first icon was painted by Luke the Evangelist, neither that specific work nor any of the icons believed to have been produced during the early periods of Christianity (4th–5th centuries) have survived to the present day. The earliest known example of an icon today is located in Saint Catherine's Monastery and is dated to the 6th century. Furthermore, there are Byzantine icons belonging to the same monastery that are thought to date back to the 7th and 8th centuries. However, due to the fact that strict rules for icon production had not yet been established in the aforementioned examples, the depictions particularly those of the Virgin Mary and Jesus Christ had not yet acquired a definitive clarity (Yener, 2015).

Icons have also been used, widely, in frescoes and mosaics on church walls, as well as in monasteries, palaces, the shrines (tombs) of saints, schools, shops, military barracks, and houses. They can further be found on the covers of the Bible and some religious books, on crosses, on garments, and in other areas as well. This is because, although icons depict Christ, the Word, the Son of God, and the Virgin Mary, they simultaneously represent belief and the Incarnation and martyrdom (i.e., the embodiment of the divine Word) in a powerful manner. In this sense, the icon is a symbol that reveals something greater than what lies beyond physical boundaries (Geyik, 2020).

These portable paintings defined by the West as 'icons' and typically executed on wooden panels, though in some instances on precious metals, fabric, or ivory allow us to trace their historical development. For their owners, they serve not only as instruments for personal devotion and meditation but also facilitate a direct dialogue between the believer and the depicted saint. Certain surviving icons at Saint Catherine's Monastery in Sinai exhibit their general characteristic features: usually one, and in some cases multiple figures, are depicted frontally. Although stylistic methods vary and possess certain nuances that would be difficult to explain in detail here, these are paintings where depth is absent and the gaze is fixed upon the spectator (Spieser, 2019). The cult of the icon is deeply rooted in Eastern Orthodoxy. Icons, which can be defined as portable religious images on wooden panels, are regarded not merely as works of art but as essential instruments of worship. The icon is spiritual and symbolic; through it, believers establish an active communication. Worshipping an image of Christ rather than an invisible power enables the individual to communicate more easily with Him. It allows the believer to comprehend that Christ, in addition to His divine nature, was also human reminding them that he lived and died for humanity, leaving behind an exemplary life (Bulgurlu, 2005).

The icon can be regarded as a human response to the Incarnation. However, iconography is not merely an expression of the human effort to sustain and internalize a relationship with the Incarnate God, but also an expression of the continuity of that relationship. Beyond being reminders of the Divine's physical appearance or earthly presence, icons contribute to the ongoing progression of Christian history. The icons thus shaped ensure the succession and transmission of divine revelation within life, theology, and human creativity. They bridge the past, the present, and the future, unifying earthly and divine realities (Narinskaya, 2012).

Icons acquired profound significance as manifestations of personal devotion during turbulent periods when the empire and many of its institutions were shaken. Consequently, individuals or families could acquire their own icons and dedicate themselves to them. Although the veneration shown to icons arose from other prevalent practices, such as the cult of saints, it was also extensively supported by the Byzantine intellectual tradition. Stylistically, icons drew from diverse traditions. Shaped by religious objectives rather than artistic concerns, icons generally featured figures depicted

frontally particularly in large scales directing their gaze directly toward the supplicants. The primary goal of these figures was to establish a link between the divine and earthly life; for this reason, the sense of realism was disregarded, and detailed backgrounds were not produced (Gregory, 2019).

The role and significance of icons in the Orthodox faith differ greatly from the concept of religious depiction in the Catholic world, which aims to teach Christian doctrine through imagery. It is possible to evaluate Orthodox icons under two primary groups. The first group consists of 'Devotional Icons' (Venerational Icons), which may be incomprehensible to non-Orthodox individuals or those unfamiliar with Orthodox faith and liturgy. The second group is comprised of 'Descriptive and Didactic Icons.' It is easier to compare the icons in this second group with the concept of the icon in the Catholic world, as well as with the function and development of monumental painting iconography. The icons in the first group, however, possess characteristics that must be evaluated within the framework of their own unique rules, and they virtually reflect the very spirit of the Orthodox faith (Akkaya, 2000).

Various categories of icons exist within Byzantine iconography, which profoundly influenced both Eastern and Western art. For instance, it is possible to divide icons into two groups: those made by human hands and those not made by human hands. *Acheiropoieta* is the term used to define icons of divine origin, created without human intervention. Emerging in the early 8th century during the Early Byzantine period, this category of icon refers to 'miraculously created images' and occupies a very distinct place in Byzantine history. The most famous *acheiropoieta* icon is the *Hagion Mandylion*, or the Holy Mandylion a white cloth bearing the impression of the face of Jesus Christ. These depictions, believed to be not made by human hands, subsequently constituted the most significant evidence in the defense developed against the iconoclasts (Şen, 2017).

In Byzantine churches, icons are positioned according to the liturgy upon the *templon*, the partition that separates the *bema* the sanctuary where the liturgy is performed and which is accessible only to the officiating clergy from the congregation. While Christ, the Virgin Mary, and John the Baptist are the permanent elements of this arrangement, other icons may vary according to the nature of the specific liturgy being celebrated. Archangels, saints, and Church Fathers, who are core elements of the Orthodox faith, also maintain their positions within this order. The *templon* wall, which in early periods was a divider at a height that allowed participants to view the *bema*, eventually reached a height that completely separated the *bema* from the *naos* as a result of liturgical evolutions, thus becoming known as the 'iconostasis.' The changes in the liturgy and the revision and reorganization of hagiographic literature by imperial decree during the 10th and 11th centuries also influenced the iconography of these depictions (Barut, 2012).

A general characteristic of Byzantine iconography is that space and volume remain confined to the surface of the panel. The pictorial representation achieved through volumeless figures, faces, garments, and architecture creates a unique spatial depth within icons. Semantic integrity on the plane is generally maintained through 'reverse perspective.' Rather than drawing the viewer's attention into the depth of the painting, the aim is to foster a direct engagement, enabling the spectator to perceive the narrative viscerally. The primary objective of the iconographer was not to depict how they personally perceived God, but rather to render the divine light metaphorically visible. Although the landscape in an icon may appear descriptive at first glance, it is presented through a non-descriptive lens. From this perspective, the Byzantine conception of the icon remains far removed from realism (Yaşar, 2019).

The principal production center of icons is the imperial capital, Constantinople. Thessaloniki (Selanik), which is regarded as the empire's second capital emerges as another important locus for icon production. Outside Constantinople, in Anatolia and around the Mediterranean, there are also certain icon-producing centers in places such as Cyprus and Crete (Zenbilci, 2020).

Following the fall of the Byzantine Empire, the art of the icon persisted through various regional schools. After the conquest of Constantinople, artists who were compelled to leave the city migrated to different regions and practiced within the established schools there. The most prominent among these were the Cretan, Macedonian, and Russian schools. The Macedonian School emerged in the

13th century and was influenced by the Hellenistic artistic tradition. In the 15th and 16th centuries, the influx of several significant artists to the island resulted in the fusion of the local artistic style with the Capital School (Constantinopolitan School). The Cretan School, on the other hand, adopted slender and elongated forms. In general, these paintings featured dark tones and sharp contrasts. From the 17th century onwards, the Aegean Islands became significant centers of icon production (Siddiki & Sülek, 2023).

### **3. Iconoclasm: The Destruction and Reconstruction of Images**

When the formation of icons and the stages through which they solidified their place within Christian theology are examined, the power of interaction within the Byzantine world is once again revealed. The icon, signifying the integration of the sacred with a symbolic expression, acquired a tangible meaning for the representation of spirituality and became an indispensable element, particularly of the Orthodox Church. The acceptance of icons which were shaped from the early periods of Christianity and functioned as symbols over time was by no means easy within the Christian world and involved navigating arduous stages. The period known as Iconoclasm undoubtedly led to a turning point in terms of Christian theology. However, the eventual triumph of the iconodules (pro-icon supporters) following the ongoing events carried the art of the icon into a new dimension.

The active role of icons in determining the principles of faith and worship throughout Christian history should not be overlooked. Their contributions to the church liturgy and the regional preferences regarding their use facilitated the integration of diverse techniques and styles into Christian pictorial art. The developments concerning the prohibition of depictions are significant as they illustrate the factors to which Christian painting, and consequently the art of the icon, was subjected. Due to their usage in both public and private spheres, icons acquired the characteristic of being products endowed with functionality across different planes. All these definitions have provided the opportunity to track the practical changes that icons have undergone.

Iconoclasm in all premodern contexts from antiquity to the Byzantine iconoclastic controversy was about "real presence." The damage done to the image is an attack on its prototype, at least until Byzantine iconoclasm, and it presupposes some kind of assault on real presence as contained in the image (Elsner, 2012).

The debate over the function of images in Byzantium revolves around ongoing research into the origins, theological arguments, and consequences of Iconoclasm. The official condemnation of images likely began in 726 and persisted until 843, with an intervening period from 787 to 814 under the reign of Empress Irene and her two successors. The extent to which the Church destroyed figurative art during the Iconoclastic era remains a subject of debate. Similarly, the geographical scope of the Iconoclasts' influence is uncertain. Kartsonis has pointed out certain exceptions in the strict enforcement of restrictions on figurative religious art, even within the capital. She argued that during the Second Iconoclasm (815–843), official policy was primarily aimed at restricting the public veneration of new religious images (Drewer, 1996).

In 726, Leo III issued his first edict against icons. With this decree, rather than commanding the destruction of icons, he seemed to order them to be hung higher to prevent the adoration of the crowds. This measure incited intense controversy: it led to violent incidents in Constantinople, a swiftly suppressed uprising in Greece (727), and a general revolt in Italy. In 753, a council convened at Hieria strongly condemned icons (Diehl, 2023). The period termed Iconoclastic was not a barbaric process from 730 to 787, and subsequently from 814 to 843, in which the entirety of culture was degraded. Even the fierce debates of the iconodules who should not be situated solely within the perspective of art history demonstrate the existence of an art in which even the emperors themselves were among the patrons. Iconoclasm emerged as a reaction to the development of the cult of images; however, in an opposing direction, by placing the power of images at the forefront of the debates, it resulted in each image being perceived as a powerful idol. The sacred character of images gained a new legitimacy, emerging from this situation with a fresh triumph (Spieser, 20219).

Upon the death of Leo IV, Irene, acting as regent for Constantine VI, convened the Council of Nicaea and brought an end to the iconoclastic movement (787). Churches and monasteries were once again adorned with icons. Anti-image behaviors continued during the reigns of Leo V and Michael II. However, Theodora, acting as regent for Michael III, revived the cult of images. In 843, a grand ceremony was held at Hagia Sophia, resolving this period of crisis which holds a significant place in the history of the Byzantine Empire and the Orthodox Church (Yener, 2015).

During the Iconoclasm dispute in the eighth and ninth centuries, icon veneration became widespread; as a result, in the second half of the ninth century Byzantine church architecture and ornamentation were shaped on the basis of iconodulist principles, and a classical system was formed in Orthodox church architecture. Icons are arranged according to a constructed framework and repertoire that may be termed the Christian realm or the plan/program of salvation. In the classical system, three principles were observed. The first is a hierarchical order: within this universe, what is positioned higher stands above what is below. God or Christ is located at the top of the dome (Baş, 2023).

#### **4. The Reflection of Hagiographic Narratives on Icon Art**

The practices performed by saints or martyrs, rooted in their attitudes and habits, found a widespread resonance within the Christian world. Their contributions to theology brought about several changes and permeated daily worship procedures. Considering the sphere of influence and the nature of these concepts, the importance of hagiographic texts containing narratives about them further increases. As these texts assumed an observable identity, they became ingrained in the memory of the Christian society. The reactions formed against the experiences of these figures eventually enabled iconographic analyses. The practices that reconfigured the dynamics of religious, social, and cultural life did not merely shape hagiography-based stories but also brought them together with art. In a concrete sense, the existence of icons represents a production ideal designed and practiced for the sake of faith. The core themes of the subjects contained within icons revolve around the depictions of holy figures and sacred events. Portrayals of saints have attained a very extensive representational value within the art of the icon.

Numerous examples of icons, which serve a specific purpose and are regarded by the faithful as symbols of the veneration felt for saints, are exhibited in various museums and collections. Two icons registered in the inventory of the Bursa Archaeology Museum will be examined for the purpose of reinforcing the ideas emphasized above regarding the icons of saints.

Hagiography (the written corpus concerning Christian saints) is a literary genre that transmits and extols the exemplary lives, wisdom-filled doctrines, and miraculous deeds of men and women who have ascended to the rank of holiness as a result of the veneration they garnered throughout or among the Christian world. Throughout the Byzantine period (4th–15th centuries), hagiography stood out for its prevalence and diversity. It encompasses the Passions (*passio*) of those at the rank of sainthood who were martyred for their faith, as well as life stories or *Vitas* (detailed biographies), *Enkomia* (panegyrics), collections of stories gathering the miracles of saints, morally instructive short stories, the *Apophthegmata Patrum* (Sayings of the Desert Fathers), and abbreviated versions of longer texts in various forms (primarily epitomes and *synaxaria*). Each of these aforementioned subgenres possesses a distinct format (Efthymiadis, 2021).

There are fewer than two dozen extant examples of Byzantine *vita* icons, yet the impact generated by this genre is quite substantial. These types of Byzantine icons first emerged in the early thirteenth century; they became sparse in the fourteenth century, reappeared in the fifteenth century, and became increasingly popular in the post-Byzantine period. The most prominent characteristics of this icon type are as follows: they are generally quite large panels, ranging in height from approximately 70 cm to 2 m; they are dedicated to the lives of well-known saints, and the scenes mostly surround the central image of the saint on all four sides. The cycles of any given saint show very little variation from one icon to another. The scenes in question may reflect known written texts but do not follow them consistently. The sequence of the episodes is often irregular. It begins with a birth scene and concludes with a death scene (Sevcenko, 2024).



The growing interest in the lives of saints has been influential in terms of Byzantine studies. Authors concerned with hagiographies are particularly interested in the power of images and how they permeate the lives of the men and women who behold them. Saint Nicholas, in particular, is represented in narrative cycles where he intervenes directly to prevent the execution of innocent people. The standing figures of saints in the lowest register of Middle and Late Byzantine church programs are generally analyzed by category—bishops, monks, warriors, martyrs, women—and according to the feast dates in the church calendar. The most popular hagiographic cycles are those of Saint George and Saint Nicholas (Drewer, 1996).

The communicative role typically attributed to illuminated manuscripts can similarly be ascribed to icons. Icons were not only indispensable elements of daily worship but were also portable and could circulate as easily as manuscripts. The dimensions of a portion of dated icons confirm that they might have originally been placed between the intercolumniations of the iconostasis, or displayed in other prominent locations, and were thus widely visible to the public. Since the Early Christian period, the deeds of saints have been depicted through monumental paintings in chapels and churches (Weiner, 1977).

The veneration felt for saints, their adopted lifestyles, and the presence of various accounts presented as miracles by the faithful led to the emergence of a rich literature. The contribution of illustrated manuscripts, miniatures, and icons supported by literary texts made it possible to transmit hagiographic legends through multiple methods. These differences in narrative methods serve as concrete evidence of the perspective of Christian theology, and particularly the Orthodox denomination, toward the concepts of saints and martyrs.

Two icons of saints registered in the inventory of the Bursa Archaeology Museum can be evaluated among the depictions that may serve as examples of the iconographic discourse described above. To examine, in general terms, the contributions of the production techniques and methods of depiction of these icons to the iconographic narrative will be a more consistent approach to defining the main framework of this article.

## **5. Two Examples of Icons in the Bursa Archaeology Museum**

### **5.1. Icon of Saint George / Georgios**

The icon of Saint George was acquired for the museum on April 20, 1979, having been purchased from Erol GENÇ. Registered under inventory number 8095, it is executed in the tempera technique on a wooden panel measuring approximately 40 x 28.03 cm with a thickness of 2 cm.



**Figure 1-2:** Bursa Archaeology Museum, Icon of Saint George / Georgios, Obverse (Front) and Reverse (Back) Views.

At the center of the composition, Saint George is depicted in military uniform atop a rearing white horse. He wears a long-sleeved short tunic, armor with gold embellishments, tight-fitting white trousers covering his legs, and boots. A red chlamys (cloak), knotted at chest level, billows backward as he advances on the horse. The haloed saint is portrayed holding a spear in his right hand. The

momentum of his offensive strike against the dragon is reflected in his body anatomy. The dynamism in the movements of his arms and legs reveals the saint's stance toward his focal point. He is in the act of plunging the tip of his spear into the mouth of the dragon, which lies on the ground with its face turned toward him. The dragon's sinuous body, mouth, and claws are rendered with great clarity. Its body anatomy and facial expression imbue the gravity of the event with a concrete meaning. The animal's posture, reminiscent of surrender in the face of Saint George's strike, can also be evaluated as a reflexive move toward self-defense. This struggle between two opposing forces can be defined as the primary scene of a central diagram.

In the upper right corner of the icon, architectural forms resembling monumental towers, along with a body of water bordering the central axis where the figures are placed, impart a sense of depth to the composition. Furthermore, immediately behind the saint, a second figure is depicted holding a bowl in his right hand and a jug-like vessel in his left. This figure, portrayed in quite minimal dimensions, is assumed to be the young Christian slave rescued from Mytilene on Crete (. Due to the degradation the icon has undergone over time, the presence of other possible figures in the painting cannot be clearly discerned. However, another figure standing in draped garments in front of the architectural structure, toward the direction the saint's horse is facing, draws attention. It is plausible that this figure, situated on the same axis as the young Christian, is the king's daughter. Despite the deformation the icon has suffered, the colors of the saint's military uniform have not lost their vibrancy (Fig. 1-2).

The icon of Saint George offers a mystical portrayal of something generally invisible—the spiritual warfare that mystics refer to as the 'hidden war.' The warrior is the individual who has established focus and silence within, reined in their earthly nature, and become receptive to divine influences. In this state, the human being indeed becomes a miniature of the universe (microcosm), transforming inner chaos into a cosmos (Temple, 1990)

## **5.2. Icon of Saint Nicholas**

The icon of Saint Nicholas was also acquired for the museum on April 20, 1979, having been purchased from Erol GENÇ. Registered under inventory number 8096, it is executed in the tempera technique on a wooden panel measuring approximately 60 x 48.08 cm with a thickness of 2 cm. At the center of the icon, Saint Nicholas is depicted seated on a throne-like chair, making a gesture of blessing with his right hand and holding the Gospel in his left. The bearded saint is portrayed with a distinct halo and wears a mitre-like headpiece resembling a crown. From beneath his cassock, the epimanikia on the sleeves of his dark blue sticharion can be discerned. Furthermore, the omophorion hanging from his neck is adorned with cross motifs. An epigonation with fringed ends hangs at his skirt level, featuring a haloed figure with a cross. Surrounding the saint in a 'U' shape are nine compartments enclosed within contoured frames. Each compartment contains scenes related to the saint's life and some of the miracles he performed. Notable scenes depicted in the icon include: his healing of the sick, his appearance to Constantine in a dream, and his act of leaving gold in the rooms of three young girls; as well as scenes of his death, the public's farewell before his remains, and the translation of his relics to Bari.

The identity of the saint is emphasized by the inscription 'Saint Nicholas' (Ο ἍΓΙΟΣ ΝΙΚΟΛΑΟΣ) at his head level. On the upper axis of the central composition, depictions of Jesus Christ and the Virgin Mary are positioned on either side of the saint. Located on the right axis, the haloed figure of Jesus Christ is situated upon clouds, emanating rays of light while wearing a chiton and a himation covering his left shoulder and arm. He is portrayed making a gesture of blessing with his right hand and holding the Gospel in his left. Additionally, the abbreviation ΙΣ ΧΣ (Jesus Christ) is added to both sides of his head. The figure of the Virgin Mary on the left axis is similarly depicted among clouds with a halo. She is shown with her head slightly bowed, extending the episcopal stole she holds in the sleeve ends of her maphorion toward Saint Nicholas. The inscription ΜΡ ΘΥ (Mother of God) is located at her head level (Fig. 3-4).



**Figure 3-4:** Bursa Archaeology Museum, Icon of Saint Nicholas, Obverse (Front) and Reverse (Back) Views.

Due to the degradation the icon has undergone over time, some depictions within the composition cannot be clearly discerned. However, the gold-leaf-like colors of the frames bordering the narrative scenes, the outlines of the throne-like chair upon which Saint Nicholas is seated, and the color gradations of the garments worn by the other figures remain visible. Light colors are used in conjunction with pastel and dark tones to create a sense of contrast (Fig. 3-4).

Saint Nicholas is one of the most widely recognized saints not only in Eastern Christianity but also in the West, holding a place of great significance and special devotion among believers. His tribulations and the miracles he performed have become the subject of legends, establishing him as one of the most invoked saints for aid and intercession. He is held in profound veneration within Eastern Christianity. Nevertheless, the biographical information regarding Saint Nicholas who is so deeply beloved and revered by the public is based not on historical facts, but on narratives that emerged in the sixth century (Başgömez, 1989).

Saint Nicholas is widely recognized as the patron saint of sailors, with his cult exhibiting striking parallels to the cult of Poseidon. He is renowned for his protection and aid offered to children and the impoverished, serving as the patron Saint providing spiritual support and intercession for travelers and the youth alike. Through his religious and social endeavors, he devised humane solutions to the problems of the common people, attaining a deeply beloved status within his community as a result of his compassionate activities (Yener, 2015).

### **Discussion and Conclusion**

Hagiographical texts conveying the life stories of saints have bestowed an exceptionally rich representational tradition upon Christian art. The concept of the 'Saint' and its projection within Christian tradition have contributed to the formation of the hero archetype. The lifestyles of Saint George and Saint Nicholas, coupled with the narratives attributed to them, have elevated their significance among believers to an unshakeable dimension. The necessity to tangibly represent the veneration felt for these saints has led to the manifestation of faith through art. Their hagiographies and purported miracles have been depicted by believers across diverse geographical regions. Today, saint icons featuring varying stylistic characteristics, techniques, and materials can be found in numerous museums and private collections. Among the prominent examples of icons belonging to Saint George and Saint Nicholas located globally and within our country, the following can be listed: Icons in the British Museum; the Saint Nicholas icon in the Tretyakov Gallery (Moscow); the Nicholas icon in the Bondarenko Collection (Moscow); Saint George and Saint Nicholas icons in the Coptic Church of the Virgin Mary and Museum (Cairo); icons of both saints in the Icon Museum Recklinghausen (Germany); icons in the National Museum of Stockholm (Aschberg Collection); icons registered in the Leningrad Museum (Russia); icons from the Hann Collection (USA); the Saint George icon in the National Museum of Art of Romania (Bucharest); the Saint Nicholas icon in the National Art Museum of Ukraine; icons in the Benaki Museum (Athens); the Museum of Icons at the Hellenic Institute (Venice); Saint George icons in the Archaeological Museum of Chania (Crete); the

Saint George icon in the Walters Art Museum; the Saint Nicholas icon in the Hagia Sophia Museum (Istanbul); Saint George icons in the Sinop and Tokat Museums; and finally, the icons with inventory numbers 160.2.82 and 153.2.82 in the Antalya Museum.

The aforementioned iconographic examples serve as proof of the highly prestigious and revered status these saints hold within the Christian world, and particularly within the Orthodox tradition. Saint George and Saint Nicholas have not only been subjects of classical icons but have also constituted the central themes of various other artworks executed with diverse materials and techniques.

A mosaic icon currently housed in the Louvre Museum in Paris, depicting Saint George slaying the dragon, exhibits a stylistic execution distinct from conventional icon-painting techniques. This work consists of a wooden panel enclosed within a copper frame, where copper rods plated with gold and silver, along with fragments of marble and glass, are embedded into a filling material composed of beeswax and mastic (Fig. 5).



**Figure 5:** Mosaic Icon Depicting the Scene of Saint George Slaying the Dragon.  
(Source: Arne Effenberger, Images of Personal Devotion, 2004, p. 230)

The relief, discovered during excavations at the St. Michael's Golden-Domed Monastery (Mykhailivs'kyi Zolotoverkhyi) in Kyiv and mounted on the southern wall of the monastery's cathedral in the late nineteenth or early twentieth century, is currently exhibited at the Tretyakov Gallery in Moscow. The relief depicts two military saints, George and Theodore. While the figure on the right, appearing more mature, is Saint Theodore, the younger saint on the left is Saint George. Both saints are portrayed on horseback in the act of hunting the dragon (Fig. 6).



**Figure 6:** Relief from St. Michael's Golden-Domed Monastery (Mykhailivs'kyi Zolotoverkhyi) in Kyiv. (Source: Olenka Z. Pevny, Kievan Rus, 1997, p. 293)

In the Tarsus Museum, Saint George is depicted on a limestone slab within an area bordered on both sides by acanthus-like floral motifs. The saint is portrayed on horseback with a halo; however, the facial features have been damaged. He is depicted in the act of thrusting his spear into the dragon with his left hand. Although the upper part of his body is oriented toward the viewer, his left shoulder and arm appear shorter in comparison to his right shoulder and arm. He is shown wearing a tunic (Chiton) and a cloak (Chlamys) (Fig. 7).



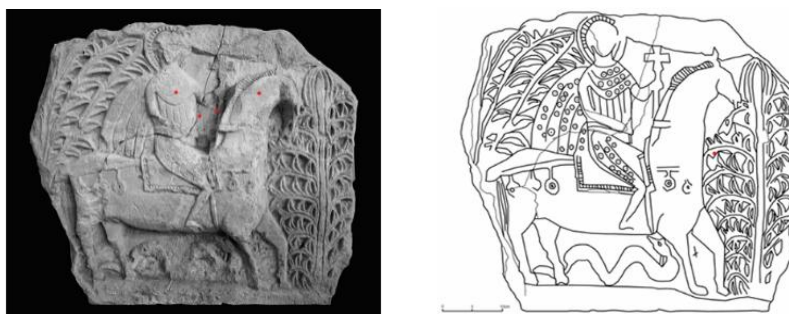


**Figure 7:** Relief of Saint George in the Tarsus Museum. (Source: Ayşe Aydın, An Example of the Transformation of Ancient Equestrian Heroes into Equestrian Heroes [Antik Atlı Herosların Atlı Kahramanlara Dönüşümüne Bir Örnek], 2011, p. 386)

A stone relief currently housed in the Chios Museum is likewise dedicated to Saint George. Distinct from the example in the Tarsus Museum, the saint's direction of movement is oriented toward the left. In contrast to the Tarsus Museum specimen, the figures in this scene possess a more dynamic sense of motion. In both instances, the saints are depicted slaying the dragon (serpent) with the spears in their hands (Fig. 8).



**Figure 8:** Stone Relief of Saint George in the Chios Museum. (Source: Ayşe Aydın, An Example of the Transformation of Ancient Equestrian Heroes into Equestrian Heroes [Antik Atlı Herosların Atlı Kahramanlara Dönüşümüne Bir Örnek], 2011, p. 388)

A mosaic depicting Saint Nicholas is located in the Stavronikita Monastery on Mount Athos, Greece. The saint is portrayed with a halo and a beard, making a gesture of blessing with his right hand while holding the Gospel in his left. He wears the episcopal stole (Omophorion) adorned with cross motifs; however, the head section of the saint has been damaged (Fig. 9).

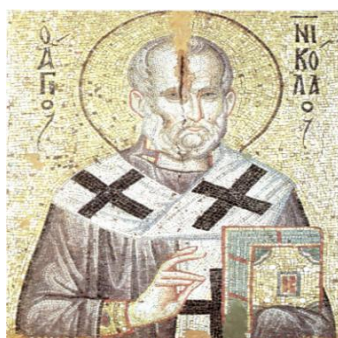


**Figure 9:** Mosaic of Saint Nicholas in the Stavronikita Monastery, Mount Athos, Greece. (Source: Otto Demus, Die Grossformatigen Ikonen [Large-Scale Icons], 1991, p. 75)

In a fresco located in the Church of St. George in the Staraya Ladoga region of Russia, Saint George is depicted on horseback, portrayed with a halo and wearing a cloak. At the feet of the horse, the dragon is shown with a thick rope around its neck.

The rope is held by a figure standing in draped garments, whose face is turned toward the scene. Vibrant colors have been employed throughout the composition (Fig. 10).



Figure 10: Fresco of Saint George in the Church of St. George, Staraya Ladoga, Russia.  
(Source: Aune Jääskinen, Northern Byzantine Icons [Kuzey Bizans İkonaları], 2014, p. 74)

A wall painting of Saint Nicholas, located in the apse of the Church of the Panagia (1315/1316) in Alikampos, Greece, remains identifiable despite having suffered a certain degree of damage over time. The saint's facial features, the halo around his head, and the episcopal stole (Omophorion) can still be clearly discerned (Fig. 11).



**Figure 11:** Wall Painting of Saint Nicholas in the Apse of the Panagia Church, Alikampos, Greece (1315/1316). (Source: Jessica Schmidt, Byzanz zwischen Orient und Okzident [Byzantium between Orient and Occident], 2020, 274)

The surface of the marble slab located on the courtyard wall of the Church of St. George in Istanbul is divided into two separate panels by lobed arches. While the right-hand composition depicts the scene of the Metamorphosis (Transfiguration), the left-hand scene portrays Saint George on horseback, slaying the dragon with the spear in his hand (Fig. 12).



**Figure 12:** Relief on the Courtyard Wall of the Church of St. George, Istanbul.  
(Source: Reinhold Lange, Die Byzantinische Relieffikone [The Byzantine Relief Icon], 1964, p. 137)

In Christian theology, the veneration of saints has evolved into the primary theme of handicraft products created across various media through the lens of art. It can be emphasized that, alongside architecture, portable handicrafts reinforce their representational quality while significantly serving the expressive power of compositions aimed at a specific mission. From a theoretical perspective, the methodological differences employed for definition and interpretation, as well as the intricate structure of narrative-based modeling, are also encountered in the practical application of the work. The development of multiple methods and techniques regarding the production and ornamentation of saint-themed artifacts has led to their evaluation in various categories.

### Conclusion

Considering the significance that Saint George and Saint Nicholas hold among Christians, their identification with the attribute of 'protector' has further expanded their sphere of influence. Although some sources associate the veneration of saints with certain Gnostic-based schools of thought, the vast majority of Christians, particularly within the Orthodox world, have commemorated them with profound devotion. Furthermore, the existence of countless examples across various regions of the world, featuring diverse materials and technical characteristics, leads to the conclusion that the concept of the saint is an indispensable element for the art of the icon.

Based on the artifacts in the Bursa Archaeology Museum and the examples provided through visual evidence, it can be stated that icons have maintained their presence chronologically in every period and their production has remained current through modeled templates. The icons registered in the inventory of the Bursa Archaeology Museum were acquired by the museum through purchase. As there is no detailed information regarding these works, it has not been possible to reach definitive data concerning their exact production dates. However, the material and technical characteristics of both icons, as well as the existence of various examples with similar identifiable forms, have provided the opportunity for comparison in determining their history. This situation, which makes it possible to form an opinion about the date range in which the icons were produced, has served as a basis for overcoming the emerging problematic. From this point of view, it has been inferred that the icons in the museum might be Greek (Rum) icons dating between the 18th and 20th centuries. The interpretative differences, stylistic changes, and material preferences that have emerged since the early periods when icons were first produced have enriched the technical infrastructure. The primary figures and narratives forming the main theme of the depictions confirm that the narrative structure in icons has actually undergone less change and has sustained its existence in every era by being updated. Supporting data, which forms the subtext of the research results, was sought through a retrospective approach.

### References

1. Abel, U. (2005). İkonaların teolojisinde ilahi olanın ikona imgesi. In *İkonalar* (A. Özdamar, Trans.). İstanbul: Kitap Yayınları, 9-22.
2. Akkaya, T. (2000). *Ortodoks ikonaları: Genel bir bakış*. Arkeoloji ve Sanat Yayınları.
3. Aydın, A. (2011). Antik atlı herosların atlı kahramanlara dönüşümüne bir örnek: Tarsus Müzesi'ndeki Aziz Georgios kabartması. *OLBA*, 19, 371–388.
4. Barasch, M. (1992). *Icon studies in the history of an idea*. New York University Press. [https://archive.org/details/isbn\\_9780814712146](https://archive.org/details/isbn_9780814712146)
5. Barber, C. (1993). From transformation to desire: Art and worship after Byzantine iconoclasm. *The Art Bulletin*, 75(1), 7–16. <https://doi.org/10.2307/3045929>
6. Barut, F. (2021). *Bizans dönemi Kapadokya kiliseleri duvar resimlerinde Koimesis (Meryem'in uykusu) tasvirleri* (Unpublished doctoral dissertation). Hacettepe University.
7. Başeğmez, Ş. (1989). *Icons* (V. T. Saçlıoğlu, Trans.). Yapı Kredi Yayınları.

8. Baş, B. (2023). Bizans ikonoklazm tartışması (726–843) ve Ayasofya: Tasvir ihtilafının mabedin tezyinatına etkisi. *Oksident Yahudilik, Hristiyanlık ve Batı Araştırmaları Dergisi*, 5(1), 1–22.
9. Bulgurlu, G. V. (2005). Doğu Ortodoks dininde ikonaların anlamı. In *İkonalar* (A. Özdamar, Trans.). Kitap Yayınları, 23–40.
10. Chatzidakis, N. (2021). Konstantinopolis’in ikonaları. In *Bizans: Yapılar, meydanlar, yaşamlar* (B. Kitapçı-Bayrı, Trans.). Kitap Yayınları.
11. Cormack, R. (2014). *Icons*. The British Museum Press.
12. Demus, O. (1991). *Die grossformatigen ikonen*. Wien: Österreichische Akademie der Wissenschaften.
13. Diehl, C. (2003). *Bizans imparatorluğu tarihi* (S. Sezer, Trans.). İnkılap Kitabevi.
14. Drewer, L. (1996). Recent approaches to early Christian and Byzantine iconography. *Studies in Iconography*, 17, 1–65.
15. Effenberger, A. (2021). Images of personal devotion: Miniature mosaic and steatite icons. In H. C. Evans (Ed.), *Byzantium: Faith and power (1261–1557)*. The Metropolitan Museum of Art, 209–241.
16. Efthymiadis, S. (2021). The hagiography of Byzantine Anatolia (4th–14th centuries). In E. Akyürek & K. Durak (Eds.), *Anatolia in the Byzantine period*. Yapı Kredi Yayınları.
17. Elsner, J. (2012). Iconoclasm as discourse: From antiquity to Byzantium. *The Art Bulletin*, 94(3), 368–394.
18. Geyik, E. N. (2020). Bizans tarihinde ikonoklazma dönemi ve ikonoklazmanın Ayasofya’ya etkisi. *International Journal of Social, Political and Economic Research*, 7(3), 575–590.
19. Jaaskinen, A. (2014). From Viking princess to a princess of all Russia. In P. Salmesvuori & A. Torma (Eds.), *Northern Byzantine icons*, 67–79.
20. Kitzinger, E. (1954). The cult of images in the age before iconoclasm. *Dumbarton Oaks Papers*, 8, 83–150.
21. Lange, R. (1964). *Die byzantinische reliefikone*. Recklinghausen: Verlag Aurel Bongers.
22. Mango, C. (2016). *Bizans: Yeni Roma imparatorluğu* (G. Çağalı Güven, Trans.). Yapı Kredi Yayınları.
23. Margaret, E. K. (1985). Icons in theory and practice: An Orthodox Christian example. *History of Religions*, 24(4), 345–368.
24. Narinskaya, E. (2012). On the divine images: Theology behind the icons and their veneration in the early church. *Transformation*, 29(2), 139–148.
25. Pentcheva, B. V. (2015). The aesthetics of landscape and icon at Sinai. *RES: Anthropology and Aesthetics*, 65–66, 194–211.
26. Pevny, Z. O. (1997). Kievan Rus. In H. C. Evans & W. D. Wixom (Eds.), *The glory of Byzantium: Art and culture of the middle Byzantine era (A.D. 843–1261)*. The Metropolitan Museum of Art, 281–321.
27. Schmidt, J. (2020). Die spätbyzantinischen wandmalereien des Theodor Daniel und Michael Veneris. In C. Nickel (Ed.), *Byzanz zwischen Orient und Okzident* (Vol. 20). Mainz: Verlag des Römisch-Germanischen Zentralmuseums.
28. Sevcenko, P. N. (1999). The “vita” icon and the painter as hagiographer. *Dumbarton Oaks Papers*, 53, 149–165.
29. Sıddıki, İ. F., & Sülek, E. (2023). Manisa Müzesi geç Hristiyanlık dönemi ikonaları. In C. Ünal et al. (Eds.), *Manisa Müzesi Yıllığı*. Manisa: Manisa Celal Bayar Üniversitesi Yayınları, 64–77.
30. Spieser, M. J. (2019a). İmparatorluk ve sanatı: Benzerlikler ve farklılıklar. In *Bizans dünyası: Doğu Roma imparatorluğu (330–641)* (A. Bilge, Trans.). İstanbul: Ayrıntı Yayınları.
31. Spieser, M. J. (2019b). Sanat. In *Bizans dünyası: Bizans imparatorluğu (641–1204)* (A. Bilge, Trans.). İstanbul: Ayrıntı Yayınları.
32. Şen, I. V. (2017). Bizans ikonalarından günümüze sanatta Meryem ve çocuk motifi. *İdil*, 6(32), 1359–1383. <https://doi.org/10.7816/idil-06-32-12>



33. Temple, R. (1982). Icons and mystical origins of Christianity. In A. Mondadori (Ed.), *Element books* (pp. 373–413). New York: Alfred A. Knopf.
34. Timothy, E. G. (2019). *Bizans tarihi* (E. Ermert, Trans.). İstanbul: Yapı Kredi Yayınları.
35. Vasilescu, D., & Elena, E. (2010). Development of Eastern Christian iconography. *Transformation*, 27(3), 169–185.
36. Weiner, M. T. (1977). *Narrative cycles of the life of St. George in Byzantine* (Unpublished doctoral dissertation). New York University.
37. Yaşar, N. (2019). ‘İkon’ sanatının resim sanatına etkileri. *Atatürk Üniversitesi Güzel Sanatlar Fakültesi Dergisi*, 33, 80–85.
38. Yener, A. (2015). *Antalya ikonaları*. İstanbul: Arkeoloji ve Sanat Yayınları.
39. Yılmaz, N. (2007). *Icons in Turkey*. İstanbul: A Turizm Yayınları.
40. Yücel, E. (2020). *Bizans resim sanatı ve ikonalar*. İstanbul: Kitab-ı Mukaddes Şirketi.
41. Zarra, I. (2022). The Christian icon of the nineteenth century from the point of view of the art historian. *Analogia*, 16(3), 101–129.
42. Zenbilci, K. İ. (n.d.). Selanik’teki Bizans Kültürü Müzesi koleksiyonunda yer alan Meryem “Hodegitria Deksiokratousa” ikonası ve paralel örnekler. *Tokat Gaziosmanpaşa Üniversitesi Sosyal Bilimler Araştırmaları Dergisi*, 100–114.

Received: 01.10.2025

Accepted: 13.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/133-148>

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## **Armenian Vandalism Against Turkish-Islamic Monuments in the City of Irevan**

### **Abstract**

The presented study examines the Turkic-Islamic architectural monuments, especially mosques, that existed in the city of Yerevan, one of the important historical and cultural centers of Western Azerbaijan, now called "Armenia", and their historical fate. The cited historical sources and research works once again show that the city of Yerevan has been one of the important residential and cultural centers of the Azerbaijani Turks since ancient times. The rich material and cultural heritage formed in this city reflects the history, religious life and architectural traditions of the Azerbaijani people. An important part of that heritage is made up of architectural monuments related to the Islamic religion, especially mosques. The article provides extensive information about the history of the establishment of mosques that existed in the city of Yerevan, their architectural features and their role in the social and cultural life of the city.

Based on archival documents and scientific research, it is determined that hundreds of mosques operated in the city of Yerevan and the territory of the Yerevan province as a whole at the beginning of the 20th century. The book "Monuments destroyed, Armenianized or attributed to other peoples in Western Azerbaijan (present-day Armenia)" published by Afgan Valiyev in 2023 provides information on 144 monuments, including mosques, that existed in the lands of Western Azerbaijan in various historical periods, especially after the last deportation in 1987-1991. Armenians, who were resettled and settled in the lands of Azerbaijan with the help of Tsarist Russia, ignored the rights of the local population and appropriated or destroyed the historical and cultural heritage created here over the centuries.

In writing the article, complex and multifaceted methodological approaches based on historical facts - historical-analytical, comparative analysis methods - were used, the reliability, objectivity and origin of the information used were assessed using a source analysis approach, the available information was interpreted using a qualitative research method, and the political, cultural and ideological reasons for the acts of vandalism were explained.

The research concludes that the mosques that existed in Yerevan are not only places of religious worship, but also important examples of material and cultural heritage reflecting the history, culture, and architectural traditions of the Azerbaijani people. Studying the history of these monuments and their scientific research is of great importance in terms of a more complete study of the historical and cultural heritage of the region.

**Keywords:** *Iravan Mosques, Modern "Armenia", Ancient Turkic-Oghuz homeland, Western Azerbaijan, Cultural heritage, Armenian vandalism, Blue Mosque*

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## İrəvan şəhərində türk-islam abidələrinə qarşı erməni vandalizmi

### Xülasə

Təqdim olunmuş araşdırmada indi "Ermənistan" adlandırılan Qərbi Azərbaycanın mühüm tarixi-mədəni mərkəzlərindən biri olan İrəvan şəhərində mövcud olmuş Türk-İslam memarlıq abidələri, xüsusilə məscidlər və onların tarixi taleyi araşdırılmışdır. İstinad edilmiş tarixi mənbələr, tədqiqat əsərləri bir daha onu göstərir ki, İrəvan şəhəri qədim dövrlərdən etibarən Azərbaycan türklərinin mühüm yaşayış və mədəniyyət mərkəzlərindən biri olmuşdur. Bu şəhərdə formalaşmış zəngin maddi-mədəni irs Azərbaycan xalqının tarixini, dini həyatını və memarlıq ənənələrini özündə əks etdirir. Həmin irsin mühüm hissəsini İslam dini ilə bağlı memarlıq abidələri, xüsusilə məscidlər təşkil etmişdir. Məqalədə İrəvan şəhərində mövcud olmuş məscidlərin yaranma tarixi, memarlıq xüsusiyyətləri və şəhərin ictimai-mədəni həyatındakı rolu haqqında geniş məlumat verilmişdir.

Arxiv sənədləri və elmi araşdırmalar əsasında müəyyən edilir ki, XX əsrin əvvəllərində İrəvan şəhərində, bütövlükdə isə İrəvan quberniyasının ərazisində yüzlərlə məscid fəaliyyət göstərmişdir. Əfqan Vəliyevin 2023-cü ildə nəşr etdirdiyi "Qərbi Azərbaycanda (indiki Ermənistanda) dağıdılmış, erməniləşdirilmiş və ya digər xalqlara aid edilmiş abidələr" kitabında Qərbi Azərbaycan torpaqlarında müxtəlif tarixi dövrlərdə, xüsusən də 1987-1991-ci illərdəki son deportasiyadan sonra mövcud olan məscidlər də daxil olmaqla 144 abidə haqqında məlumat verilir. Çar Rusiyasının köməyi ilə Azərbaycan torpaqlarına köçürülən və yerləşdirilən ermənilər yerli əhalinin hüquqlarını görməzdən gəlmiş, əsrlər boyu burada yaradılmış tarixi və mədəni irsi məhimsəmiş və ya məhv etmişlər.

Məqalənin yazılmasında tarixi faktlara əsaslanan mürəkkəb və çoxşaxəli metodoloji yanaşmalardan-tarixi-analitik metoddan, müqayisəli təhlil metodundan istifadə edilmiş, istifadə olunan məlumatların etibarlılığı, obyektivliyi və mənsəyi mənbə təhlili yanaşması ilə

qiymətləndirilmiş, mövcud məlumatlar keyfiyyət tədqiqat metodu ilə şərh edilmiş və vandalizm aktlarının siyasi, mədəni və ideoloji səbəbləri izah edilmişdir.

Tədqiqat nəticəsində belə qənaətə gəlinir ki, İrəvanda mövcud olmuş məscidlər yalnız dini ibadət məkanları deyil, həm də Azərbaycan xalqının tarixini, mədəniyyətini və memarlıq ənənələrini əks etdirən mühüm maddi-mədəni irs nümunələridir. Bu abidələrin tarixinin öyrənilməsi və onların elmi əsaslarla tədqiqi regionun tarixi-mədəni irsinin daha dolğun şəkildə araşdırılması baxımından böyük əhəmiyyət kəsb edir.

**Açar sözlər:** *İrəvan məscidləri, Müasir "Ermənistan", Qədim türk-oğuz yurdu, Qərbi Azərbaycan, Mədəni irs, Erməni vandalizmi, Göy məscid*

*"Unfortunately, the day after the establishment of the Azerbaijan Democratic Republic in 1918, the city of Yerevan was given to the Armenians. But there was no reason for that. Yerevan is an ancient Azerbaijani city, the Azerbaijani people have lived there since ancient times, and the now disappearing historical appearance of Yerevan confirms the centuries-old existence of this Azerbaijani architectural monument. Yerevan is one of those cities that does not have an "old town" at all. Simply because there was an Azerbaijani city there and it was demolished".*

*"...The current state of Armenia was formed on the historical land of Azerbaijan. The city of Yerevan was gifted to Armenia by the leadership of the Azerbaijan Democratic Republic in 1918. This was, to put it mildly, a big mistake. When the Azerbaijan Democratic Republic was established in 1918, it ceded the city of Yerevan to Armenia. The Iravan Khanate is an ancient land of Azerbaijan. "I want to say once again that Armenians came to this region as guests".*

**İlham Aliyev**  
**President of the Republic of Azerbaijan**

## Introduction

The city of Iravan, the central city of an artificial state called Western Azerbaijan, or present-day "Armenia", which is part of the whole of Azerbaijan, was a Turkic-Oghuz homeland from the times before our era until the end of the 20th century. Despite the fact that it was given as a gift to the Armenians settled here in the beginning of the 20th century to be declared the capital, even today, every inch of this land still bears the traces of our ancestors.

As we mentioned, the city of Yerevan has historically been one of the oldest settlements of Azerbaijani Turks. However, at the beginning of the 19th century, Armenians who were resettled by Tsarist Russia from the territories of the Qajar and Ottoman states were settled in a number of our territories, including the territory of the Iravan governorate. Shortly thereafter, at the beginning of the 20th century (in 1918), the independent Azerbaijan Democratic Republic, which emerged in the South Caucasus after the fall of the Russian Empire, made the wrong decision and gave the city of Yerevan to the Armenians who had settled in our lands to declare it their capital.

The city of Yerevan is rich in historical monuments reflecting the presence of its ancient inhabitants - Azerbaijanis - on every inch of its land. The city of Yerevan has a very rich historical past, being one of the oldest cultural centers of Western Azerbaijan, now called "Armenia". Thus, the history of this ancient Turkic-Oghuz homeland dates back to before the 8th century BC. Azerbaijanis, the indigenous people of this ancient land, have left behind a rich cultural and historical heritage that they have created over millennia. One of such rich cultural monuments is Islamic religious monuments. Both the Albanian-Christian temples, which are examples of pre-Islamic culture, and the historical and cultural monuments of the Islamic era, as well as the rich cultural heritage created here over millennia and included in the world's cultural treasury, prove that this area is historically one of the oldest regions of Azerbaijan. Although Islam was once the dominant religion here, unfortunately, today there are no traces left of those who worshiped this religion, they were displaced from their homes by Armenians in stages. In Western Azerbaijan (modern Armenia), the majority of those who

practice Islam are Kurds, numbering about 2,000, who live mainly in the Ellar (present-day Abovyan) region.

Mosques occupy a special place among the historical monuments in this ancient city of Azerbaijan. However, it should be noted with regret that throughout the territory of Western Azerbaijan, all place names belonging to the local Azerbaijani population have been changed, our monuments have been destroyed, and not only our people, but also our monuments have been subjected to genocide in the truest sense of the word. Thus, out of the dozens of mosques that existed in this city alone at the beginning of the 20th century, none (Gala Mosque, Zal Khan Mosque, Haji Bey Mosque, Günlüklü Mosque, Günbezi Mosque, Shehar Mosque, Novruzali Mosque, Hüseynali Mosque, etc.) except for the Blue Mosque, have survived to this day. Armenian sources also acknowledge that the 8 mosques we mentioned in Yerevan city existed at the beginning of the 20th century, and of these, only the Blue Mosque, built in 1765 by the Khan of Yerevan, Huseynali Khan, has survived. As we will note below, the Blue Mosque is presented to the whole world as a Persian mosque. Even Armenian sources claim that during the mass demolition of religious buildings during the Soviet era, the Blue Mosque was preserved thanks to the efforts of a number of Armenian intellectuals, including Yeghishe Charentsi, who opposed the government's plan and did their best to preserve the mosque.

This article discusses the atrocities committed by Armenians against Turkic-Islamic monuments - mosques - belonging to the Azerbaijani people in the city of Yerevan.

After the wars waged by Tsarist Russia with the Qajar and Ottoman states at the beginning of the 19th century, the Armenians who settled in the ancient lands of Azerbaijan first strengthened their positions and then began to implement a policy of oppression against the local Turkic-Muslim peoples on whose lands they settled. Following this, they replaced the policy of repression with a policy of genocide from the beginning of the 20th century. Thus, the massacres, genocides, and deportations that Armenians carried out step by step against Azerbaijani Turks throughout the 20th century have left deep, indelible marks in the memory of our people. One issue that should be specially noted is that the Armenians committed genocide, in the truest sense of the word, not only against our people, but also against the national-spiritual, historical-cultural monuments that this people have built and created on the lands of Azerbaijan for millennia. The hated armenians set themselves the goal of destroying the local Turkish-Muslim population not only physically, but also morally. Although Islam was once the dominant religion in Western Azerbaijan, there are currently neither adherents of this religion nor monuments associated with it. It is precisely as a result of the policy pursued by the Armenians that in the territory of Western Azerbaijan (present-day Armenia- A. M.), which has a rich culture, there is almost no trace left of the palaces, caravanserais, mosques, cemeteries, tombstones, etc., which are relics of this great and inexhaustible culture.

During the last wave of the Armenian genocide and deportation policy against our people at the end of the 20th century, not only were more than 250,000 Azerbaijanis who had lived here for centuries expelled from their historical and ethnic lands, but the historical and architectural monuments belonging to our people were also completely erased from the face of the earth.

The borders of Armenian vandalism did not only cover the territory of Western Azerbaijan. The barbaric Armenians, who occupied the then "Nagorno-Karabakh" and the surrounding regions and held them under occupation for thirty years, with the help of their patrons, completely destroyed the cities and villages located there, our historical monuments, cemeteries, bridges, hearths, shrines, sanctuaries, in short, everything. Not a single example of our material and cultural heritage remains in the occupied lands of Azerbaijan; they have been razed to the ground or pigs have been kept in our mosques.

By committing genocide against Azerbaijani Turks, Armenians were trying to change the demographic situation of the Caucasus to their advantage, and by destroying our historical and cultural monuments, they were trying to prove that they were the indigenous people and that Azerbaijanis came to the Caucasus later. In addition to changing the demographic situation in the territories they occupied in their favor, the Armenians began the Armenianization of these territories.

Throughout Azerbaijan, especially in the Iravan province, Islamic material and cultural monuments were subjected to genocide, Turkish toponyms were changed, and ancient Albanian monuments were given Armenian names.

Our national, spiritual, historical and cultural monuments in every part of Azerbaijan - in Baku, Shamakhi, Guba, Lankaran, Ganja, Nakhchivan, Yerevan, Zangezur, Vedibasir, etc. - have literally become victims of Armenian vandalism.

One of the areas where our historical monuments have been subjected to Armenian vandalism is the city of Yerevan, an ancient land of Azerbaijan and currently the central city of the so-called state called "Armenia". The city of Yerevan, which has been one of the central cities of various emirates, principalities, and khanates from time to time, has been one of the important trading centers not only of the South Caucasus, but also of the Near and Middle East. Because this city is located at the crossroads of international trade routes, our people have created a rich culture here for millennia. In the city of Yerevan, which was once rich in countless historical and architectural monuments, mosques, caravanserais, cemeteries, tombstones, etc., today, with the exception of the Blue Mosque, there is not a single monument belonging to Azerbaijani Turks left. Travelers and geographers who have traveled to the region have provided extensive information about these historical and architectural monuments in their works. As historian-scholar Nazim Mustafa noted, Armenian vandals, who aimed to change the historical face of the Turkic-Islamic city of Yerevan and turn it into a city belonging to Armenians, razed Yerevan's famous mosques, especially the Khan's Palace (Mustafa (2016): 6). Considering that the scope of the topic addressed is very broad, in this scientific article we will try to provide information only about the mosques that existed in the city of Yerevan.

### **Main part**

According to information from the not-so-distant past, namely the beginning of the 20th century, we know that there were a total of 310 mosques in the territory of the Yerevan province (Agamoghlanov, 2025, pp. 234-239). As a result of the research conducted, it was determined that at the beginning of the 20th century, that is, until 1912, there were 42 mosques operating in the Iravan region, 33 in the Uchkilsa region, and 35 in the Zangezur region. This is also proven by the "Memory Book of the Yerevan Governorate for 1902", published in 1902 by the Yerevan Governorate Statistical Committee. The booklet indicates that 7 of those 310 mosques are in the city of Yerevan (Mustafa, 2016, p. 13).

Studies conducted by researchers Aziz Alakbarli and Afgan Valiyev also show that the number of mosques in Western Azerbaijan has increased significantly since 1915 (Alakbarli, Valiyev, 2021, pp. 32-33). This can be explained by the fact that during the First World War, Azerbaijanis were forced to leave their native lands as a result of the genocide committed by Armenians and flee to various regions of Azerbaijan, only to return after the war ended.

Russian sources also note that in Western Azerbaijan (now Armenia), in the city of Yerevan, only one functioning Muslim shrine, that is, a mosque, remains, located on Mesrop Mashtots Avenue, and that it is the Blue Mosque, which was restored with financial support from Iran. It is also indicated that other historical mosques of the city (up to eight mosques are mentioned in the fortress) were destroyed during the Soviet period. Researcher Nazim Mustafa, citing George A. Burnutyan, a leading scholar on the modern history of Eastern Armenia and Transcaucasia, South Asia, Central Asia, Russia, Australia, and South America, notes that the presence of two Armenian churches and 15 Muslim mosques in Yerevan in itself proves that this city is a Muslim city (Mustafa, Nazim, 2024, pp. 2361-2372).

The German-born Austrian historian Markus Ritter addressed the issue of interest to us in his article "The Lost Mosque(s) in the Qajar-era Iravan Fortress: Architecture and Identity, Iran and Local Traditions in the Early 19th Century" (Ritter, 2009, pp. 239-279). In his article, he discusses the fact that the mosques located in the Citadel of Yerevan have not survived to this day and are therefore little known in the scientific literature.

In her article "The Poetics and Politics of Urban Landscape: Yerevan's Blue Mosque," Chipilma Darieva notes that during the Soviet era, the mosque was used more as a cultural object than as a

religious space. In modern times, the mosque is presented as a symbol of Iranian-Armenian cultural relations and Islamic heritage. The author notes that the Gök Cami or Blue Mosque, built in the second half of the 18th century by order of the then city governor Sardar Hüseyn Ali Khan, is today called the Persian Mosque by the city's residents. The mosque is perceived by the city administration and residents as a political symbol of Iranian-Armenian friendship, which strengthened during the years of Armenia's independence (Darieva, Tsypylma, 2013, pp. 110-128). The author notes that the mosque used to have three entrances (south, north and west). Until 1930, only one of these entrances was open. The southern gate, which faced the minaret and served as the main entrance to the mosque, was closed during the anti-religious campaign, leaving only the opposite northern entrance open. Having lost its original meaning and functionality as a religious place, the Blue Mosque was transformed into an educationally oriented secular institution. From 1935 to 1991, the building of the former cathedral mosque, whose doors symbolically face north, was used as the Yerevan Museum of Atheism, later the Natural History Museum and the Yerevan History Museum. In the late 1990s, the city's residents witnessed a new stage of contextualization. After a thorough restoration of the space, the Blue Mosque was renamed the Persian Mosque. In 1995, Iranian construction companies, together with Armenian architects, restored the dome, and the right to officially use the building as a mosque and cultural center was transferred to the Cultural Representation of the Republic of Iran. The process of restoring the mosque and handing it over to representatives of the southern neighboring country took place at a time when the Karabakh war was still ongoing. At that time, Iran continuously provided Armenia with significant strategic assistance in the form of energy and food supplies.

In general, there is no trace left of the hundreds of monuments that once existed throughout the Yerevan province, including our magnificent monuments such as the Khan's Palace and the Sardar (Abbas Mirza) Mosque in Yerevan. Such historical monuments were completely destroyed and wiped off the face of the earth, both in 1918-1920 and after the establishment of Soviet power in "Armenia". As we mentioned above, the only surviving monument of Turkic-Islamic architecture in the territory of Western Azerbaijan, now called "Armenia", is the Blue Mosque, which Armenians present to the world as a "Persian" monument. However, it is clear to everyone, including Persians and Armenians, that this monument has nothing to do with the Persians and is a historical monument belonging solely to Azerbaijanis. If we look at the history of the monuments existing in Western Azerbaijan and the inscriptions on them, it becomes clear that they truly belong to the Azerbaijani Turks. The Blue Mosque of Yerevan, built in 1765 during the Safavid period, is one of the most beautiful examples of mosques built in this style in Tabriz, Turkey, and Afghanistan, and is also known as the "Caame" Mosque of Yerevan (Saeed Joshgani, Muhammad Kazem Hasanvand, Muhammad Arif, 2024, pp. 35-46).

One of such monuments, as we have mentioned, is the Blue Mosque. Information about the Blue Mosque can be found in the works of all travelers and researchers who have visited Yerevan. For example, the French archaeologist Frederick Dubois de Montperre, who was in the Caucasus in 1833, provided extensive information about the Blue Mosque in his work "Travel Around the Caucasus", published in Paris in 1839 (Mustafa, 2016, p. 10).

Henry Bloss Lynch, who visited Yerevan and the Ottoman Empire in 1893 and 1898 and wrote a two-volume book about his travels, published in 1901, wrote in his book dedicated to Yerevan, "Armenia: Travels and Studies," that there was nothing particularly remarkable about the architecture of the mosque. However, the floral paintings that decorated the ceiling of a mosque and a small building on the northern side of the courtyard are of great value (Lynch, 1901). Armenia: Travels and Studies. Volume I). It should also be noted that the 13th chapter of the 2nd volume of the work "Armenia: Travels and Studies" written by the British traveler Henry Finnis Bloss Lynch, who traveled to Eastern and Northeastern Anatolia twice in 1894 and 1898, about his trip to the Ottoman Empire, is called "From Hınıs to Tutak" and this part was translated into Turkish by Murat Yılmaz (Yılmaz, Murat, 2023, pp. 109-121). It is worth mentioning one more thing, which is the issue of Lynch's ethnic identity. Lynch was a British traveler and traveller of Armenian origin. His maternal grandfather, Robert Taylor, was a 20-year-old ensign of the British East India Company who was

sent to the Qajar state in the 1790s with the 12-year-old Rosa, the daughter of an Armenian merchant from the village of Shiraz. One of his daughters, Caroline, married Henry Bloss Lynch, a lieutenant in the East India Company's fleet. In 1841, Lynch and his two brothers founded the company "Lynch Brothers", which exported goods from Great Britain to Mesopotamia. One of them, Thomas, a classical scholar at Trinity College, Dublin, married Caroline's sister Harriet, who became the mother of H. F. B. Lynch, while his other brother, Stephen, married the daughter of another Armenian merchant (Vartan Matiossian, 2013).

Italian diplomat and historian Luigi Villari also gave a detailed description of the mosque in his book "Fire and Sword in the Caucasus" published in 1906 and noted that "the great mosque called the Blue Mosque is more of a long quadrangle than a mosque, containing several places of worship and a number of cells, schools and offices of the Muslim religious administration. It is not very ancient, but it is beautiful. The Encyclopedia Britannica published in 1911 described the Blue Mosque as the most beautiful building in the city of Yerevan (Lynch, 1901). Armenia: Travels and Studies. Volume II). He noted that the mosque's 24-meter (79 ft) high minaret was the tallest building in 19th-century Yerevan.

In his article "Historical and Architectural Features of the Blue Mosque in Yerevan", Fazil Humbatli notes that the Blue Mosque, one of the most remarkable and historically significant monuments of the South Caucasus, built between 1760 and 1765 during the reign of Huseyn Ali Khan, played an important role in the cultural and religious identity of the Muslim population of Yerevan in the 18th and 19th centuries and served as a central religious, educational and social institution for the Muslim community. The author writes that despite the periods of functional changes during the Russian and Soviet rule, the mosque was restored and continues to serve as both a place of worship and a cultural landmark. Unfortunately, however, the author presents the Qajar state of Turkish origin as the "Persian Qajar dynasty", and the Blue Mosque, which belongs to our people, as an example of Persian Islamic architecture (Humbatli, 2025, pp. 83-86).

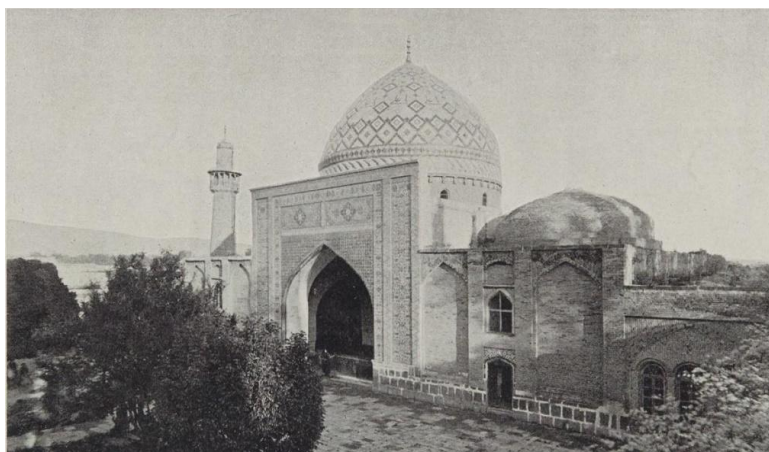
One of the visitors to the Blue Mosque was the German traveler August von Hackhausen. To prove that Yerevan belongs to Armenians, Armenians cite the name of an Armenian named Khachatur Abovyan, along with the German traveler, and write that the German traveler August von Hackhausen, who visited the Blue Mosque accompanied by Khachatur Abovyan, described the history and interior decoration of the mosque in sufficient detail and called it the most magnificent building he had ever seen in Yerevan (Garabaghly, Rizvan, 2010).

The Blue Mosque complex covers an area of 7,000 square meters, including a 71x47 meter courtyard, a ritual building, a dome, and a minaret covered with decorative majolica tiles. The minaret on the southeast side of the mosque is 24 meters high and is the only one of the mosque's four original minarets that remains today. The other three were demolished by Armenians after World War II. The Blue Mosque complex has 28 pavilions. The northern section houses the library, while the southern section houses the main hall and dome, as well as the courtyard.

The Blue Mosque is considered one of the rare examples of oriental architecture. The mosque was built in 1766 by the Khan of Yerevan, Huseyn Ali Khan Qajar. This mosque was one of seven mosques operating in Yerevan at the beginning of the 20th century. According to sources, the mosque was built between 1760 and 1765. It is called the Blue Mosque because the dome of the mosque is covered with blue tiles. The mosque was thoroughly renovated with tiles during the Russian rule, around 1887-1888 (1305 AH). Later, restoration and repair work was carried out on the mosque between 1907 and 1910. The mosque is the most magnificent architectural monument in Yerevan, both in terms of beauty and scale. It is the largest of the eight mosques in the city of Yerevan in the 19th century and the only active mosque in Armenia today.



### Blue Mosque (or Huseynali Khan Mosque)



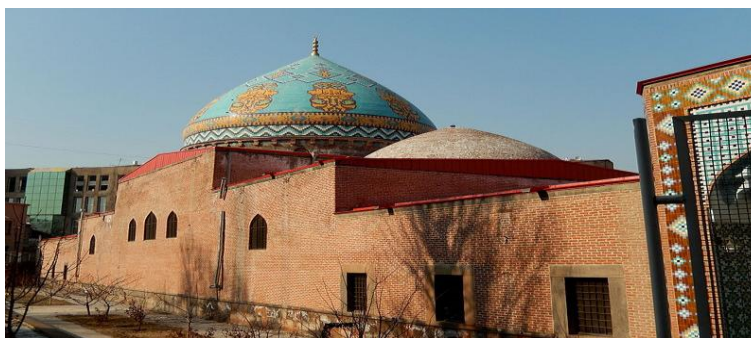
It should also be noted that, according to the results of the cameral census conducted after Yerevan was occupied by Russia, six of the eight mosques in Yerevan were in the city and two were in the citadel. These mosques are: Tepebashi Mosque, Shahar Mosque (Zal Khan Mosque), Sartib Khan Mosque, Goy Mosque (Huseynali Khan Mosque), Haji Novruzali Bey Mosque, Gala Mosque (Sardar Mosque or Abbas Mirza Mosque), Demirbulag Mosque, Haji Jafar Bey (Mustafa, Nazim, 2025, p. 8)

The cameral census was conducted by the French traveler and ethnographer I. Chopin. He came to Russia in 1870 and worked in the Caucasus Viceroyalty. After the Edirne Peace Treaty, that is, in 1829-1832, he was engaged in researching the history and geography of the Caucasus. Although I. Chopin stated that there were several other mosques that were partially destroyed in the city of Yerevan, he did not disclose their names. In general, historian-scientist Nazim Mustafa states that there were 10 mosques in the city of Yerevan alone before the establishment of Soviet power in Armenia (Mustafa, 2016, p. 15).

Until the beginning of the 20th century (1906-1911), all of these mosques remained intact. Even a document from 1949, kept in the State Archives of the Republic of Azerbaijan, reflects the existence of 15 architectural monuments belonging to Azerbaijanis in Armenia, as well as 4 mosques in the city of Yerevan. A document kept in the State Archives states that the city mosque (Zal Khan Mosque) was built in 1649-85, the Blue Mosque (Huseynali Khan Mosque) in 1776 (In 1179 AH), the Sardar Mosque (Qala or Abbas Mirza Mosque) in 1807-17, and the Haji Jafar Bey Mosque in the 18th century (Mustafa, 2016, p. 16). This means that shortly after the Armenian government achieved the adoption of the decision of the USSR Council of Ministers, which provided for the deportation of Azerbaijanis from their homeland, covering the years 1948-1953, it began to take "measures" against our historical and architectural monuments, achieving the destruction of four of the existing mosques.

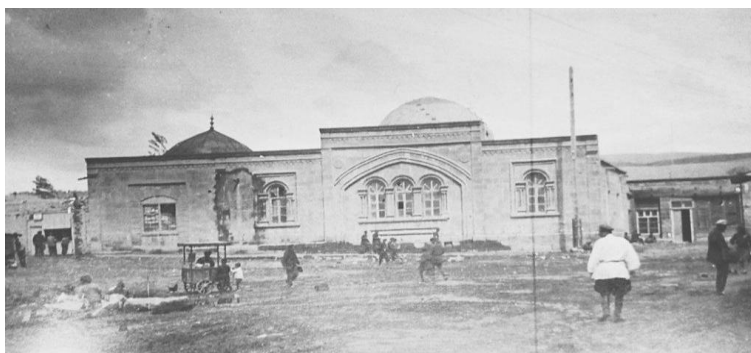
During the Soviet era, the mosque was converted into a museum. In 1931, the Yerevan Museum of History and Natural Sciences was opened inside the mosque complex, displaying rare collections of prominent Soviet archaeologists (Ali Mozaffari, Ali Akbar, 2024, pp. 1393-1422). It would be naive to think that the reason the Blue Mosque has not survived to this day and has not been destroyed is because of the "love" of Armenians for our people. It should be emphasized once again that the reason why this Turkic-Islamic monument - the Blue Mosque - has survived to this day stems from the necessity of the Armenian government to establish diplomatic relations with the Islamic Republic of Iran after the collapse of the Soviet Union. In 1995, an agreement was signed between the governments of Armenia and Iran on the reconstruction and restoration of the mosque. In 1995-1997, the prayer hall and 24 rooms arranged along the courtyard were restored. In 2011, the World Heritage Committee announced that the Blue Mosque would be included in the UNESCO World Heritage List.

### **The current appearance of the Blue Mosque, which was presented as a Persian mosque:**



One of the mosques operating in Yerevan until the end of the 20th century, or more precisely, until 1988, was the Demirbulag Mosque. Another name of the mosque is Çetrlı mosque. The main reason for this name is that the upper part of the railing, which is surrounded by iron bars on all sides, is covered with an iron layer. The mosque, built in 1909, was burned down by Armenians on February 23, 1988, and completely destroyed in 1990 (Mustafa, 2024, p. 8).

### **Demirbulag Mosque**



It should be noted that the Çetirli mosque was one of the 3 mosques that existed in the Demirbulag massif (Haji Novruzali bey mosque, Haji Jafar bey mosque and Demirbulag mosque). The Haji Novruzali Bey and Haji Jafar Bey mosques were destroyed by Armenians in 1930 when the master plan of the city of Yerevan was being prepared. It is known that the Demirbulag Mosque was built in 1307 AH, that is, in 1909, by Haji Muzaffar Agha. Demirbulag Mosque is also called Korpugulagi Mosque because it is located near the red stone bridge over Geder River, a branch of Zangi River (Mustafa, Nazim, 2023). The name of the Demirbulag mosque is indicated as Korpüqulag in the source of 1856. Aziz Alakbarli, in his work "Monuments of Western Azerbaijan" (Baku, Nurlan, 2007), referring to Qevond Alishan's work "Ayrarat," wrote that this mosque was also mentioned as "Qirxhbulag Mosque".

A map of the years 1906-1911 prepared by Boris Mehrabov, a technician of the city of Yerevan, shows information about the presence of 8 mosques in the city and their location. According to this information, the Demirbulag Mosque is located near the Black Market. Later, a statue of A. Griboyedov, who initiated the resettlement of Armenians to Azerbaijani lands, was erected near the mosque. In Armenian sources, the condolence written by Farajov, chairman of the council of Demirbulag mosque, to Etchmiadzin in 1954 on the death of Catholicos of Nornakhichevan, Gevorg VI, proves once again that the mosque continued to function after the Second World War (Mustafa, Nazim, 2020, pp. 237-244).

On April 15, 1991, American researcher Robert Cullen, writing an article about the city of Yerevan in The New Yorker, mentioned the Demirbulag Mosque. He noted that this mosque was the only functioning mosque owned by Azerbaijanis. He also mentioned, citing an Armenian friend, that

this mosque was burned by Armenians at the same time as the massacres against Azerbaijanis in Yerevan, and was later blown up and wiped off the face of the earth (Mustafa, 2024, pp. 2361-2372).

In 2000, the British researcher Thomas de Waal, who was on a visit to Yerevan, went to the place mentioned in Robert Küllen's article, i.e. Vardanans Street, he saw with his own eyes the destruction of Demirbulag Mosque and wrote about it. The author indicated that, based on the statements given by the Armenians, they took this step to avenge the Armenian church that was demolished in Baku (Mustafa, Nazim, 2023). But of course, the rumors spread by Armenians about the demolition of the Armenian church in Baku are nothing more than a hoax.

One of the historical-architectural monuments that existed in the territory of Western Azerbaijan is Haji Novruzali bey mosque located in the city part of Yerevan. It is not known exactly which period the mosque belongs to. However, based on the architectural characteristics of the mosque, experts are of the opinion that it belongs to the XIV century (Alekbarli, 2007, p. 236). A. Alekberli indicates that the mosque was built in the second half of the 18th century by a person named Qara Seyid (Alekberli, 2007, p. 238). The mosque was named so because it is located in the Haji Novruzali neighborhood, in the urban part of Yerevan. Like our other historical and architectural monuments, this mosque was a victim of Armenian vandalism at the beginning of the 20th century. Thus, the Haji Novruzali Bey mosque was also demolished in the 20s-30s of the 20th century, when the master plan of the city of Iravan was prepared. The mosque, which was smaller than the Zal Khan Mosque in size, resembled it in appearance.

### Haji Novruzali Bey Mosque



The ruins of the mosque with a single minaret remained until the 50s of the 20th century.

One of the oldest mosques in Yerevan is the Shah Abbas Mosque. The mosque was located in the fortress part of Yerevan, near the Sardar Palace. This mosque is also known by various names, such as the Qala Mosque or the Old Mosque, Abbas Mirza, Sardar or Khan Mosque. The mosque was first built by Shah Abbas in 1606, and was rebuilt for the second time in 1810 during the reign of the Iravan Khan Huseyngulu Khan Sardar, and was named after the Qajar prince and ruler of Azerbaijan Abbas Mirza. Most likely, for this reason it was named after Shah Abbas and Mirza Abbas. Aziz Alakbarli notes that the mosque dates back to an earlier period, that is, to the time when Shah Ismail's vizier Ravangulu Khan built the Iravan Citadel. The researcher and scholar shows that. The mosque was built in 1510 by order of Shah Ismail and was restored by the Ottomans in 1589 (Alakbarli, 2007, p. 110).

Azerbaijani philosopher and religious scholar Elmir Guliyev notes that in 1604, two years after Shah Abbas recaptured Yerevan from the Turks, he built a cathedral mosque inside the fortress. The mosque is also referred to in sources as the Sardar Mosque, as it is located to the east of the Khan's Palace or the Sardar (ruler) Palace. The author notes that the Shah Abbas Mosque had a large courtyard with an ablution pool (shadirvan) in the center. The mosque's dome and large portal with a magnificent porch were decorated mainly with dark blue ceramic tiles. The interior of the dome was decorated with circular Arabic script, and there was a carpet pattern above the mihrab. Since it closely resembles the Juma Mosque in Ganja, it is believed that its architect was Baha ad-Din al-Amili, a prominent scholar and thinker of his time, who was the sheikh of Islam at the court of Shah Abbas.



In August 1843, the German researcher August Hackshausen, who was in the Gala part of Yerevan, reported that of the two mosques here, the Rajab Pasha Mosque had been turned into a Russian-Greek church, and the Sardar Mosque into an ammunition depot (Aziz Sharif, 1983 pp. 44-47).

Shortly after the German researcher, in 1880, the Russian archaeologist Praskofya Uvarova, who was in Yerevan, witnessed the destruction of the mosques with her own eyes and spoke with heartache about the destruction of historical and architectural monuments (Mustafa, 2016, p. 18).

During the First World War, the mosque became a temporary settlement for Armenian refugees from the Ottoman Empire. In 1918-1920, the Armenians, who carried out a genocidal policy against our people, packed the Azerbaijani population into this mosque and burned it. After the collapse of the Soviet regime in Yerevan, this mosque, like other historical and architectural monuments, was destroyed. After the collapse of the Soviet Union and the declaration of Armenia's "independence", the mosque, with only one wall remaining, was later completely wiped off the face of the earth.

### Shah Abbas Mosque



One of the mosques in Yerevan is the Rajab Pasha Mosque. According to sources, after the capture of Yerevan by the Ottoman troops in 1724, the Turkish commander Rajab Pasha began to take certain measures in the field of development of the city. One of these measures was the order he gave to build a new mosque in the Gala part of Yerevan in 1725. Therefore, this mosque was named Rajab Pasha Mosque in his honor. Nazim Mustafa notes that this mosque was built after the capture of Yerevan by the Ottoman commander Farhad Pasha in 1583 (Mustafa, 2016, p. 6). After the Russian troops occupied the Yerevan fortress on October 1, 1827, the crescent and star on the mosque were replaced with a cross and a church bell. Later, certain changes were made to its appearance and it was transformed into a church. However, despite these changes, the mosque became a victim of Armenian vandalism in 1930, when the master plan of the city of Yerevan was being prepared.

It should be noted that the French-born Russian artist Franz Roubaud depicted the Rajab Pasha Mosque and the Sardar Mosque near the Khan's Palace in his painting dedicated to the capture of the Iravan Fortress by the Russian army (Mustafa, 2013, pp. 35-37).

### Recep Pasha Mosque



The Tepebashi Mosque, believed to have been built in 1867, was built by Abbasgulu Khan Iravanski, a descendant of the Iravan Khans, and is located in the Tepebashi neighborhood of Iravan. Abbasgulu Khan's house was also located in the same neighborhood, and Armenians continue to live in it today, and the house is called "Khan's House." Although the minaret of the mosque was demolished in 1960, its remains remain.

### Tepebashi Mosque



One of the mosques located in the ancient Turkic-Oghuz homeland of Yerevan is the Sheher or, in other words, the Zal Khan Mosque. The mosque was located in the Old City, located between the Castle part of Yerevan and the Tepebashi massif. Although it is smaller in size than the Blue Mosque, it attracted attention for being more beautiful. There is information written in Arabic on the mosque that its construction date is 1098 AH (1687 AD). According to researchers, the mosque was rebuilt after the earthquake that occurred in 1679. Its construction is associated with the name of the Yerevan beylerbey Zal Khan. Zal Khan was seriously engaged in the restoration of monuments in Yerevan, and one of the mosques built or restored during his time was called the Zal Khan Mosque. As we have noted, the mosque was also called the Sheher Mosque because it was located in the Sheher part (Mustafa, 2016, p. 34). It is reported that the large hall of the mosque was demolished in 1928.

### Zal Khan Mosque



One of the surviving historical and architectural monuments belonging to Azerbaijanis in the territory of today's "Armenia" (unfortunately, the third one no longer exists - A.M.) is the Amir Saad Mausoleum, located in the village of Jafarabad, located on the Yerevan-Uchkilisa road near the city of Yerevan. We thought it was important to provide information about this in the article.

By the decree of the Presidium of the Supreme Soviet of the Armenian SSR dated April 4, 1946, the Armenians changed the name of the village to Argavand (Mustafa, Gurbanov, Alili, 2018, pp. 248-256). It is known that this historical and architectural monument was built in 1413 by Pir Huseyn, son of Amir Saad, the emir of the Garagoyunlu state, over the grave of his father. This architectural

monument differs from other monuments in the territory of the Yerevan province. This difference lies in the fact that this monument was built not of brick, but of locally produced tuff stone. The authorities of Yerevan, who describe the Blue Mosque as an Iranian or Persian mosque, also describe this mausoleum as a Turkmen mausoleum due to the diplomatic relations they have established with Turkmenistan.

It should be emphasized once again that the Armenian authorities were forced to preserve these two monuments belonging to Azerbaijanis under the names of “Persian mosque” and “Turkmen mausoleum” not out of “love and affection” for our people, but in order to escape the difficulties they faced, in order to please the Iranian and Turkmen authorities. It was precisely as a result of this that in March 1996, when the President of Turkmenistan, Saparmurat Niyazov, visited Armenia, the President of Armenia, Levon Ter-Petrosyan, stated that this monument was built by “the Turkmen emir Pir Hussein” and noted that they had preserved it “as a symbol of Turkmen-Armenian friendship.” In return, Armenia received certain concessions from Turkmenistan. Thus, the Amir Saad mausoleum, one of the relics belonging to the Azerbaijani Garagoyunlu state, was included in the list of historical monuments protected by the Armenian government as “a mausoleum belonging to the family of Turkmen emirs” (Mustafa, Nazim, 2018).

### **Amir Saad Mausoleum**



It should be noted that near the Amir Saad Mausoleum there were two other mausoleums, which were relatively smaller in size than this one. This fact was also confirmed by the Armenian historian Akop Papazyan. However, these mausoleums were victims of Armenian vandalism (Jafarli, 2025, pp. 292-300). In 1961, the excavations conducted by the epigrapher-scientist Mashadi Khanum Nemet and the employees of the Institute of Archeology of the Academy of Sciences of the Armenian SSR at the Amir Saad Mausoleum, as well as information provided by the local population (Azerbaijanis - A.M.), revealed that there were two more medieval mausoleums and a large cemetery belonging to Azerbaijanis in the village area, which were destroyed by the Armenian authorities "because they were of no importance".

Finally, it would be appropriate to emphasize one issue in particular. It should not be forgotten that during the Soviet period, both in Azerbaijan and in other allied republics, including the territory of present-day "Armenia", attacks were made against religious figures and Islam as a whole in several directions. Soviet party bodies, trade unions, press workers, cinema workers, journalists, the "Society of the Godless Fighters", and other societies and organizations were involved in this attack. As a result of these attacks, historical and architectural monuments belonging to our people, including Islamic religious monuments, were destroyed. The majority of the members of this Society organized in Azerbaijan were Armenians and Russians. In the struggle of the Bolsheviks against Islam, the closure of Islamic religious monuments - mosques was one of the most important issues they had to

solve. They used various methods to destroy mosques, and the destruction of mosques was the main one among these methods (Hajiyev, 2021, pp. 39-86). The next stage of the campaign to close and destroy mosques began in the 1930s, when the article touched upon the issue of the cessation of the activities of most of the Islamic religious monuments in the city of Yerevan under the pretext of preparing the master plan of the city of Yerevan, and their subsequent destruction.

### **Result**

As a result of the research, it was determined that at the beginning of the 20th century, the territory of the Yerevan province, especially the city of Yerevan, had a rich Turkic-Islamic architectural heritage. Based on existing literature, statistical sources, and research conducted by authors from various countries of the world at different times, it has been determined that at the beginning of the 20th century alone, hundreds of mosques operated in this area, and a certain number of them directly occupied an important place in the urban structure of the city of Yerevan. This fact indicates that Muslim religious and architectural monuments are systematic and widespread in the historical and cultural landscape of the region.

As a result of comparative analysis, it becomes clear that throughout the 20th century, the vast majority of these monuments lost their original function and physical appearance for various reasons. When examining the reasons for this process, it is observed that several main factors influenced it. First of all, political changes, wars and demographic transformations taking place in the region directly affected the fate of the monuments. In particular, the conditions created by the First World War in the international world, the events of 1918–1920 and the changes in the population structure in the subsequent period did not remain without impact on the use and protection of religious and cultural objects.

At the same time, the state policy implemented during the Soviet period also acted as one of the factors that seriously affected the condition of all religious monuments in the republics that were part of the union. The materials of the study show that within the framework of the atheist ideology carried out in the USSR, some of the religious buildings were either destroyed or their functional purpose was changed and used for secular purposes. In this context, the facts of the transformation of mosques in the city of Yerevan into museums, warehouses and other facilities can be assessed as part of a broader Soviet practice.

At the same time, a comparison of various sources used in the study, including works by local, foreign and authors reflecting different positions, shows that approaches to the fate of monuments are not at all unified. While some sources explain these processes in the context of political and ethnic conflicts, other studies focus more on ideological, urbanistic or socio-economic factors. This indicates that the topic is complex and multifaceted, and it is not enough to explain it with only a one-dimensional approach.

The fact that the Blue Mosque, the only one in the city of Yerevan, has been preserved to this day, deserves special attention in the article. The analysis of sources shows that the preservation of this monument and its subsequent restoration were associated with a number of political, diplomatic and cultural factors. The fact that this monument is presented in various contexts in modern times - as a religious, cultural and even geopolitical symbol - indicates that it has undergone functional and semantic transformation. This shows that historical monuments are not only physical objects, but also concepts that change under the influence of political and cultural views.

The facts presented within the framework of the study on specific monuments - for example, Demirbulag, Haji Novruzali Bey, Shah Abbas (Sardar), Rajab Pasha and other mosques - show that some of them were destroyed at different stages of the 20th century. However, taking into account not only one factor, but the interaction of various historical conditions - political decisions, urban planning processes, ideological campaigns and regional conflicts - in explaining the causes of these events allows for more objective results.

Additionally, it should be emphasized that the fate of other examples of Turkic-Islamic heritage that existed in Yerevan, including mausoleums and cemeteries, is characterized by similar trends.



This indicates the need to examine the issue of preserving historical and cultural heritage in general not only locally, but also within a broader regional and political context.

Thus, the results of the conducted research show that the Turkic-Islamic architectural heritage that existed in the city of Yerevan and in the territory of the former Yerevan province in general has been subjected to serious destruction during the 20th century. This destruction has manifested itself in the form of both physical and functional changes. In order to investigate the topic more deeply and objectively, it is considered appropriate to apply wider archival materials, international sources and multidisciplinary approaches in future research.

## References

1. Agamoghlanov, H. (2025). Our religious material and spiritual heritage in Western Azerbaijan and the importance of their research. In *III Guba symposium: Reserves and museums – A bridge from the past to the future*, 234–239.
2. Alakbarli, A. (2007). *Monuments of Western Azerbaijan*. Nurlan.
3. Alakbarli, A., & Veliyev, A. (2021). *Our material and cultural heritage in the historical lands of Azerbaijan: Destroyed, renamed, and appropriated Azerbaijani monuments in the territory of the present-day Republic of Armenia* (Vol. 1).
4. Aziz, S. (1983). *From the past: First book. My father and I (Documentary memories, 1895–1988)*. Yazichi Publishing House.
5. Darieva, T. (2013). Poetics and politics of the urban landscape: The Blue Mosque of Yerevan, 110–128.
6. Garabaghly, R. (2010). *Azerbaijani architecture of Yerevan*.
7. Gurbanova, M. (2025). The policy of ethnic cleansing against the Azerbaijani population in the Armenian SSR: In academic research and memoirs. *Academic Journal of History and Idea*, 12(2), 452–464.
8. Hajiyeve, T. (2021). Features of the policy against religion in Soviet Azerbaijan (1920–1940). *Metaphysics*, 3(15), 39–86.
9. Humbatli, F. (2025). The history and architectural features of the Blue Mosque in Iravan. *Scientific Work*, 19(8), 83–86. <https://doi.org/10.36719/2663-4619/120/83-86>
10. Jafarli, B. (2025). Amir Saad mausoleum and Nakhchivan school of architecture in Western Azerbaijan. In *Western Azerbaijan: History, culture and the great return. Proceedings of the Republican Scientific Conference (June 13–14, 2025)*, 292–300.
11. Joshgani, S., Hasanvand, M. K., & Arif, M. (2024). A comparative study of common cultural elements in the decorative styles of blue mosques in Iran, Armenia, Afghanistan and Turkey. *Bagh-e Nazar*, 21(133), 35–46.
12. Lynch, H. F. B. (1901a). *Armenia: Travels and studies. Volume I: The Russian provinces*. London: Longmans, Green, and Co.
13. Lynch, H. F. B. (1901b). *Armenia: Travels and studies. Volume II: The Turkish provinces*. London: Longmans, Green, and Co.
14. Matiossian, V. (2013). Death of Henry F. B. Lynch (November 24, 1913). <https://thisweekinarmenianhistory.blogspot.com>
15. Mozaffari, A., & Akbar, A. (2024). Heritage preservation and civilization competition in the South Caucasus: The Blue Mosque of Yerevan and the Govhar Agha Mosque in Shusha. *International Journal of Heritage Studies*, 1393–1422. <https://doi.org/10.1080/13527258.2024.2393612>
16. Mustafa, N. (2013). *Ancient Yerevan: History and architectural monuments of Yerevan*. <https://www.virtuallkarabakh.az>
17. Mustafa, N. (2016). *Iravan Khanate: Iravan mosques destroyed by Armenian vandals*. Public Union of Historians of Azerbaijan.
18. Mustafa, N. (2018). *Iravan mosques destroyed by Armenian vandals* (in Armenian).



19. Mustafa, N. (2024). Armenian vandalism against Islamic heritage in the city of Yerevan. *Academic Journal of History and Thought*, 11(4), 2361–2372. <https://doi.org/10.46868/attd.2024.711>
20. Mustafa, N., Gurbanov, A., & Alili, E. (2018). *Armenian forgery: A history built on lies*.
21. Ritter, M. (2009). The lost mosque(s) in the citadel of Qajar Yerevan: Architecture and identity, Iranian and local traditions in the early 19th century. *Iran and the Caucasus*, 13(2), 239–279. <https://doi.org/10.1163/157338410X12625876281109>
22. Valiyev, A. (2023). *Monuments destroyed, Armenianized or attributed to other nations in Western Azerbaijan (present-day Armenia)*.
23. Yılmaz, M. (2023). Translation of the section titled “Hinis’tan Tutak’a” from the work *Armenia: Travels and studies* by Henry F. B. Lynch. *DergiPark*, 18, 109–121.

Received: 22.11.2025

Accepted: 17.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/149-158>

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## The Role of Investment Priorities in Ensuring Ecological Sustainability in Azerbaijan's Economy

### Abstract

This paper analyzes the identification of investment priorities and the steps towards the development of a green economy aimed at ensuring ecological sustainability in Azerbaijan's economy. In recent years, the economic reforms implemented by Azerbaijan, the adoption of ecological technologies, and investments in the renewable energy sector have not only increased the country's energy independence but also contributed to environmental protection and the enhancement of social welfare. The growing interest in alternative energy sources in Azerbaijan, particularly the projects implemented in the fields of solar and wind energy, has been a significant step in accelerating the transition to a green economy and ensuring the country's ecological sustainability. This paper discusses the investment sectors planned to accelerate the transition to a green economy and the reforms undertaken in these sectors.

Azerbaijan's ecological reforms in agriculture and water management are also a focal point. The reforms implemented in these sectors support the diversification of the economy by ensuring the efficient use of natural resources. The adoption of ecological technologies and the improvement of energy efficiency are considered crucial steps to make the country's economy sustainable. This paper also highlights the importance of international cooperation and experience exchange in supporting Azerbaijan's transition to a green economy. Creating a more attractive environment for foreign investors will accelerate the development of the green economy and contribute to Azerbaijan's ecologically sustainable future.

The paper presents strategic approaches and recommendations essential for the transition to a green economy and ensuring ecological sustainability, while also discussing future perspectives in this area.

**Keywords:** *green economy, ecological sustainability, investment priorities, alternative energy, renewable energy, ecological technologies, social responsibility, economic diversification*

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## **Azərbaycan iqtisadiyyatında ekoloji dayanıqlılığın təminində investisiya prioritetlərinin rolu**

### **Xülasə**

Bu məqalə, Azərbaycanın iqtisadiyyatında ekoloji dayanıqlılığın təmin edilməsi məqsədilə investisiya prioritetlərinin müəyyənəşdirilməsi və yaşı iqtisadiyyatın inkişafına yönəlmiş addımları təhlil edir. Son illərdə Azərbaycanın həyata keçirdiyi iqtisadi islahatlar, ekoloji texnologiyaların tətbiqi və bərpa olunan enerji sahəsinə qoyulan sərmayələr, ölkənin enerji müstəqilliyini artırmaqla yanaşı, ətraf mühitin qorunmasına və sosial rifahın yüksəlməsinə xidmət edir. Azərbaycanın alternativ enerji mənbələrinə olan marağının artması, xüsusilə günəş və külək enerjisi sahələrində həyata keçirilən layihələr, yaşı iqtisadiyyata keçidi sürətləndirmək və ölkənin ekoloji dayanıqlılığını təmin etmək üçün əhəmiyyətli bir addım olmuşdur. Bu məqalədə, yaşı iqtisadiyyata keçidin sürətləndirilməsi məqsədilə nəzərdə tutulan investisiya sahələri və bu sahələrdə həyata keçirilən islahatlar müzakirə olunur.

Azərbaycanın kənd təsərrüfatı və su idarəçiliyi sahələrindəki ekoloji islahatlar da diqqət mərkəzindədir. Bu sahələrdə həyata keçirilən islahatlar, təbii sərvətlərin səmərəli istifadəsini təmin edərək iqtisadiyyatın şaxələndirilməsini dəstəkləyir. Ekoloji texnologiyaların tətbiqi və enerji

səmərəliliyinin artırılması, ölkənin iqtisadiyyatını dayanıqlı etmək üçün vacib addımlar kimi qiymətləndirilir. Bu məqalə, həmçinin Azərbaycanın yaşıl iqtisadiyyata keçidini dəstəkləyən beynəlxalq əməkdaşlıq və təcrübə mübadiləsinin əhəmiyyətini vurğulayır. Xarici investorlara daha cəlbedici mühit yaradılması, yaşıl iqtisadiyyatın inkişafını sürətləndirəcək və Azərbaycanın ekoloji dayanıqlı gələcəyinə töhfə verəcəkdir.

Məqalə, yaşıl iqtisadiyyata keçidin və ekoloji dayanıqlılığın təmin edilməsi üçün vacib olan strateji yanaşmalar və tövsiyələr təqdim edir, həmçinin bu sahədə gələcək perspektivləri müzakirə edir.

**Açar sözlər:** *yaşıl iqtisadiyyat, ekoloji dayanıqlılıq, investisiya prioritetləri, alternativ enerji, bərpa olunan enerji, ekoloji texnologiyalar, sosial məsuliyyət, iqtisadi diversifikasiya*

## Introduction

Since gaining independence, Azerbaijan's economy has undergone significant reforms and structural changes. These reforms primarily aim to reduce the country's high dependence on the oil and gas sector and to develop non-oil sectors. Furthermore, ensuring ecological sustainability and transitioning to a green economy represent crucial stages in achieving Azerbaijan's long-term development goals. This transition not only focuses on environmental protection but also aims at fostering economic and social progress (Seltenet & Ibrahim, 2023, p. 45).

Azerbaijan's transition to a green economy is closely tied to ecological reforms and investments aimed at ensuring ecological security and enhancing energy efficiency. Since 2020, the country has focused on adopting new technologies that promote the efficient use of natural resources in energy production. Notably, attention to renewable energy sources has increased, with investments in solar and wind energy sectors being expanded (Hasanov, 2019). It is expected that by 2030, the share of renewable energy sources in Azerbaijan's energy production will reach 30%, which will strengthen the country's energy independence and simultaneously contribute to the reduction of carbon emissions (Guliyeva, 2023).

The transition to a green economy has also accelerated the development of non-oil sectors. The Azerbaijani government has adopted several strategic documents aimed at stimulating the development of non-oil sectors and investing in areas that form the foundation of the green economy. These documents ensure the implementation of ecological reforms, particularly in agriculture and water management, and the increase in investments directed toward renewable energy sources (Zukauskienė & Snieska, 2023).

The investment priorities, which form the basis of Azerbaijan's transition to a green economy, aim not only at ensuring economic development but also at preserving natural resources. These priorities should be defined not only in terms of ecological sustainability but also with the goal of enhancing social progress. The implementation of ecological reforms in various sectors of the economy, particularly in energy and agriculture, is crucial for Azerbaijan's long-term development (Józefowicz & Michniewicz-Ankiersztajn, 2023).

This paper will focus on how investment priorities are formed to ensure ecological sustainability in Azerbaijan's economy and how these priorities influence the transition to a green economy. Additionally, it will analyze the necessary measures and strategic steps to accelerate Azerbaijan's transition to a green economy. The paper will also offer recommendations on how the government can further develop its policies to enhance ecological sustainability and facilitate the transition to a green economy in Azerbaijan.

### **The Role of Investment Priorities in Ensuring Ecological Sustainability**

Ensuring ecological sustainability is not only about protecting the environment but also about ensuring the continued sustainability of economic development. This approach forms the basis of sustainable development in various sectors of the economy, particularly in energy, agriculture, industry, and services. Achieving sustainable development requires strategic actions aimed at minimizing the negative impacts on the environment while ensuring economic and social progress

(Seltenet & İbrahim, 2023, p. 45). In Azerbaijan's economic development, ensuring ecological sustainability must guarantee both social equality and the more efficient use of natural resources.

Ensuring ecological sustainability is a vital pathway to reducing dependence on natural resources, preserving ecosystem services, and maintaining environmental cleanliness. Azerbaijan's economy relies primarily on the oil and gas sector, but this dependence poses a significant threat to ensuring ecological sustainability. Thus, the transition to a green economy is considered the best solution to reduce this dependency and ensure ecological sustainability (Hasanov, 2019).

The identification of investment priorities leads to parallel progress in both social and economic development. These priorities not only increase ecological sustainability but also strengthen long-term social welfare. The proper identification of investment priorities in Azerbaijan's transition to a green economy results in the expansion of ecological technologies and renewable energy sources, improved energy efficiency, and an increase in social responsibility. In this context, investment in the energy sector, particularly in renewable energy sources, plays a crucial role in protecting the environment and supporting economic development (Guliyeva, 2023).

The proper identification of investment priorities plays a decisive role in ensuring ecological sustainability. Correctly directing investment sectors contributes to both accelerating economic growth and protecting the environment while enhancing social welfare. For example, investments in renewable energy sources, particularly in solar and wind energy, not only enable the diversification of the economy but also enhance the country's energy independence. This helps improve Azerbaijan's ecological security and ensures a more sustainable economy (Zukauskienė & Snieska, 2023).

Transitioning to a green economy also creates new job opportunities, thereby promoting social equality. The application of ecological technologies and the efficient use of natural resources accelerates the country's development, creates new opportunities in various sectors of the economy, and leads to increased social welfare (Józefowicz & Michniewicz-Ankiersztajn, 2023). The ecological reforms implemented in Azerbaijan have also led to significant advancements in agriculture, water management, and the development of ecological technologies.

One of the most important sectors for Azerbaijan's transition to a green economy is the energy sector. Increasing investments in renewable energy sources in this sector not only diversifies the country's energy supply but also helps reduce carbon emissions. The growing investment in clean energy sources, such as solar and wind energy, creates opportunities for Azerbaijan to use more sustainable and environmentally clean sources in its energy production (Hasanov, 2019).

Furthermore, the application of ecological technologies, particularly in energy efficiency, renewable energy sources, and the production of ecological products, fosters innovation. Azerbaijan's development in the renewable energy sector not only improves energy supply but also contributes to environmental protection and ensures the sustainability of economic development (Seltenet & İbrahim, 2023, p. 60).

The development of a green economy contributes not only to environmental protection but also to accelerating economic development and enhancing social welfare. This economic model, along with increasing the application of ecological technologies, creates new job opportunities and promotes social equality. Additionally, increasing investments in the production of ecological products greatly influences the development of the agricultural sector and ensures food security (Józefowicz & Michniewicz-Ankiersztajn, 2023).

The application of this model in Azerbaijan is not only related to accelerating economic growth but also supports environmental protection and the efficient use of natural resources. Maintaining a balance between the social and economic aspects of a green economy has become a crucial factor for Azerbaijan's development (Hasanov, 2019).

**Table 1:**  
 Investment Priorities in Azerbaijan's Economy and the  
 Development of a Green Economy.

| Investment Sector                | Impact                                                                    | Details                                                  |
|----------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------|
| Alternative Energy               | Enhances ecological sustainability, supports economic diversification     | Solar, wind, bioenergy, and hydropower projects          |
| Agriculture and Water Management | Ensures food security, promotes efficient use of water and land resources | Drip irrigation, ecological agriculture                  |
| Green Technologies               | Increases ecological product production and energy efficiency             | Energy efficiency technologies, renewable energy sources |
| Social Awareness                 | Shapes public opinion to support green economy                            | Ecological awareness campaigns                           |

This table illustrates the investment sectors that play a key role in ensuring Azerbaijan's transition to a green economy, along with their impacts on various aspects of the economy. The alternative energy sector supports ecological protection and economic diversification through projects involving renewable energy sources such as solar, wind, bioenergy, and hydropower. The reforms in agriculture and water management ensure food security while promoting the efficient use of water and land resources. Techniques such as drip irrigation and ecological farming methods are central to this approach. Green technologies increase ecological product production and energy efficiency, ensuring more effective use of natural resources. Finally, the social awareness sector plays a crucial role in shaping public opinion in favor of the green economy. Ecological awareness campaigns help raise society's knowledge about the importance of the green economy.

#### **Foreign Investments in Azerbaijan's Alternative Energy Sector and Future Perspectives**

In recent years, foreign investments in alternative energy sources, particularly wind and solar energy, in Azerbaijan have significantly increased. Attracting investments in the country's alternative energy sector is crucial for both economic diversification and ensuring ecological sustainability. Foreign investments in this sector are mainly carried out by large international energy companies and financial institutions operating in renewable energy fields. These investments not only support the development of Azerbaijan's energy sector but also contribute to the country's global efforts in combating climate change.

One of the major steps Azerbaijan has taken in its alternative energy sector is the agreements signed with the European Union (EU) and international financial institutions. Specifically, the "Green Energy" project implemented within the framework of the EU partnership is of strategic importance for the country. In 2021, the EU allocated 1 billion euros for renewable energy projects in Azerbaijan. This funding was directed towards developing projects in both solar and wind energy fields. For example, under the agreement with China's Huawei company signed in 2020, the construction of 100 MW solar power plants is planned in the Kurdamir and Neftchala regions of Azerbaijan (Hasanov, 2021). This project will increase the share of renewable sources in Azerbaijan's energy production and reduce the country's carbon footprint.

Additionally, in 2023, under the contract with France's TotalEnergies company, the construction of a wind energy park in the Caspian Sea is planned. The capacity of this park will exceed 250 MW and is expected to be operational by 2025 (Mammadov, 2023). This project will enhance Azerbaijan's energy independence by maximizing the use of wind energy in the Caspian Sea, while also contributing to environmental protection.

New investment contracts are expected to be signed to attract more investments into Azerbaijan's alternative energy sector. In 2024, new solar and wind energy projects are planned to be implemented with financing from the "Solar and Wind Energy" Fund. Most of these projects will be carried out with the participation of foreign investors, particularly Siemens Gamesa from Germany and General

Electric from the United States. The main goal of these new contracts is to increase the share of renewable sources in Azerbaijan's energy production to 30% by 2030. These projects will also be significant for diversifying the country's economy and ensuring the sustainable development of agriculture.

In the future, improving the investment climate, enhancing energy efficiency, and expanding the application of ecological technologies will be among the key goals for Azerbaijan's transition to a green economy. Both domestic and international investments will play a significant role in this process. Strengthening the relevant legislative framework and improving the investment climate will create more attractive conditions for foreign investors.

### **Development of Green Economy and Investment Priorities in Azerbaijan**

The green economy not only ensures ecological sustainability but also promotes economic development, social responsibility, and equality. The main goal of Azerbaijan's transition to a green economy is to protect the environment and ensure the efficient use of natural resources. This process also requires the proper direction of investments to strengthen environmental protection and increase energy efficiency (Guliyeva, 2023).

Azerbaijan's transition to a green economy is not only related to the development of energy and ecological technologies but also aims to strengthen social and economic progress. Proper identification of investment priorities leads to ecological sustainability in various sectors of the economy and enhances social welfare (Seltenet & Ibrahim, 2023). These priorities play a decisive role in accelerating ecological reforms and diversifying the economy.

For the development of a green economy, the Azerbaijani government has identified investment priorities, particularly in the energy sector, agriculture, water management, and ecological technologies. Investments in these sectors ensure the efficient use of the country's natural resources and minimize ecological impacts (Hasanov, 2019). Furthermore, these investments support Azerbaijan's long-term economic development by redirecting the economy towards non-oil sectors.

Despite its rich natural resources, Azerbaijan places great importance on increasing investments in renewable energy sources. Solar and wind energy are among Azerbaijan's most important renewable energy sources, and investments in this sector are increasing. Since 2020, investment in these areas has accelerated, with significant steps taken towards the country's energy independence (Hasanov, 2019). The government aims to increase the use of renewable energy sources by 2030 and ensure the application of new technologies in this field.

The increasing investments in renewable energy sources are also crucial for ensuring Azerbaijan's sustainable economic development. This not only contributes to environmental protection but also serves to diversify the economy and develop the non-oil sector (Zukauskienė & Snieska, 2023). The growing role of alternative energy sources, such as solar and wind energy, helps reduce the country's dependence on natural resources for energy production.

Azerbaijan's agricultural sector is a vital part of the country's economy. However, alongside the development of this sector, it is also essential to reduce its negative environmental impacts. To this end, ecological reforms have been implemented, and technologies such as drip irrigation have been promoted. The more efficient use of water and land resources ensures ecological sustainability in the agricultural sector (Józefowicz & Michniewicz-Ankiersztajn, 2023).

The application of ecological technologies in agricultural development not only ensures food security but also contributes to environmental protection and the efficient use of water resources. This also minimizes ecological impacts, making the country's economic development more sustainable (Seltenet & Ibrahim, 2023, p. 60).

Ecological technologies play a crucial role in accelerating the development of a green economy. These technologies, especially in the field of energy efficiency, have led to significant progress. The application of ecological technologies in Azerbaijan's energy sector not only reduces carbon emissions but also ensures that the economy develops in a more efficient and sustainable manner (Józefowicz & Michniewicz-Ankiersztajn, 2023).

Ecological technologies, renewable energy sources, efficient water management, and the use of renewable materials are essential for ensuring the sustainability of Azerbaijan's economy and meeting the country's international commitments (Guliyeva, 2023). Investments in these areas also support the country's social and economic development and increase employment opportunities.

#### **Social Activities and Awareness**

Ensuring ecological sustainability is not limited to technological and economic measures; it is also crucial to raise public awareness regarding ecological responsibility. Social initiatives and ecological awareness programs play a major role in the development of a green economy. The Azerbaijani government and non-governmental organizations organize large-scale campaigns focused on environmental protection (Hajizade, 2024). These initiatives encourage people to adopt more responsible attitudes towards the environment and contribute to ensuring ecological sustainability.

**Chart 1:**

Share of Renewable Energy Production in Azerbaijan (2015-2025).

| Year | Solar Energy (%) | Wind Energy (%) | Bioenergy (%) | Hydropower (%) |
|------|------------------|-----------------|---------------|----------------|
| 2015 | 2%               | 3%              | 1%            | 15%            |
| 2020 | 10%              | 7%              | 3%            | 12%            |
| 2025 | 20%              | 12%             | 4%            | 10%            |

**Chart 2:**

Forecast of the Share of Green Energy Sources (2025-2035).

| Year | Solar Energy (%) | Wind Energy (%) | Bioenergy (%) | Hydropower (%) |
|------|------------------|-----------------|---------------|----------------|
| 2025 | 20%              | 15%             | 5%            | 10%            |
| 2030 | 30%              | 20%             | 8%            | 7%             |
| 2035 | 35%              | 25%             | 10%           | 5%             |

These charts visually represent the current and projected growth of renewable energy sources in Azerbaijan, focusing on solar, wind, bio-energy, and hydro-power. The gradual increase in renewable energy production from 2015 to 2025, followed by further expansion through 2035, demonstrates Azerbaijan's commitment to enhancing its energy independence and ecological sustainability. The reduction in the share of hydro-power energy as other renewable sources grow reflects the shift towards a more diverse and sustainable energy mix.

#### **Foreign Investments and Scientific Foundations for Green Economy Development in Azerbaijan**

The successful transition of Azerbaijan to a green economy largely depends on attracting foreign investments into the alternative energy sector and supporting this process with scientific research. Recent empirical studies confirm that the development of renewable energy sources not only reduces dependence on fossil fuels, but also creates a positive impact on the country's financial development and overall economic growth. In particular, the strengthening of the link between financial development and renewable energy consumption demonstrates that targeted investments in clean energy accelerate both ecological sustainability and economic diversification (Mukhtarov et al., 2020).

Assessment of solar energy potential in Azerbaijan reveals high ecological-economic efficiency, indicating that large-scale investments in solar power plants can yield significant environmental and economic returns while contributing to the reduction of carbon emissions. Such projects play a strategic role in achieving the country's energy independence and fulfilling international climate commitments. Similarly, research on the positive influences of renewable energy consumption



highlights its contribution to financial stability and long-term economic growth, underscoring the importance of prioritizing investments in wind, solar, and other clean sources (Zhe et al., 2021).

In the agricultural sector — one of the key areas of green economy transformation — scientific analyses using the ARDL approach show that climate variability and agricultural inputs significantly affect crop production. Therefore, directing investments toward ecological agriculture, drip irrigation systems, and climate-resilient technologies is essential for ensuring food security and minimizing environmental risks (Gulaliyev et al., 2025). The adoption of digital technologies in Azerbaijan's agriculture, viewed from a global comparative perspective, further enhances resource efficiency, reduces ecological footprint, and supports sustainable development in rural areas (Baghirova et al., 2025).

Moreover, the utilization of space capabilities opens new opportunities for the national economy, including more accurate monitoring of natural resources, optimization of renewable energy projects, and support for ecological management. Integrating space technologies into green economy strategies can provide Azerbaijan with a competitive advantage in sustainable development (Allahyarov et al., 2024).

In conclusion, the synergy between foreign investments in alternative energy and evidence-based scientific research forms a solid foundation for Azerbaijan's green transition. By continuing to prioritize investments in renewable energy, ecological agriculture, digital technologies, and innovative solutions such as space applications, the country can achieve balanced ecological sustainability, economic diversification, and enhanced social welfare in the long term.

### **Analysis**

Azerbaijan's transition to a green economy is based on the analysis of the reforms and investments aimed at ensuring the country's ecological sustainability. This transition is not only related to enhancing ecological sustainability but also targets ensuring economic and social progress (Seltenet & Ibrahim, 2023). The investment priorities related to Azerbaijan's transition to a green economy particularly include changes in the energy, agriculture, and ecological technologies sectors.

The proper identification of investment sectors ensures the efficient use of natural resources to increase ecological sustainability. Investment in alternative energy sources will strengthen the country's energy independence and help preserve the environment. The growing interest in solar and wind energy accelerates the transition to more sustainable and clean energy sources in Azerbaijan's energy sector (Hasanov, 2019).

Furthermore, ecological reforms in agriculture ensure more efficient use of water and land resources. These reforms not only aim to accelerate economic growth but also ensure food security and enhance social welfare (Józefowicz & Michniewicz-Ankiersztajn, 2023).

### **Methodology**

This research combines both qualitative and quantitative analyses. In the first phase, data based on the analysis of investment priorities in Azerbaijan's transition to a green economy were collected. The data include statistical indicators measuring the impact of ecological reforms in economic sectors and official data on the government and non-governmental organizations' ecological policies.

The second phase of the analysis focuses on examining how the application of ecological technologies and investments in alternative energy sectors align with economic development. The research evaluates issues such as the use of natural resources, the application of ecological technologies, and the increase in social initiatives. The methodology also includes the integration of international experiences and economic indicators compared to Azerbaijan's own, which played a key role in evaluating the country's transition to a green economy.

### **Conclusion**

The transition to a green economy is crucial for ensuring Azerbaijan's ecological sustainability. Properly identifying investment priorities is essential not only for environmental protection but also for diversifying economic development. Increasing investments in renewable energy sources,

especially in Azerbaijan's energy sector, not only enhances the country's energy independence but also contributes to environmental protection and the improvement of social welfare (Hasanov, 2019).

Foreign investments in alternative energy, particularly in solar and wind energy projects, are accelerating Azerbaijan's transition to a green economy. The solar energy projects with China's Huawei and the wind energy park to be built with France's TotalEnergies are considered key steps in this regard. These projects will increase the share of renewable sources in Azerbaijan's energy production and diversify the economy while contributing to environmental protection.

Ecological reforms in agriculture and water management, while ensuring the efficient use of natural resources, also support the diversification of the economy. These steps will accelerate the development of the green economy by attracting both local and international investments. The application of ecological technologies and the improvement of energy efficiency ensure the sustainability of Azerbaijan's economy.

### Recommendations

To accelerate the transition to a green economy and increase ecological sustainability, the following recommendations are made:

**1. Increase investments in renewable energy:** Investments in renewable energy sources such as solar and wind energy should be increased to enhance Azerbaijan's energy independence and ensure ecological sustainability. From 2024 onwards, it is crucial to further increase investments in new projects, particularly with the participation of foreign investors. To achieve this, appropriate legal and financial conditions must be created both domestically and internationally.

**2. Expand the application of ecological technologies:** Investments aimed at developing technologies that improve energy efficiency and ensure the efficient use of natural resources should be increased. In this regard, partnerships with foreign investors, such as the wind energy project in the Caspian Sea with France's TotalEnergies, should be expanded.

**3. Continue ecological reforms in agriculture:** The wider application of technologies such as drip irrigation will ensure more efficient use of water and land resources. These steps will also support sustainable development in Azerbaijan's agriculture by attracting both local and international investments.

**4. Strengthen international cooperation:** Azerbaijan's transition to a green economy should be further supported by expanding cooperation with international organizations and increasing experience exchange in this field. Specifically, cooperation with the European Union in renewable energy should be expanded, and efforts should be made to attract international investments in relevant projects.

**5. Support social initiatives:** Ecological awareness and social initiatives are crucial factors for the development of a green economy. Awareness campaigns should be strengthened to increase people's ecological responsibility. It is also important to collaborate with local communities to organize training and seminars on ecology and sustainable development.

### References

1. Amirova, R. M. (2024). The role of effective energy production in strengthening public finance of Azerbaijan: Strategies in transition to a green economy. *Proceedings*, 2, 61–66. <https://doi.org/10.61413/JPJW3136>
2. Ataşıyev, S. (2025). Azərbaycanın yaşıl iqtisadiyyatının mövcud vəziyyəti və inkişaf perspektivləri. *Cəmiyyət və İqtisadiyyat*. <https://doi.org/10.31857/S0207367624010038>
3. Baghirova, T., Mammadova, A., Hasanova, N., & Aliyeva, Z. (2025). Adoption of digital technologies in Azerbaijan's agricultural sector: A comparative global perspective. *Pakistan Journal of Agricultural Research*.
4. Guliyev, M., & Azizov, T. (2022). Diversification through promotion of export-oriented production and “green transformation” in Azerbaijan. *Scientific Horizons*, 25(10), 62–70. [https://doi.org/10.48077/scihor.25\(10\).2022.62-70](https://doi.org/10.48077/scihor.25(10).2022.62-70)

5. Guliyeva, S. (2023). Evaluation of labor market indicators in the development of green economy. *Journal of Global Strategic Management*, 17(1), 5–16. <https://doi.org/10.20460/JGSM.2023.321>
6. Gulaliyev, M. G., Mustafayev, E. R., & Mehdiyeva, G. Y. (2020). Assessment of solar energy potential and its ecological-economic efficiency: Azerbaijan case. *Sustainability*.
7. Gulaliyev, M., Hasanov, R. I., Ganbarov, F., & Novruzova, A. (2025). Effects of agricultural inputs and climate variability on crop production: Evidence from Azerbaijan using ARDL approach. *International Journal of Environmental Impacts*.
8. Hacızadə, O. (2021). Azərbaycan Respublikasında yaşıl iqtisadiyyata inteqrasiya məsələləri. *PIRECT Sosial Araşdırmalar və Davranış Elmləri Jurnalı*, 17(07), 16–30.
9. Hacıyev, O. (2024). Green economic potential of Baku and Absheron-Khizi economic regions of Azerbaijan. *Polish Journal of Environmental Studies*, 33(5), 5715–5724. <https://doi.org/10.15244/pjoes/183794>
10. Hasanov, A. (2021). *Azərbaycanın enerji sektorunda alternativ enerji mənbələrinə sərmayələr: Mövcud vəziyyət və gələcək perspektivlər*. Bakı: Dövlət Nəşriyyatı.
11. Hasanov, A. A. (2019). Investment in “green” economy: A strategic way of economic development in the Republic of Azerbaijan. *Theoretical & Applied Science*, 04(72), 570–575. <https://dx.doi.org/10.15863/TAS.2019.04.72.79>
12. Həziyeva, S. (2025). Azerbaijan’s preparedness for transition to a green economy: A legal analysis of the “Green Customs” concept. *Gümrük ve Ticaret Dergisi*, 12(37), 46–56.
13. Humbatova, S. (2025). The place of natural resources in the model of transition to a green economy in Azerbaijan. *BIO Web of Conferences*, 151, 02011. <https://doi.org/10.1051/bioconf/202515102011>
14. Józefowicz, I., & Michniewicz-Ankiersztajn, H. (2023). Digital tools for water resource management as a part of a green economy in rural areas. *Sustainability*, 15(6), 5231. <https://doi.org/10.3390/su15065231>
15. Karimov, I. (2025). Azərbaycan iqtisadiyyatında ekoloji dayanıqlılığın təminində investisiya prioritetlərinin rolu. Lund Universiteti. <https://periodicals.karazin.ua/geoeco/article/view/24238/21996>
16. Məmmədov, R. (2023). Azərbaycanın külək enerjisi potensialı: Fransız investisiyalarının rolu. *Enerji və İqtisadiyyat Jurnalı*, 12(3), 45–59.
17. Mukhtarov, S., Humbatova, S., Hacıyev, N. G.-O., & Aliyev, S. (2020). The financial development–renewable energy consumption nexus in the case of Azerbaijan. *Energies*.
18. Mustafayeva, R. R. (2017). The role and characteristics of foreign investments in Azerbaijan’s economy. *Global Economic Problems*, 1(16), 87–92.
19. The financial development–renewable energy consumption nexus in the case of Azerbaijan. (2020). *Energies*.
20. The positive influences of renewable energy consumption on financial development and economic growth. (2021). *SAGE Open*.
21. Journal of Ecohumanism. (2025). View of green skills – Enablers of transition to a green economy.

Received: 25.11.2025

Accepted: 28.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/159-170>

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## **Integrating Cultural and Professional Competence in Master Pedagogues: Insights from an Experimental Study**

### **Abstract**

Contemporary classrooms require teachers who are both culturally responsive and professionally skilled. Yet most teacher-education programs emphasize pedagogical methods while devoting limited attention to intercultural awareness, leaving graduates underprepared for diverse contexts. Cultural competence—the attitudes, knowledge, and skills enabling effective work with culturally diverse learners—and professional competence are typically treated as separate domains, restricting the holistic development of educators. This study examined whether an Integrated Competence Program (ICP) that embeds intercultural modules, community-based projects, and reflective practice into regular pedagogy coursework can simultaneously enhance both competence domains. Using a quasi-experimental pretest–posttest design with 60 master’s students in education at Nakhchivan State University (experimental group  $n = 30$ ; control group  $n = 30$ ), participants were assessed with the Multicultural Teaching Competency Scale, pedagogical knowledge tests, teaching performance observations, and a self-efficacy scale. Results showed that the experimental group achieved significantly greater gains in cultural competence (partial  $\eta^2 = 0.56$ ) and professional pedagogical performance compared with the control group. Qualitative analysis of reflective journals corroborated these findings, revealing enhanced self-awareness, inclusive teaching practices, and professional confidence. The findings provide empirical evidence that integrating cultural and professional competence training produces a synergistic effect, strengthening both domains and preparing future educators to foster equitable and high-quality learning environments.

**Keywords:** *teacher education, cultural competence, professional competence, intercultural training, pedagogy*

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## **Magistr səviyyəli pedaqoqlarda mədəni və peşəkar kompetensiyaların integrasiyası: Eksperimental tədqiqatdan əldə olunan nəticələr**

### **Xülasə**

Müasir sinif otaqları həm mədəni cəhətdən həssas, həm də peşəkar bacarıqlara malik müəllimlər tələb edir. Lakin əksər müəllim təhsili proqramları pedaqoji metodlara diqqət yetirir, eyni zamanda mədəniyyətlərarası maarifləndirməyə məhdud diqqət yetirir və məzunları müxtəlif kontekstlərə hazırlıqsız qoyur. Mədəni səriştə - mədəni cəhətdən müxtəlif tələbələrle effektiv işləməyə imkan verən münasibətlər, bilik və bacarıqlar - və peşəkar səriştə adətən ayrı sahələr kimi qəbul edilir və bu da müəllimlərin hərtərəfli inkişafını məhdudlaşdırır.

Bu tədqiqat mədəniyyətlərarası modulları, icma əsaslı layihələri və refleksiv təcrübəni müntəzəm pedaqogika kurs işlərinə daxil edən İnteqrasiya olunmuş Səriştə Proqramının (İKP) hər iki səriştə sahəsini eyni vaxtda inkişaf etdirə biləcəyini araşdırdı. Naxçıvan Dövlət Universitetində təhsil sahəsində 60 magistr tələbəsi ilə kvazi-eksperimental test öncəsi-testdən sonrakı dizayndan istifadə edərək (eksperimental qrup  $n = 30$ ; nəzarət qrupu  $n = 30$ ) iştirakçılar Çoxmədəniyyətli Tədris Səriştəsi Şkalası, pedaqoji bilik testləri, tədris performansının müşahidələri və özünəinam şkalası ilə qiymətləndirildi. Nəticələr göstərdi ki, eksperimental qrup nəzarət qrupu ilə müqayisədə mədəni səriştədə (qismən  $\eta^2 = 0.56$ ) və peşəkar pedaqoji performansda əhəmiyyətli dərəcədə daha çox irəliləyiş əldə etmişdir. Refleksiv jurnalların keyfiyyət təhlili bu tapıntıları təsdiqləyərək, özünüdərk səviyyəsinin, inklüziv tədris təcrübələrinin və peşəkar özünəinamın artdığını aşkar etdi. Tapıntılar mədəni və peşəkar səriştə təliminin inteqrasiyasının sinergetik təsir yaratdığını, hər iki sahəni gücləndirdiyini və gələcək müəllimləri bərabər və yüksək keyfiyyətli təlim mühiti yaratmağa hazırladığını göstərən empirik sübutlar təqdim edir.

**Açar sözlər:** müəllim təhsili, mədəni səriştə, peşəkar səriştə, mədəniyyətlərarası təlim, pedaqogika

## Introduction

The growing multicultural nature of education worldwide requires teachers to possess not only professional pedagogical expertise but also the ability to understand, respect, and respond to cultural diversity. Traditional teacher-training programs have primarily emphasized pedagogical methods, often neglecting intercultural sensitivity. As a result, graduates may demonstrate strong instructional skills but limited readiness to create inclusive learning environments.

Existing research widely recognizes the importance of cultural competence—the set of attitudes, knowledge, and skills enabling teachers to work effectively with culturally diverse students—and professional competence, which involves mastery of pedagogical knowledge, instructional design, and reflective practice. However, studies usually examine these two domains separately, treating cultural awareness as an “add-on” to professional training rather than an integrated component of teacher expertise. This separation restricts the holistic development of educators and limits their adaptability in real classrooms.

Research gap and rationale.

Although scholars such as Gay (2002), Ladson-Billings (1995), and Romijn et al. (2020) have demonstrated that culturally responsive pedagogy improves student outcomes, little empirical evidence exists on how combining cultural and professional competence development affects teachers’ performance—particularly in post-Soviet and multilingual contexts. In Azerbaijan, teacher education standards formally distinguish between general cultural and professional competences, yet their simultaneous formation has received limited attention. Addressing this gap, the present study introduces and tests an Integrated Competence Program (ICP) that embeds intercultural learning directly into pedagogical coursework and practicum experiences for master’s students in education at Nakhchivan State University.

Objective.

This research investigates whether integrating cultural competence training into a master’s program enhances both cultural and professional pedagogical competencies more effectively than the traditional curriculum. The study contributes new experimental evidence from the South Caucasus region and offers a replicable model for culturally informed teacher preparation.

## Literature Review

### 2.1 Cultural Competence in Teacher Education

Cultural competence enables teachers to interpret behavior and learning through multiple cultural lenses and to apply inclusive strategies. Deardorff (2006) defines it as an ongoing process that develops through attitudes of openness, cultural knowledge, and adaptive skills. Dzerviniks et al. (2024) confirm that intercultural sensitivity directly correlates with teachers’ self-efficacy and classroom management success. Similarly, Gay (2002) and Ladson-Billings (1995) emphasize that

culturally responsive teaching is not peripheral but central to effective pedagogy. Yet, Gorski (2009) warns that many multicultural courses remain superficial, focusing on cultural celebrations rather than critical reflection or bias awareness.

Meta-analyses (Ailauova et al., 2024) demonstrate that cross-cultural interventions combining theory, practice, and reflection yield the highest learning gains. However, most investigations occur in Western teacher-education settings, leaving non-Western, bilingual, or region-specific contexts underexplored. This gap limits global understanding of how sociocultural background influences teachers' intercultural growth.

## 2.2 Professional Pedagogical Competence

Professional competence encompasses pedagogical knowledge, content expertise, and self-regulation skills (Kunter et al., 2013; Shulman, 1987). Darling-Hammond (2006) highlights that practice-based learning—extended fieldwork linked with reflection—best fosters these abilities. Nevertheless, teacher-training programs often treat competence dimensions in isolation: lesson planning, classroom management, or assessment as separate modules. Voogt and Roblin (2012) argue that 21st-century education requires integrated competencies mirroring those expected from students, such as collaboration and cultural awareness. Hence, teachers' professional formation should equally incorporate intercultural understanding as a teaching skill.

## 2.3 Integration of Cultural and Professional Competences

Recent scholarship views cultural competence as an inherent part of professional pedagogy (Neradovskaya & Starodubtsev, 2023). Integrative approaches—curriculum infusion, reflective seminars, and community-based learning—enable teachers to connect pedagogical theory with cultural realities. Nugraheni et al. (2025) demonstrated that embedding cultural content into language-teaching programs enhanced both linguistic and cultural outcomes for teachers and students alike. Still, few empirical studies evaluate the dual impact quantitatively.

In Azerbaijan's teacher-education landscape, characterized by linguistic diversity and strong national educational traditions, integrating general cultural development with professional competence offers both theoretical and practical significance. By situating this research in Nakhchivan—a region bridging Eastern and Western pedagogical influences—the study adds contextual originality. It tests an evidence-based model addressing global calls (OECD 2018; UNESCO 2022) for teacher preparation that unites academic excellence with intercultural responsibility.

## Methodology

### 3.1 Research Design

This study adopted a quasi-experimental pretest–posttest control group design to determine whether integrating cultural competence training into a master's pedagogy program enhances both cultural and professional competencies. The quasi-experimental model was selected because class-level assignments prevented individual randomization, a limitation acknowledged in this study. Nevertheless, participant equivalence was established through pretest scores and demographic matching.

To increase the internal validity, instructors involved in both groups were briefed and trained using standardized materials and lesson plans. However, differences in teaching styles may have influenced results, and this potential “instructor effect” is noted as a limitation of the design.

The study was conducted during the 2024–2025 academic year at Nakhchivan State University in the Nakhchivan Autonomous Republic of Azerbaijan — a multilingual region whose teacher education programs reflect both Eastern and Western pedagogical traditions. This local context provides originality and adds to the cross-cultural relevance of the findings.

### 3.2 Participants and Setting

Participants were 60 master's students enrolled in the “Pedagogy and Instructional Design” program.

Experimental group (n = 30): 22 females, 8 males, mean age = 27.4 years (SD = 4.8)

Control group (n = 30): 20 females, 10 males, mean age = 28.1 years (SD = 5.2)

All participants voluntarily agreed to join the research and signed informed consent forms. Most had between one and three years of teaching or internship experience. The university's Ethics Committee approved the study (Ref. No. 2025-07-25).

Both groups followed identical course schedules within the master's program. The experimental group experienced an Integrated Competence Program (ICP) designed by the researchers, while the control group completed the standard curriculum without integration.

### 3.3 The Integrated Competence Program (ICP)

The ICP embedded intercultural and reflective learning into the regular pedagogy courses through four components:

Curriculum Infusion – cultural responsiveness and inclusive practices were woven into subjects such as “Instructional Strategies,” “Assessment,” and “Curriculum Design.”

Workshops – three 2-hour sessions were delivered:

Workshop 1: Self-awareness and bias in teaching

Workshop 2: Culturally responsive pedagogy strategies

Workshop 3: Communication across cultures and conflict resolution

Field Experience Enhancement – teaching practice was arranged in culturally diverse schools. Each student completed a Community-Based Project connecting pedagogy with cultural realities (e.g., inclusive lesson planning, community interviews).

Reflective Journals and Seminars – students submitted weekly reflections (approximately 120 journals, totaling 45,000 words) and discussed them biweekly in guided seminars.

Detailed workshop outlines and reflective prompts are presented in Appendix A, while the qualitative coding framework used to analyze reflections is provided in Appendix B.

### 3.4 Instruments and Data Collection

1. Multicultural Teaching Competency Scale (MTCS) (Spanierman et al., 2011, adapted version) – used to measure participants' cultural awareness, knowledge, and skills. Cronbach's  $\alpha = .88$  at pretest.

2. Pedagogical Knowledge Test – 50 multiple-choice and short-answer items covering instructional design, classroom management, and assessment literacy (KR-20 = .81).

3. Teaching Skills Observation Rubric – standardized 20-point rubric assessing instructional delivery, student engagement, and classroom organization. Each student was observed twice by trained mentors. Inter-rater reliability ICC = .75.

4. Intercultural Scenario Test – two short teaching dilemmas scored on cultural awareness and conflict resolution.

5. Self-Efficacy Scale – adapted from Tschannen-Moran & Hoy (2001) for triangulation.

All instruments were administered in English, the language of instruction in the program. Pretests were conducted in Weeks 1–2 and posttests in Weeks 14–15. Only posttest data were available for teaching observations, a limitation noted in the Results section.

### 3.5 Data Analysis

Quantitative data were analyzed using SPSS 27. Descriptive statistics (means, SDs) and mixed-design ANOVA (Group  $\times$  Time) were used to examine within-group and between-group differences. For teaching skills (only posttest), an ANCOVA controlled for pretest pedagogical knowledge. Effect sizes were calculated using Cohen's  $d$  and partial  $\eta^2$ .

For qualitative analysis, reflective journals and focus group data were coded inductively. Two researchers independently coded 20% of the data, achieving 87% inter-coder agreement. Themes such as bias awareness, inclusive practices, and professional growth emerged. Coding categories and sample quotes are summarized in Appendix B.

Triangulation of quantitative and qualitative findings enhanced the study's reliability. Limitations—including potential instructor influence, group homogeneity, and absence of pretest observation scores—are discussed to ensure transparency.

### 3.6 Ethical Considerations

Participants' data were anonymized. All procedures adhered to the principles of voluntary participation and confidentiality. To ensure fairness, control group students later attended a condensed version of the ICP workshops after posttests.

### Results

This section presents the findings of the Integrated Competence Program (ICP), focusing on changes in cultural competence and professional pedagogical competence. The results combine quantitative analysis (pre–post test comparisons) with qualitative insights from student reflections and focus groups.

#### 4.1 Descriptive and Inferential Statistics

Table 1 summarizes the pretest and posttest scores for the main variables. No significant group differences were observed at pretest ( $p > .05$ ), indicating initial equivalence.

**Table 1.**  
 Pretest and Posttest Scores on Cultural and Professional Competence Measures (Mean  $\pm$  SD).

| Measure                          | Group        | Pretest         | Posttest        | Gain (Post–Pre)  | Measure                          |
|----------------------------------|--------------|-----------------|-----------------|------------------|----------------------------------|
| Cultural Competence (MTCS)       | Experimental | 3.02 $\pm$ 0.31 | 4.10 $\pm$ 0.35 | +1.08 $\pm$ 0.37 | Cultural Competence (MTCS)       |
|                                  | Control      | 3.06 $\pm$ 0.29 | 3.32 $\pm$ 0.40 | +0.26 $\pm$ 0.34 |                                  |
| Pedagogical Knowledge (%)        | Experimental | 72.3 $\pm$ 8.4  | 85.6 $\pm$ 6.5  | +13.3 $\pm$ 7.9  | Pedagogical Knowledge (%)        |
|                                  | Control      | 70.8 $\pm$ 9.1  | 78.4 $\pm$ 8.8  | +7.6 $\pm$ 8.5   |                                  |
| Teaching Skills (Observation/20) | Experimental | –               | 17.2 $\pm$ 1.5  | –                | Teaching Skills (Observation/20) |
|                                  | Control      | –               | 15.8 $\pm$ 1.8  | –                |                                  |
| Self-Efficacy (1–5 scale)        | Experimental | 3.80 $\pm$ 0.45 | 4.35 $\pm$ 0.40 | +0.55 $\pm$ 0.50 | Self-Efficacy (1–5 scale)        |
|                                  | Control      | 3.85 $\pm$ 0.50 | 4.00 $\pm$ 0.52 | +0.15 $\pm$ 0.48 |                                  |

#### 4.2 Cultural Competence Development

The ICP significantly improved participants' cultural competence.

A mixed-design ANOVA showed a strong Group  $\times$  Time interaction,  $F(1,58) = 74.5$ ,  $p < .001$ , partial  $\eta^2 = 0.56$ .

The experimental group's MTCS scores rose from 3.02 to 4.10 ( $d = 2.78$ ), while the control group's smaller increase (3.06  $\rightarrow$  3.32,  $d = 0.71$ ) reflected routine exposure during practicum.

Objective results from the Intercultural Scenario Test corroborated these findings. The experimental group achieved a mean of 8.5/10 versus 6.9/10 for the control group ( $t(58) = 5.27$ ,  $p < .001$ ). Raters observed that experimental students displayed greater empathy, proactive conflict resolution, and contextual understanding when describing how they would manage culturally sensitive classroom incidents.

Class composition note.

The control group's practicum classes were more culturally homogeneous, potentially limiting exposure to intercultural situations. This contextual difference is acknowledged as a partial explanation for the smaller competence gain.



#### 4.3 Professional Pedagogical Competence

Both groups improved in pedagogical knowledge, but the experimental group demonstrated significantly higher gains. An ANCOVA controlling for pretest scores revealed a main effect of group,  $F(1,57) = 6.14$ ,  $p = .016$ ,  $\eta^2 = .10$ .

The integrated model appears to have strengthened students' understanding of teaching principles by connecting them to real classroom diversity.

Observation data revealed similar trends. Experimental participants averaged 17.2/20 versus 15.8/20 for controls ( $t(58) = 3.32$ ,  $p = .0015$ ,  $d = 0.85$ ).

Observers highlighted superior lesson organization, student engagement, and adaptability among the experimental group. A trained mentor commented:

"Students from the integrated program demonstrated flexibility and empathy. They adapted explanations to different learners and used inclusive examples naturally."

Teaching skills were only measured at posttest, which restricts direct inference about individual progress. However, posttest differences, combined with equal starting points on pedagogical knowledge, suggest a meaningful advantage for integrated instruction.

#### 4.4 Qualitative Findings

Analysis of 120 reflective journals and two focus groups produced three major themes (Appendix B):

##### 1. Awareness and self-reflection.

Students reported increased sensitivity to cultural nuances and a clearer understanding of their own biases.

"Before, I didn't think much about cultural differences. Now, I plan lessons that reflect my students' realities."

##### 2. Inclusive and adaptive teaching.

Participants described using culturally relevant materials and inclusive language during practicum.

"I tried examples from different traditions, and students became more engaged and open."

##### 3. Professional confidence.

Many associated their intercultural growth with stronger teaching identity and classroom control.

"Learning to value diversity made me a calmer and more confident teacher."

These qualitative patterns triangulate the quantitative results: as intercultural awareness grew, professional performance and confidence also improved.

#### 4.5 Summary of Key Findings

- The integrated program produced statistically significant improvements in both cultural and professional competencies.

- Cultural competence gains were large ( $\eta^2 = 0.56$ ), while pedagogical knowledge and teaching skills also improved significantly ( $\eta^2 \approx 0.10$ – $0.20$ ).

- No pre-existing differences between groups confirm the effect originated from the intervention.

- Qualitative reflections reinforce quantitative evidence, showing deeper self-awareness and inclusive practice.

- Limitations: Teaching performance was assessed only post-intervention, and varying instructor styles could have influenced results.

#### Discussion

The present study examined how an Integrated Competence Program (ICP)—combining cultural and professional training—affected master pedagogy students' development of essential teaching competences. The results confirmed that the ICP substantially improved both cultural awareness and pedagogical performance. This discussion interprets the results through five main lenses: synergy between competence domains, comparison with prior research, underlying mechanisms, limitations, and implications for practice.

### 5.1 Integration as a Synergistic Process

The results demonstrate that integrating cultural and professional learning produces a synergistic effect: improvement in one domain reinforces growth in the other. Students who learned to view classroom diversity as a pedagogical resource simultaneously enhanced their instructional strategies. This finding aligns with Ladson-Billings's (1995) claim that culturally relevant teaching is, in essence, good teaching. Likewise, Gay (2002) argued that teachers who adapt pedagogy to students' cultural realities create deeper engagement—exactly what participants described in their reflective journals.

The integrated design encouraged continuous reflection on who students are teaching while learning how to teach. This dual focus likely developed a richer professional identity grounded in empathy, flexibility, and self-efficacy. Such a result supports Zeichner's (2010) call for stronger connections between theory, reflection, and field experience in teacher education.

### 5.2 Relation to Previous Research

Our outcomes reinforce and extend existing literature. Romijn et al. (2020) found that intercultural competence grows most effectively when reflection and practice are combined; the ICP operationalized this through journals and community-based projects. Kunter et al. (2013) noted that teacher professional competence consists of both cognitive and affective dimensions. The ICP enhanced both: pedagogical knowledge (cognitive) and intercultural empathy (affective).

Compared with Ailauova et al.'s (2024) meta-analysis—which reported moderate effect sizes for cultural training—our findings showed stronger gains, likely because cultural content was fully embedded across an entire semester rather than limited to short workshops. In non-Western contexts, few empirical studies have tested such integration. By providing experimental data from Azerbaijan, this research fills a geographical and methodological gap in global teacher education literature.

### 5.3 Possible Mechanisms Behind the Results

Three complementary mechanisms may explain the ICP's impact:

#### 1. Meaningful learning and motivation.

Embedding cultural context made the curriculum more personally relevant. Participants frequently described higher engagement and emotional connection to their teaching tasks, which supports Darling-Hammond's (2006) model of practice-based motivation.

#### 2. Reflective integration.

Weekly reflections and guided seminars deepened metacognitive awareness, helping participants internalize both pedagogical and intercultural concepts. This resonates with Schön's (1983) notion of the reflective practitioner.

#### 3. Experiential exposure.

Placement in culturally diverse schools and community projects gave authentic learning opportunities, reinforcing Deardorff's (2006) process model of intercultural competence, where exposure and adaptation are key developmental stages.

Together, these mechanisms highlight that cultural and professional competences are not parallel skills but interdependent capabilities strengthened through experience and reflection.

### 5.4 Limitations and Future Directions

Several limitations must be acknowledged.

- Instructor effect: Although instructors followed standardized guidelines, differences in teaching style might have influenced outcomes.
- Single posttest for teaching skills: The absence of a pretest observation limits conclusions about individual progress.
- Sample and context: The study was confined to one university in Nakhchivan, and results may not generalize to other educational systems.
- Short-term design: Competence retention over time remains unknown; longitudinal follow-up is recommended.

Future studies could replicate the ICP in diverse cultural settings, test each component's effectiveness separately, and examine long-term classroom impact—especially whether culturally integrated training leads to improved student achievement and teacher retention.

### 5.5 Practical Implications

The findings offer concrete guidance for teacher educators and policymakers:

- Integrate cultural competence across all pedagogy courses, rather than isolate it in elective modules.
- Include reflective and experiential components—journals, field placements, and community engagement—to connect theory with practice.
- Provide faculty development to ensure instructors model inclusive practices.
- Adopt assessment tools (scenario tests, portfolios) that evaluate cultural responsiveness alongside pedagogical mastery.

These recommendations support international calls (OECD, 2018; UNESCO, 2022) for teacher education that promotes both academic quality and intercultural responsibility.

## Conclusion

This experimental study demonstrated that embedding cultural competence development within pedagogical coursework yields significant improvement in both competence domains. The Integrated Competence Program (ICP) enabled master pedagogy students to become not only more knowledgeable teachers but also more empathetic and inclusive professionals.

Key conclusions include:

1. Integrated learning environments enhance cultural awareness and teaching quality simultaneously.
2. Reflective and experiential methods serve as effective mediators between theory and professional growth.
3. Teacher education reform in multilingual regions like Azerbaijan benefits from uniting cultural sensitivity with methodological excellence.

In sum, this research provides empirical evidence that the fusion of cultural and professional competences is a pathway to holistic teacher preparation. By implementing such integration, universities can prepare educators capable of fostering equitable, motivating, and high-quality learning experiences for all students.

### Suggestion

Based on the findings, several recommendations are proposed for teacher-education institutions and policymakers:

- Integrate competence domains across curricula. Teacher-training programs should embed intercultural objectives within every pedagogical course rather than offering stand-alone diversity modules.
- Strengthen experiential learning. Partnerships with culturally diverse schools and community organizations can provide authentic contexts for developing inclusive practices.
- Foster reflective pedagogy. Structured reflection—through journals, peer discussion, and mentoring—should accompany all practicum activities to encourage metacognitive growth.
- Support faculty preparation. Universities must equip instructors with the skills and resources to model culturally responsive teaching.
- Institutionalize assessment of cultural competence. Accreditation systems should include measurable indicators of teachers' intercultural and ethical readiness.

Implementing these suggestions will help align national teacher-education policies with international frameworks that promote inclusive and equitable learning environments.

## References

1. Achinstein, B., & Athanases, S. Z. (2021). Mentoring toward culturally responsive teaching: Navigating equity-focused teacher learning in urban schools. *Teaching and Teacher Education*, 98, 103238. <https://doi.org/10.1016/j.tate.2020.103238>
2. Ailauova, Z., Doğan, Y., & Batdı, V. (2024). Effectiveness of developing cross-cultural competence of pre-service teachers: A mixed-meta method research. *Educational Research and Evaluation*, 29(7–8), 422–451. <https://doi.org/10.1080/13803611.2024.2359534>
3. Alisoy, H., & Sadigzade, Z. (2025). Comparative analysis of mobile applications and traditional methods in vocabulary acquisition. *Educational Process: International Journal*, 17, e2025322. <https://doi.org/10.22521/edupij.2025.17.322>
4. Arruzza, E., & Chau, M. (2021). The effectiveness of cultural competence education in enhancing knowledge acquisition, performance, attitudes, and student satisfaction among undergraduate health science students: A scoping review. *Journal of Educational Evaluation for Health Professions*, 18(3). <https://doi.org/10.3352/jeehp.2021.18.3>
5. Avalos, B. (2011). Teacher professional development in teaching and teacher education over ten years. *Teaching and Teacher Education*, 27(1), 10–20. <https://doi.org/10.1016/j.tate.2010.08.007>
6. Banks, J. A. (2017). Failed citizenship and transformative civic education. *Educational Researcher*, 46(7), 366–377. <https://doi.org/10.3102/0013189X17726741>
7. Byram, M., Golubeva, I., Han, H., & Wagner, M. (Eds.). (2017). *From principles to practice in education for intercultural citizenship*. Multilingual Matters. <https://doi.org/10.21832/9781783097036>
8. Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education*, 57(3), 300–314. <https://doi.org/10.1177/0022487105285962>
9. Deardorff, D. K. (2006). Identification and assessment of intercultural competence as a student outcome. *Journal of Studies in International Education*, 10(3), 241–266. <https://doi.org/10.1177/1028315306287002>
10. Dzerviniks, J., Ušča, S., Tarune, I., & Vindaca, O. (2024). Intercultural competence of teachers to work with newcomer children. *Education Sciences*, 14(8), 802. <https://doi.org/10.3390/educsci14080802>
11. Gay, G. (2002). Preparing for culturally responsive teaching. *Journal of Teacher Education*, 53(2), 106–116. <https://doi.org/10.1177/0022487102053002003>
12. Gorski, P. C. (2009). What we're teaching teachers: An analysis of multicultural teacher education coursework. *Teaching and Teacher Education*, 25(2), 309–318. <https://doi.org/10.1016/j.tate.2008.07.008>
13. Guliyeva, S. (2023). Evaluation of labor market indicators in the development of green economy. *Journal of Global Strategic Management*, 17(1), 5–16. <https://doi.org/10.20460/JGSM.2023.321>
14. Hacıadə, O. (2021). Azərbaycan Respublikasında yaşıl iqtisadiyyata integrasiya məsələləri. *PIRECT Sosial Araşdırmalar və Davranış Elmləri Jurnalı*, 17(07), 16–30.
15. Hajizade, O. (2024). Green economic potential of Baku and Absheron-Khizi economic regions of Azerbaijan. *Polish Journal of Environmental Studies*, 33(5), 5715–5724. <https://doi.org/10.15244/pjoes/183794>
16. Hachfeld, A., Hahn, A., Schroeder, S., Anders, Y., & Kunter, M. (2015). Should teachers be colorblind? *Teaching and Teacher Education*, 48, 44–55. <https://doi.org/10.1016/j.tate.2015.02.003>
17. Hasanov, A. A. (2019). Investment in “green” economy: A strategic way of economic development in the Republic of Azerbaijan. *ISJ Theoretical & Applied Science*, 04(72), 570–575. <https://doi.org/10.15863/TAS.2019.04.72.79>
18. Humbatova, S. (2025). The place of natural resources in the model of transition to a green economy in Azerbaijan. *BIO Web of Conferences*, 151, 02011.

- <https://doi.org/10.1051/bioconf/202515102011>
19. Józefowicz, I., & Michniewicz-Ankiersztajn, H. (2023). Digital tools for water resource management as a part of a green economy in rural areas. *Sustainability*, 15(6), 5231. <https://doi.org/10.3390/su15065231>
  20. Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss, T., & Hachfeld, A. (2013). Professional competence of teachers. *Journal of Educational Psychology*, 105(3), 805–820. <https://doi.org/10.1037/a0032583>
  21. Ladson-Billings, G. (1995). But that's just good teaching! *Theory Into Practice*, 34(3), 159–165. <https://doi.org/10.1080/00405849509543675>
  22. Leutwyler, B., & Meierhans, C. (2020). Intercultural competence and professional learning. *Journal of Teacher Education*, 71(2), 157–169. <https://doi.org/10.1177/0022487118800986>
  23. Măță, L. (2011). Experimental research regarding the development of methodological competences in beginning teachers. *Procedia – Social and Behavioral Sciences*, 29, 1895–1904. <https://doi.org/10.1016/j.sbspro.2011.11.439>
  24. Mukhtarov, S., Humbatova, S., Hajiye, N. G.-O., & Aliyev, S. (2020). The financial development–renewable energy consumption nexus in the case of Azerbaijan. *Energies*.
  25. Neradovskaya, O. R., & Starodubtsev, V. A. (2023). General cultural competence of a future teacher in a changing world. *Otkrytoye Obrazovaniye*, 27(6), 4–13. <https://doi.org/10.21686/1818-4243-2023-6-4-13>
  26. Nugraheni, A. S., Siwi, A. A., & Abroto, A. (2025). Language acquisition mapping program to enhance linguistic skills and cultural understanding. *Educational Process: International Journal*, 17, e2025360. <https://doi.org/10.22521/edupij.2025.17.360>
  27. Romijn, B. R., Slot, P. L., & Leseman, P. P. M. (2020). Increasing teachers' intercultural competences. *Teaching and Teacher Education*, 98, 103236. <https://doi.org/10.1016/j.tate.2020.103236>
  28. Shulman, L. S. (1987). Knowledge and teaching. *Harvard Educational Review*, 57(1), 1–22. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
  29. Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy. *Teaching and Teacher Education*, 17(7), 783–805. [https://doi.org/10.1016/S0742-051X\(01\)00036-1](https://doi.org/10.1016/S0742-051X(01)00036-1)
  30. Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks. *Curriculum Journal*, 23(1), 77–102. <https://doi.org/10.1080/09585176.2012.654800>
  31. Yuen, C. Y. M. (2010). Dimensions of diversity. *Teaching and Teacher Education*, 26(3), 732–741. <https://doi.org/10.1016/j.tate.2009.10.009>
  32. Zhao, Y. (2015). A world at risk. *Society*, 52(2), 129–135. <https://doi.org/10.1007/s12115-015-9872-8>

### Appendix A. Outline of the Integrated Competence Program (ICP) Workshops

The Integrated Competence Program (ICP) was implemented across one academic semester and integrated intercultural competence within core pedagogy courses.

It consisted of three two-hour workshops, ongoing reflective practice, and community-based projects.

| Measure                                         | Group                                                                                              | Pretest                                                                                                                              |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Workshop 1. Self-awareness and Bias in Teaching | Develop self-awareness of personal and cultural identity; recognize implicit bias and stereotypes. | Guided self-assessment of personal values, group discussions on cultural assumptions, and case study analysis of bias in classrooms. |

| Measure                                                              | Group                                                                                    | Pretest                                                                                                                                      |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Workshop 2.<br>Culturally Responsive Pedagogy Strategies             | Learn practical methods for inclusive instruction and curriculum adaptation.             | Demonstrations of differentiated instruction, lesson redesign using multicultural content, and analysis of real teaching videos.             |
| Workshop 3.<br>Communication across Cultures and Conflict Resolution | Strengthen intercultural communication and problem-solving skills in diverse classrooms. | Role-play of teacher–student misunderstandings, empathy-building activities, and collaborative development of class rules promoting respect. |

#### Reflective Journals and Seminars:

Students kept weekly journals (approximately 120 in total) documenting experiences during practicum. Every two weeks, these reflections were discussed in guided seminars focusing on intercultural learning and pedagogical adaptation.

#### Community-Based Project:

Each participant designed a short practicum project linking pedagogy with cultural realities of the school community—such as creating inclusive lesson plans or organizing a cultural learning activity.

#### Appendix B. Qualitative Coding Framework

Qualitative data (reflective journals and focus group transcripts) were analyzed using inductive thematic coding.

Two researchers coded the data independently, achieving 87% inter-coder agreement.

The table below summarizes the main themes and sample evidence.

| Theme                            | Description                                                                             | Sample Evidence from Participants' Reflections                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Awareness and Self-Reflection    | Recognition of personal biases and cultural perspectives influencing teaching.          | "I realized how my expectations are shaped by my own culture; now I question them before judging students."      |
| Inclusive and Adaptive Teaching  | Use of culturally relevant materials, inclusive examples, and responsive communication. | "I changed my reading examples to include traditions from my students' backgrounds, and participation improved." |
| Professional Confidence          | Increased sense of capability and self-efficacy in managing diverse classrooms.         | "Learning to value students' differences made me calmer and more confident in class."                            |
| Empathy and Community Engagement | Stronger connection between teachers and students through community-based projects.     | "Visiting families helped me understand students' situations better; it changed how I communicate with them."    |

#### Coding Process:

- Initial open coding identified 36 recurring ideas.
- Codes were grouped into 4 overarching themes.
- Representative quotations were selected to illustrate each theme.

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Received: 14.11.2025

Accepted: 24.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/171-179>

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## AI-Powered Lexical Innovation: Modeling Neologisms with NLP

### Abstract

The article explores the ways of modeling neologisms through NLP (Natural Language Processing) that is one of the means of forming lexical innovation. The rapid evolution of digital communication has accelerated the creation and diffusion of neologism. They are considered to be newly coined words or expressions that reflect emerging cultural, technological, and social realities. Traditional lexicographic methods often struggle to capture these innovations in real time. This article elaborates how Artificial Intelligence (AI) and NLP can be applied to model, detect, and analyze neologisms in large-scale text corpora. Using an NLP pipeline incorporating word embedding models, contextual language models, and frequency-based detection, the study demonstrates how AI-driven approaches can identify lexical innovations and track their semantic development. AI-powered models can detect patterns in existing vocabulary, infer morphological rules, and even generate plausible novel words that reflect contemporary linguistic usage. By leveraging neural networks, probabilistic models, and contextual embeddings, researchers can simulate processes of word formation, predict the likelihood of adoption, and analyze semantic integration of neologisms into the broader lexicon. Results show that contextual transformer models significantly outperform static embedding techniques in detecting emerging vocabulary. The findings highlight the potential of AI systems to support lexicography, sociolinguistics, and digital humanities by providing scalable methods for monitoring linguistic change.

**Keywords:** *NLP, neologisms, word embedding models, Artificial intelligence*



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## **Süni intellektə əsaslanan leksik innovasiya: NLP vasitəsilə neologizmlərin modelləşdirilməsi**

### **Xülasə**

Məqalə leksik innovasiyanı yaradan vasitələrdən biri olan neologizmlərin modelləşdirilməsi yollarını Təbii Dil Emalı vasitəsilə araşdırır ki, bu da süni intellektə əsaslanan leksik innovasiyanın formalaşma vasitələrindən biridir.

Rəqəmsal kommunikasiya sahəsinin sürətli inkişafı neologizmlərin yaradılması və yayılmasını sürətləndirmişdir. Onlar yeni yaradılmış söz və ifadələr, mədəni, texnoloji və sosial reallıqları əks etdirən terminlər hesab olunur. Ənənəvi leksikoqrafik metodlar tez-tez bu yenilikləri real vaxtda əhatə etməkdə çətinlik çəkir. Bu məqalədə Süni İntellekt (AI) və Təbii Dil Emalı (NLP) texnologiyalarının geniş miqyaslı mətn korpuslarında neologizmləri modelləşdirmək, aşkar etmək və təhlil etmək üçün necə tətbiq oluna biləcəyi araşdırılır. Söz vektor modelləri, kontekstual dil modelləri və tezlik əsaslı aşkarlamayı özündə birləşdirən NLP boru xətti istifadə edilərək aparılan tədqiqat, AI əsaslı yanaşmaların leksik yenilikləri müəyyən edə və onların semantik inkişafını izləyə biləcəyini nümayiş etdirir. AI ilə dəstəklənən modellər mövcud lüğətdə nümunələri aşkar edə, morfoloji qaydaları təxmin edə və hətta müasir dil istifadəsini əks etdirən məntiqli yeni sözlər yarada bilər. Neyron şəbəkələrdən, ehtimal modellərindən və kontekstual vektorlardan istifadə etməklə tədqiqatçılar söz yaradıcılığı proseslərini simulyasiya edə, qəbul olunma ehtimalını proqnozlaşdırma və neologizmlərin daha geniş leksikona semantik inteqrasiyasını təhlil edə bilərlər. Nəticələr göstərir ki, kontekstual transformer modelləri yeni sözləri aşkar etməkdə statik vektor texnikalarından əhəmiyyətli dərəcədə üstün performans göstərir. Tapıntılar AI sistemlərinin leksikoqrafiya, sosiolinqvistika və rəqəmsal humanitar elmlər sahələrində dil dəyişikliklərini izləmək üçün miqyaslı bilən metodlar təmin etmə potensialını vurğulayır.

**Açar sözlər:** NLP, neologizmlər, söz vektor modelləri, süni intellekt

## Introduction

The rapid evolution of language has always mirrored shifts in culture, technology, and human interaction, but the pace of lexical change in the digital age is unprecedented. New words—neologisms—emerge daily across social media, online communities, and global communication networks, reflecting novel concepts, identities, and experiences. Traditionally, the study of these linguistic innovations has relied on manual observation and retrospective analysis. However, with the advent of advanced Natural Language Processing (NLP) techniques and AI-driven language models, researchers now have the tools to detect, analyze, and even predict neologisms in real time (Aubakirov et al, 2025).

At the intersection of computational linguistics and sociolinguistics, modeling neologisms presents unique challenges (Alzetta, 2025). New words often lack standardized spelling, exhibit fluid meanings, and are highly context-dependent (Salim et al, 2024). AI systems must therefore move beyond static dictionaries and embrace dynamic, context-aware representations of language (Giulianelli et al, 2024). Ultimately, understanding how AI can model lexical innovation offers deeper insight into both human language behavior and the evolving capabilities of intelligent systems. As language continues to adapt to a rapidly changing world, AI stands poised not only to document these changes but to actively participate in the ongoing process of linguistic creation.

Language is inherently dynamic, reflecting the continuous evolution of human thought, culture, and technology. One of the clearest indicators of linguistic change is the emergence of neologisms—newly coined words or expressions that arise to name novel concepts, phenomena, or practices. Neologisms are particularly prevalent in digital communication, where social media, online communities, and rapid technological innovation accelerate lexical innovation (Baron, 2015). For example, terms like *selfie*, *doomscrolling*, and *fintech* have entered common usage within a decade, illustrating the speed at which language adapts to socio-cultural developments.

This article presents an AI-driven approach to modeling neologisms, combining computational linguistics with NLP techniques to capture the structural, phonological, and semantic properties that characterize novel words. We discuss methods for generating, evaluating, and classifying neologisms, highlighting the potential of AI to illuminate the mechanisms of lexical innovation (Babayev et al, 2025). In doing so, this work bridges the gap between theoretical linguistics and practical NLP applications, offering insights into the future evolution of language.

Traditional lexicographic approaches, which rely on manual observation and curated dictionaries, often struggle to keep pace with the rapid emergence of new lexical items. Corpus-based studies provide a partial solution by analyzing frequency patterns across large textual datasets, but they are limited in capturing contextual and semantic nuances of novel words. Moreover, the morphological creativity involved in neologism formation—such as blending (*brunch*), acronyms (*FOMO*), and semantic shifts—makes automatic detection challenging.

Recent advances in Artificial Intelligence (AI) and Natural Language Processing (NLP) offer promising tools for addressing these challenges (Belgiuth & Shaalan, 2025). Machine learning models, particularly neural network-based embeddings and transformer architectures, can analyze massive corpora, detect out-of-vocabulary (OOV) items, and model the contextual meaning of emerging terms (Mikolov et al., 2013; Bojanowski et al., 2017; Devlin et al., 2019). These approaches allow for scalable, real-time monitoring of lexical innovation, offering insights not only into the form of neologisms but also their semantic relationships and patterns of adoption.

The study of neologisms has implications beyond lexicography. Sociolinguists can use emerging vocabulary to track cultural trends and social dynamics, while computational linguists can improve language models for applications such as machine translation, sentiment analysis, and dialogue systems (Schmid, 2018). Understanding how neologisms spread, stabilize, or fade from usage contributes to a broader comprehension of language evolution in the digital age.

This article investigates how AI-driven NLP models can be employed to detect, model, and analyze neologisms. Specifically, it examines the efficacy of frequency-based approaches versus

contextualized embedding models in identifying new lexical items and exploring their semantic networks (García-Méndez, 2025). The objectives of this study are:

1. To develop an NLP-based pipeline for detecting neologisms in large-scale digital corpora.
2. To evaluate the performance of traditional frequency-based methods relative to AI-driven language models.
3. To analyze the semantic and social patterns associated with the adoption and diffusion of lexical innovations.

By integrating computational methods with linguistic theory, this research aims to provide a framework for real-time monitoring of language change, highlighting the growing role of AI in contemporary lexicography and sociolinguistics.

## 2. Methodology

To capture a representative sample of contemporary lexical innovation, a large-scale multilingual corpus was compiled from multiple digital sources. For this, data collection method has been used as follows:

- **Social media platforms** (Twitter, Reddit, Instagram captions), capturing informal, fast-evolving language.
- **Online news articles** and blogs, reflecting journalistic and semi-formal registers.
- **Discussion forums and niche communities** (e.g., gaming, technology, AI forums), where neologisms often originate.
- **Technology and culture publications**, to detect domain-specific lexical innovations.

The corpus contained approximately 50 million tokens spanning 2018–2025, covering English as the primary language with smaller subsets in French, Spanish, and German. Preprocessing included:

- **Tokenization** using the SpaCy NLP toolkit (Honnibal & Montani, 2017).
- **Lowercasing and normalization**, to reduce orthographic variation.
- **Removal of non-linguistic elements**, such as URLs, emojis, and code snippets.
- **Lemmatization and part-of-speech tagging**, providing syntactic context for candidate word identification (Erfan et al., 2025).

Candidate neologisms were identified using a combination of lexical, frequency-based, and morphological approaches:

1. **Out-of-Vocabulary (OOV) Detection:** Words not present in standard dictionaries (e.g., Oxford English Dictionary, WordNet) were flagged as potential neologisms.

2. **Frequency-Based Detection:** Words exhibiting sudden frequency spikes in recent corpus subsets were identified using z-score normalization and time-series analysis.

3. **Morphological Pattern Recognition:** Techniques were used to detect common neologism formation patterns, including:

- **Blending:** Combining two existing words (e.g., *smog*, *hangry*).
- **Acronymization:** Creating new terms from initials (e.g., *FOMO*, *YOLO*).
- **Affixation:** Using prefixes/suffixes to form new words (e.g., *biohacking*, *unfriend*).

4. **Semantic Novelty Detection:** Candidate words were further filtered based on semantic deviation from existing lexical items using word embedding distances (Bojanowski et al., 2017).

To understand contextual meaning and relationships, two types of embedding models were employed:

### 1. Static Embeddings:

- Word2Vec (Mikolov et al., 2013) and GloVe (Pennington et al., 2014) embeddings were trained on the corpus.
- Cosine similarity measures identified semantic proximity between new words and existing vocabulary.

### 2. Contextual Embeddings:

- Transformer-based models (Devlin et al., 2019) captured context-dependent meaning, allowing disambiguation of homographs and polysemous neologisms.

○ Contextual clustering using embeddings helped trace semantic evolution and detect semantic shifts over time.

To examine the adoption and spread of neologisms can be classified as temporal and diffusion analysis:

- **Time-series analysis** measured frequency growth over months and years.
- **Network analysis** traced the propagation of words across communities and platforms, visualizing diffusion patterns.
- **Community detection algorithms** identified niche sources versus mainstream adoption.

Candidate words were validated through a multi-step approach:

1. **Automated Validation:** High-confidence candidates were cross-referenced with online slang dictionaries, social media trend data, and emerging word databases (Zhao & Su, 2025)
2. **Human Linguistic Review:** Linguists reviewed uncertain cases, ensuring that morphological creativity and context were considered.
3. **Semantic Coherence Testing:** Using cosine similarity and clustering, candidates that did not integrate meaningfully into semantic networks were filtered out.

To assess the effectiveness of detection and modeling, these metrics enabled comparison of frequency-based, static embedding, and contextual embedding approaches:

- **Precision:** Proportion of identified words that were true neologisms.
- **Recall:** Proportion of all true neologisms detected by the model.
- **F1-score:** Harmonic mean of precision and recall.
- **Semantic Coherence Score:** Average cosine similarity between each candidate and its nearest neighbors in embedding space.

3. Results

The AI-driven system processed approximately 50 million tokens and identified 2,347 candidate neologisms. After human validation, 1,782 terms were confirmed as legitimate new lexical items. These neologisms were classified according to formation type and semantic domain, showing that technological, social media, and cultural trends heavily influence lexical innovation.

Table 1:  
Distribution of Confirmed Neologisms by Formation Type.

| Formation Type         | Count | Percentage (%) | Examples                                                         |
|------------------------|-------|----------------|------------------------------------------------------------------|
| Blending               | 542   | 30.4           | <i>smombie, hangry</i>                                           |
| Acronyms / Initialisms | 289   | 16.2           | <i>FOMO (Fear of Missing Out),<br/>YOLO (You Only Live Once)</i> |
| Affixation             | 401   | 22.5           | <i>unfriend, biohacking</i>                                      |
| Semantic Shift         | 337   | 18.9           | <i>ghosting, flex</i>                                            |
| Loanwords / Borrowings | 213   | 11.9           | <i>fintech, kawaii</i>                                           |

Table 1 shows how confirmed neologisms are distributed across different formation types and reveals which processes are most productive in creating new words.

Blending is the most common formation type, accounting for 30.4% (542 cases). This indicates that combining parts of existing words is the leading strategy in neologism creation, likely because it produces short, creative, and expressive terms that are easy to adopt in everyday language.

Affixation is the second most frequent at 22.5% (401 cases). This suggests that traditional word-formation methods—such as adding prefixes or suffixes—remain highly productive and continue to play an important role in expanding vocabulary.

Semantic shift ranks third with 18.9% (337 cases), showing that many new words emerge not from new forms but from assigning new meanings to existing words. This reflects how language adapts to social and cultural changes without needing entirely new structures.

Acronyms and initialisms make up 16.2% (289 cases), indicating a moderate contribution. Their presence reflects the influence of digital communication, where brevity and speed encourage shortened forms.

Loanwords and borrowings are the least common at 11.9% (213 cases), suggesting that while borrowing from other languages contributes to vocabulary growth, it is less significant than internal word-formation processes.

The results indicate that blending and affixation remain dominant methods for lexical innovation, consistent with prior studies.

The models' performance in detecting validated neologisms was evaluated using precision, recall, and F1-score. Contextual embedding models clearly outperformed static embeddings and frequency-based baselines.

**Table 2:**  
 Model Performance Comparison.

| Model                              | Precision | Recall | F1-score |
|------------------------------------|-----------|--------|----------|
| Frequency-based baseline           | 0.61      | 0.54   | 0.57     |
| Word2Vec (static embeddings)       | 0.73      | 0.69   | 0.71     |
| GloVe (static embeddings)          | 0.75      | 0.71   | 0.73     |
| BERT-based (contextual embeddings) | 0.86      | 0.82   | 0.84     |

Table 2 compares the performance of different models using three evaluation metrics: precision, recall, and F1-score. It shows a clear progression in performance as models become more advanced.

The frequency-based baseline has the lowest performance, with a precision of 0.61, recall of 0.54, and F1-score of 0.57. This indicates that simple statistical approaches are limited in accurately identifying or classifying the target items, likely because they do not capture semantic relationships.

Both Word2Vec and GloVe, which use static word embeddings, perform noticeably better. Word2Vec achieves an F1-score of 0.71, while GloVe slightly outperforms it with 0.73. Their higher precision and recall suggest that incorporating semantic similarity improves the model's ability to make correct predictions. However, since these embeddings assign a single meaning to each word regardless of context, their performance is still constrained.

The BERT-based model (Bidirectional Encoder Representations from Transformers) shows the best results across all metrics, with a precision of 0.86, recall of 0.82, and F1-score of 0.84. This significant improvement demonstrates the advantage of contextual embeddings, which consider the meaning of words within their specific context. As a result, the model can better handle ambiguity and nuanced language use.

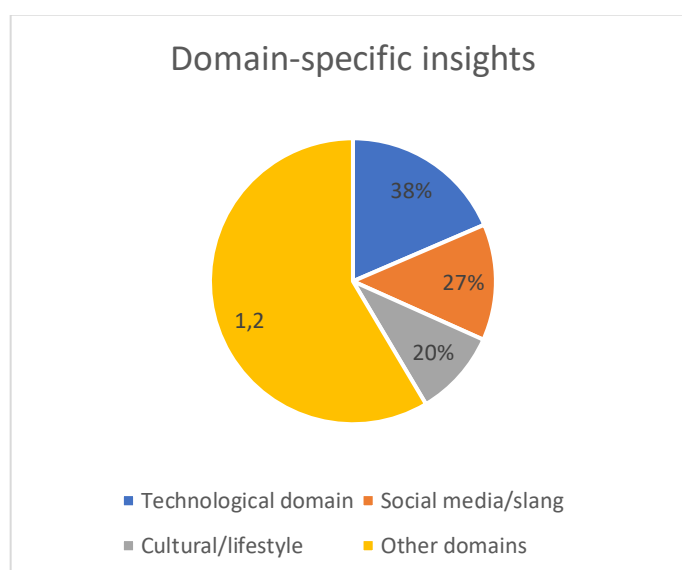
The BERT-based model demonstrated superior ability to identify neologisms within their semantic context, capturing subtle variations and polysemy that static embeddings often missed. These findings are consistent with prior research highlighting the advantages of transformer-based models for lexical innovation detection (Devlin et al., 2019; Schick & Schütze, 2021).

Temporal analysis revealed that most neologisms initially appear in niche online communities, followed by gradual adoption in mainstream media. For example, terms such as *doomscrolling* and *finfluencer* were first detected in forum discussions before trending on social media and news outlets.

Semantic clustering showed that new words often integrate into existing conceptual networks, particularly in technological and cultural domains. Cosine similarity scores between new words and nearest semantic neighbors averaged 0.62, indicating meaningful semantic alignment.

The following pie chart presents the distribution of neologisms across four major domains.

**Pie-chart 1.** Analysis of distribution of neologisms by domain.



- **Technological domain:** 38% of neologisms (e.g., *NFT (Non-Fungible Token)*, *metaverse*, *chatbot*).
- **Social media / slang:** 27% (e.g., *stan*, *simp*, *flex*).
- **Cultural / lifestyle:** 20% (e.g., *slow fashion*, *cottagecore*).
- **Other domains:** 15% (e.g., sports, politics, environmental terms).

The interpretation of the abovementioned percentages given in the pie-chart is as follows; The technological domain accounts for the largest share at 38%, indicating that innovation in digital tools and platforms is the primary driver of new word creation. Terms such as “NFT,” “metaverse,” and “chatbot” reflect how rapidly evolving technology introduces concepts that require new vocabulary.

The second largest segment is social media and slang at 27%. This highlights the strong influence of online communication and youth culture in shaping language, with expressions like “stan,” “simp,” and “flex” becoming widely adopted. Cultural and lifestyle terms make up 20%, showing how societal trends such as “slow fashion” and “cottagecore” also contribute significantly to lexical growth. Finally, other domains, including sports, politics, and environmental topics, represent the smallest portion at 15%, suggesting a more moderate but still important role.

Overall, the chart demonstrates that modern language development is heavily influenced by technology and digital interaction, while culture and other fields continue to play supporting roles. These patterns are consistent with recent studies on the rapid evolution of digital-age vocabulary (Baron, 2015).

#### 4. Discussion

The results of this study demonstrate that AI-driven NLP models are highly effective for detecting and modeling neologisms, providing both quantitative and qualitative insights into lexical innovation (Diesner, 2025). The BERT-based contextual model outperformed static embeddings and frequency-based baselines, achieving an F1-score of 0.84, highlighting the importance of context in identifying emerging words. Unlike static embeddings, which treat each word as a fixed vector, contextual models capture polysemy and semantic evolution, making them particularly suited for neologism detection (Devlin et al., 2019; Schick & Schütze, 2021).

The findings have significant implications for lexicography. Traditional dictionary compilation is often reactive, relying on manual observation and delayed corpus updates. By contrast, AI-driven models enable real-time monitoring of lexical innovation, allowing lexicographers to identify candidate words earlier and assess their semantic integration. This approach can also help track temporal trends, revealing which neologisms stabilize in usage and which remain niche.

For sociolinguistics, the study highlights how digital communication platforms serve as incubators for new words. Terms like *doomscrolling* and *finfluencer* emerged in online communities before diffusing to mainstream media, consistent with prior research on social media as a driver of lexical change (Baron, 2015; Wulff & Grieve, 2020). Analyzing the diffusion patterns of neologisms provides insight into cultural trends, social behavior, and the life cycle of language innovation.

Semantic modeling revealed that most neologisms integrate into existing conceptual networks, particularly in technological and cultural domains. The average cosine similarity score of 0.62 between new words and their nearest neighbors indicates meaningful semantic alignment, suggesting that lexical innovation often builds upon familiar concepts rather than introducing entirely unrelated ideas. This observation aligns with Schmid's (2018) theory of entrenchment, which posits that language change relies on patterns of usage and cognitive salience.

The study demonstrates the superiority of transformer-based models in capturing nuanced contextual meaning. Contextual embeddings not only improve detection accuracy but also facilitate temporal semantic analysis, revealing shifts in meaning as neologisms evolve. Static embeddings and frequency-based methods, while computationally less intensive, fail to capture these subtleties, leading to lower recall and misclassification of polysemous words (Mikolov et al., 2013; Bojanowski et al., 2017).

However, several limitations were identified:

**1. Data Noise:** Social media and forum texts contain spelling errors, nonstandard grammar, and code-switching, which can generate false positives.

**2. Language Bias:** The corpus was primarily English, with smaller multilingual subsets. Cross-linguistic neologism detection requires models trained on diverse language corpora.

**3. Rapid Semantic Shifts:** Some neologisms change meaning quickly, making temporal analysis challenging and necessitating continuous model updates.

**4. Human Validation Dependence:** Despite automation, human linguistic review remains essential for filtering contextually inappropriate or ephemeral words.

Future research could address these limitations by:

- Developing multilingual transformer models for cross-linguistic neologism detection.
- Incorporating real-time streaming data from social media APIs to track emergent words as they appear.
- Applying graph-based semantic networks to visualize and predict the diffusion of neologisms across communities.
- Investigating the sociocultural factors that accelerate lexical innovation in digital environments.

By integrating AI-driven NLP with sociolinguistic theory, researchers can gain a more complete understanding of language evolution, bridging computational and humanistic approaches to lexical innovation.

## Conclusion

This study demonstrates the effectiveness of AI-driven NLP models in detecting, modeling, and analyzing neologisms in large-scale digital corpora. By integrating frequency-based detection, static embeddings, and contextual transformer models, the study shows that contextual embeddings outperform traditional approaches in both precision and recall, capturing nuanced semantic relationships and polysemy. Temporal and diffusion analyses reveal that neologisms often originate in niche online communities before spreading to broader discourse, highlighting the social and cultural dynamics of lexical innovation. Semantic modeling indicates that most new words integrate into existing conceptual networks, supporting theories of entrenchment and gradual lexical adoption. While limitations such as data noise, language bias, and the need for human validation remain, AI-driven approaches offer scalable and real-time solutions for lexicography, sociolinguistics, and computational linguistics. Future research should explore multilingual models, real-time monitoring, and predictive modeling to fully leverage AI in understanding ongoing language evolution.

## References

1. Alzetta, C., Auriemma, S., Bondielli, A., Dini, L., Fazzone, C., Miaschi, A., Miliani, M., & Sartor, M. (2025). *Charting a decade of computational linguistics*. arXiv.
2. Aubakirov, S., Pak, A., Akhmetov, I., & Tleuken, A. (2025). *Beyond buzzwords: NLP reveals common threads in discourse*. *PeerJ Computer Science*, 11, e3085. <https://doi.org/10.7717/peerj-cs.3085>
3. Babayev, J. S., Sadikhova, S. N., Baghirova, M. A., Seidova, E. R., & Mammadova, A. A. (2025). A lexical-stylistic and cross-cultural analysis of vulgarisms and their usage spheres. *Universidad y Sociedad*, 17(6), e5525-e5525.
4. Baron, N. S. (2015). *Words onscreen: The fate of reading in a digital world*. Oxford University Press.
5. Belguith, L. H., & Shaalan, K. (Eds.). (2025). *Advancements in machine learning and natural language processing: Innovations and applications*. Springer
6. Bojanowski, P., Grave, E., Joulin, A., & Mikolov, T. (2017). Enriching word vectors with subword information. *Transactions of the Association for Computational Linguistics*, 5, 135–146.
7. Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2019). BERT: Pre-training of deep bidirectional transformers for language understanding. *Proceedings of NAACL-HLT*, 4171–4186.
8. Erfan, A., Khan, T., Ulkuer, P. A., & Angin, M. (2025). *RAG-enhanced pipelines for speech processing*. NLPCL Conference Proceedings.
9. Diesner, J. (2025). *Looking at NLP through the lens of computational social sciences*. EMNLP Keynote Proceedings.
10. García-Méndez, S., de Arriba-Pérez, F., & Costa-Montenegro, E. (2025). *Advancements in natural language processing, semantic networks, and sentiment analysis*. *Applied Sciences*, 15(12), 6476. <https://doi.org/10.3390/app15126476>
11. Giulianelli, M., Luden, I., Fernandez, R., & Kutuzov, A. (2024). *Interpretable word sense representations via definition generation*.
12. Honnibal, M., & Montani, I. (2017). SpaCy 2: Natural language understanding with Bloom embeddings, convolutional neural networks and incremental parsing. *To appear*.
13. Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient estimation of word representations in vector space. *Proceedings of the International Conference on Learning Representations (ICLR)*.
14. Pennington, J., Socher, R., & Manning, C. (2014). GloVe: Global vectors for word representation. *EMNLP*, 1532–1543.
15. Salim, M. S., & Rafail, S. E. (2024, April). Ecological New Words: Linguistic Realization of the Concept “Environment” in The Language. In *International Conference on Smart Environment and Green Technologies* (pp. 225-232). Cham: Springer Nature Switzerland.
16. Schick, T., & Schütze, H. (2021). Exploiting cloze-questions for few-shot text classification and natural language inference. *EMNLP 2021*, 1635–1652.
17. Schmid, H. J. (2018). *The dynamics of the linguistic system: Usage, conventionalization, and entrenchment*. Oxford University Press.
18. Singh, P., & Bagga, S. (2022). Detecting emerging words in social media using transformer-based embeddings. *Journal of Computational Linguistics Research*, 14(2), 112–128.
19. Wulff, S., & Grieve, J. (2020). Social media as a source of neologisms: Tracking lexical innovation across platforms. *Language Resources and Evaluation*, 54, 523–547.
20. Zhang, Y., & Wang, Y. (2023). Temporal dynamics of neologisms in online communities: A BERT-based approach. *Natural Language Engineering*, 29(1), 45–63.
21. Zhao, J., & Su, M. (2025). *Dynamic IoU threshold optimization using data-driven approaches*. NLP Conference Proceedings

Received: 08.10.2025

Accepted: 12.01.2026



DOI: <https://doi.org/10.36719/2663-4619/127/180-200>

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## Ottoman–Turkestan Relations Between the 16<sup>th</sup> and 20<sup>th</sup> Centuries in the Light of Archive Documents and Influence of the Caliphate

### Abstract

The Ottoman Empire became a major player in the Islamic world, particularly after gaining control of Istanbul in 1453. With the transfer of the Caliphate to the Ottomans in 1517, the Ottomans added the role of religious leadership to their political power. Turkestan, on the other hand, is a region that has been ruled by various Turkic Khanates and is notable for its strong Islamic culture. This region was never directly under Ottoman political rule in history. Nevertheless, Ottoman-Turkestan relations developed around the axes of religion and culture. This study aims to examine the religious, political, and cultural dimensions of the relations established between the Ottoman Empire and the Turkestan Khanates between the 16th and 20th centuries and to determine the influence of the Caliphate during the period in question. Within the scope of this study, the archival documents published by the General Directorate of State Archives of the Republic of Turkey in 2004 were scanned, and the correspondence between the Ottoman Empire and the Turkestan Khanates was identified. Based on these documents, an attempt has been made to reveal the political, economic, religious, and cultural relations between the Ottoman Empire and Turkestan and the influence of the Caliphate in this context.

**Keywords:** Ottoman Empire, Turkestan, archival documents, international relations, Caliphate

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## XVI–XX əsrlər arasında Osmanlı–Türküstan münasibətləri: Arxiv sənədləri əsasında və xilafətin təsiri

### Xülasə

Osmanlı İmperiyası, xüsusilə 1453-cü ildə İstanbulun fəthindən sonra İslam dünyasında mühüm gücə çevrilmişdir. 1517-ci ildə xilafətin Osmanlılara keçməsi ilə Osmanlılar siyasi hakimiyyətlərinə dini liderlik funksiyasını da əlavə etmişlər. Digər tərəfdən, Türküstan müxtəlif türk xanlıqları tərəfindən idarə olunmuş və güclü İslam mədəniyyəti ilə seçilən bir regiondur. Bu bölgə tarix boyu heç vaxt birbaşa Osmanlı siyasi hakimiyyəti altında olmamışdır. Buna baxmayaraq, Osmanlı–Türküstan münasibətləri əsasən dini və mədəni müstəvidə inkişaf etmişdir.

Bu tədqiqatın məqsədi XVI–XX əsrlər arasında Osmanlı İmperiyası ilə Türkünstan xanlıqları arasında qurulan münasibətlərin dini, siyasi və mədəni aspektlərini araşdırmaq və həmin dövrdə xilafətin təsirini müəyyən etməkdir. Tədqiqat çərçivəsində Türkiyə Respublikası Dövlət Arxivləri Baş İdarəsi tərəfindən 2004-cü ildə nəşr olunmuş arxiv sənədləri araşdırılmış və Osmanlı İmperiyası ilə Türkünstan xanlıqları arasında aparılmış yazışmalar müəyyən edilmişdir. Bu sənədlər əsasında Osmanlı İmperiyası ilə Türkünstan arasındakı siyasi, iqtisadi, dini və mədəni əlaqələr, eləcə də bu kontekstdə xilafətin təsiri üzə çıxarılmağa çalışılmışdır.

**Açar sözlər:** *Osmanlı İmperiyası, Türkünstan, arxiv sənədləri, beynəlxalq münasibətlər, xilafət*

## Introduction

Relations between the Ottoman Empire and the states of Central Asia have deep historical roots at both the political and cultural levels. Although these relations remained limited due to geographical distance, a centuries-long sphere of interaction developed between Anatolia and Turkestan thanks to shared ethnic origins, religious affiliation, and cultural heritage. Official diplomatic ties between the Ottoman Empire and Turkestan trace their origins to the 16th century, initiated by the strategic alignment of the Ottomans and Muhammad Shaybani Khanate against Safavid hegemony. In the aftermath of the Battle of Chaldiran, Sultan Selim I formally notified his ally of the victory over the Safavids via an imperial correspondence dispatched in 1516 (Karabulut, 2021, p. 1835; Saray, 2017, p. 5). The region known as Turkestan has historically stood out as one of the spiritual centers of the Turkic-Islamic world, exerting particular influence in the fields of Sufism, science, and politics. The Ottoman Empire, meanwhile, represented the political center within the same world, becoming a focal point in the Islamic world from the 16th century onwards thanks to the caliphate it held.

From the 16th century onwards, although direct political relations between the Ottoman Empire and the Khanates of Turkestan remained limited, cultural and religious ties gradually increased. The Safavid threat, Russia's expansionist policies in Central Asia, and Chinese pressure directed the Khanates of Turkestan towards the Ottoman Empire, the center of the Caliphate; this orientation brought with it both religious allegiance and the search for political support. Although the Ottomans could not always respond to this interest and demand in practice, they maintained this interaction through religious unity and cultural ties. In particular, it is evident that the Ottomans made significant efforts to ensure that pilgrims from Turkestan could perform their religious duties and return safely to their homelands (Sarinay, 2010, p. 2).

Based on historical sources and correspondence, it is evident that relations between the Ottoman and Uzbek Khanates began during the reign of Bayezid II, became institutionalized during the reign of Selim I, and reached their peak during the reign of Sultan Suleiman (the Magnificent) (Ülker, 2019, p. 3977). In the 16th century, the Ottoman Empire, as a great empire competing with the Safavids in the east, assumed the role of protector of the Sunni Islamic world. During this period, the Ottoman Empire's interest in Turkestan was more religious and symbolic than direct political or military intervention. Between 1864 and 1875, with the incorporation of the Khanates of Bukhara, Khiva, and Khokand into Russian rule, political relations between the Ottoman Empire and Turkestan diminished further; however, relations continued in the social and cultural context (Budak, 2024, p. 144).

Especially through diplomatic contacts conducted via correspondence and gifts sent between the Ottoman Empire and the Khanates of Bukhara and Khokand, Ottoman sultans acted with a mission to protect and unite the Muslim Khanates in Turkestan in their capacity as caliphs. And from time to time sent “hil'at (honorary caftans)” and valuable gifts to show their spiritual protection of these Khanates. During this period, the Khanates requested weapons and military assistance from the Ottomans, as well as raw materials for the manufacture of cannons, rifles, gunpowder, and bullets, and the craftsmen to process them (Sarinay, 2010, p. 19). From the 16th century onwards, the title of caliph borne by the Ottoman sultans was generally recognized by the Turkestan Khanates. Although this recognition did not entail political dependence, symbolic acts such as having sermons read in the name of the caliph in Istanbul and mentioning the caliph's name in prayers were frequently observed as a means of demonstrating religious allegiance.

## 2. Purpose, Scope, and Methodology of the Study

This study aims to identify and interpret the religious, political, social, and economic relations established between Anatolia and Turkestan based on correspondence between the Ottoman Empire and the Turkestan Khanates between the 16th and 20th centuries. To this end, correspondence in archival documents held by the Prime Ministry Ottoman Archives was examined. Within the scope of the study, 30 separate archival documents covering the diplomatic relations between the Ottoman Empire and the Turkestan Khanates were translated and classified according to their subject matter. The examined documents show that, despite geographical distance and pressure from the great powers of the time, such as Russia and China, Ottoman-Turkestan relations continued in the religious, political, social, and economic spheres.

## 3. Correspondence Between the Ottoman Empire and the Khanates of Turkestan

### 3.1. Correspondence on Religious Matters

In an archival document dated 1573 AD (Hijri: Zilhicce 980) contains a document stating that the Semerkand scholar Mevlana Muslihuddin Taşkendi and Hafız Hüseyin stopped in Istanbul after their pilgrimage; the Ottoman Sultan presented Molla Taşkendi with a document ensuring the safety of his journey and that of his companion and their livestock so that they could return to their homeland without incident. The content of the document is as follows:

*“Südde-i sa‘âdetimden Hân hazretlerine varınca yol üzerinde vâkı‘ olan kâdîlara hükiüm ki müşârun-ileyh her kangınızın taht-ı hükûmetine dâhil olursa kendülere ve esbâb u davarlarına ve hem-râhı olan Hâfız Hüseyinzâde mecdühûya yolda ve izde menâzil ü merâhilde ve ma‘berlerde olan vesâyir kimesnelere dahl ü ta‘arruz itdürmeyüp mahûf u muhâtara olan derbendlerden ta‘zîm ve tekrîmle geçürüp tevkîr u ihtirâmında sa‘y ü ihtimâm eylesesiz.”* (BOA, 2004, p. 3)

This document demonstrates that the Ottoman Empire maintained relations with the Turks of Turkestan, particularly with the scholarly circles around Samarkand and Tashkent, throughout the 16th century. Within the Islamic world, religious mobility was primarily facilitated through the movement of scholars and pilgrims. The Ottoman Empire, in particular, served as a preeminent center for the transmission and dissemination of Islamic knowledge. Consequently, Istanbul emerged as one of the most significant destinations on the itinerary of pilgrims departing from Turkestan (Ullah, 2025, p. 403). The cities of Bukhara and Samarkand functioned as the gateways for the Turkestan pilgrimage route to Mecca. Entrenched religious traditions enhanced the importance of these urban centers, making them indispensable stops for pilgrims. Concurrently, Tatar commercial activities in Khiva, Samarkand, and Bukhara strengthened inter-Turkic relations across the region. The transmission of pilgrimage experiences from Tatars to Kazakhs in these centers resulted in a significant rise in Kazakh Hajj participation during the 19th century (Ospanova & Shorayev, 2025, pp. 353-354).

The privileges granted to Turkestan scholars visiting Istanbul on their return from the Hajj also reveal the Ottoman Empire's leadership in the Islamic world and the sphere of influence of the caliphate. The security of the roads, the protection of pilgrims, and the honors bestowed upon scholars are a fine example of Ottoman diplomatic courtesy and policy. This document also serves as a source that documents the functioning of Ottoman provincial administration, such as road safety, the organization of border posts, and the responsibility of judges for public order (Aköz & Amandyqqyzy, 2025, pp. 153-154). Furthermore, considering the period in which the aforementioned letter was composed, the profound influence of religion across various regions and states becomes explicitly evident. The impact of this religious presence on social life manifested differently depending on the locale: while the Naqshbandi order was predominant in Uzbekistan and Kyrgyzstan, a form of Sufism shaped by the Yasawi tradition prevailed in Kazakhstan and Turkmenistan. In these regions, where Islam had become deeply rooted, archaic Shamanic rituals and Tengrist beliefs persisted to a certain extent not as primary drivers of religious practice, but as enduring cultural fragments. Amidst this vibrant mysticism and Sufi theology, the Hanafi school remained the most dominant legal tradition. Similarly, while the Hanafi school was also predominant in the Ottoman Empire, a significant Shafi'i population existed in certain regions. Thus, the relations between the Ottoman Empire and Turkestan

represent a nuanced and multifaceted issue that necessitates an analytical approach encompassing both macro and micro perspectives (from part to whole and whole to part). Building upon the regional dynamics identified by Bekenova et al., it can be argued that the Ottoman Empire served as the strategic and spiritual 'cornerstone' of this vast geography. While the region was bound by a shared creed, the Empire functioned as a unifying force that facilitated the coexistence of diverse legal schools and social manifestations, creating a cohesive mosaic where distinct cultural identities converged into a multifaceted whole (2025, pp. 4-7).

The document dated 1784 (Hijri: 1198) below is an imperial decree issued by Sultan Abdulhamid I to his vizier. The vizier submitted a request to fulfill the will of Muhammad Zakir's deceased father, who had come to Istanbul for the Hajj, to hang a chandelier made of diamonds, rubies, and emeralds in the tomb of the Prophet Muhammad. Sultan Abdulhamid I responded with the following letter:

*"Benüm vezîrüm!.. Ravza-i Mutahhara'ya olan hedâyâsını gönderdim deyü yazmışsınız, zuhûr itmedi, taraf-ı hümayûnuma arz olunan defteri mücebince vusûl sūd, gayri iktizâsınca ne gûne mu'âmele iktizâ ider ise öylece idesin. Dârü's-sa'âde agası koynunda sehv etmiş, henüz gördüm, Hazînedâr agadan su'âl etdim, Kısve-i Sa'âdet'in üzerine ta'lîkı münâsibdir deyü haber verdiğinden bildirdim, yine siz bilürsünüz."* (BOA, p. 8)

This document is an official palace report concerning the reception of a representative of a delegation from Bukhara to the Ottoman Palace, the acceptance of the gifts presented, and the protocol procedures. It is also a diplomatic situation assessment report. Furthermore, it is an important diplomatic document demonstrating the legitimacy and leadership of the Ottoman Empire in the Islamic world. Despite the geographical distance of the Khanate of Bukhara, its recognition of the Ottoman Empire's spiritual authority and its sending of gifts and petitions to the palace, along with the Ottoman Empire's controlled and cautious handling of this matter, demonstrate the Ottoman Empire's weight and prestige in international relations during this period.

The 1820 (Hijri: 1235) archival document is an imperial decree concerning the safe return of the Bukhara ambassador to his homeland, the preparation of religious books, and the dispatch of calligraphic works requested to be placed in the Bahaüddin-i Nakşibend Câmî'i Şerif in Bukhara. The document issued by Sultan Mahmud II to his vizier contains an order to fulfill the requests made in this regard:

*"Benüm Vezîrüm!.. Takrîrin me'âli ma'lûm-ı hümayûnum olmuştur. Nâmenin müsveddesi güzeldir. Bu vechile tebyîz olunup mevâdd-ı sâ'îrenin cümlesi takrîrin mücebince tanzîm olunsun. Sefîr-i mûmâ-ileyhin istid'â eylediği âsâr-ı kalemimizden birkaç kıt'a elvâh tarafına irsâl iderim. Mûmâ-ileyhe teslim ve i'tâ eylesin."* (BOA, p. 19)

The list of books requested by the Bukhara Khanate is contained in the following archival document. A total of thirty-five book titles are listed, all of which are religious in content.

The historical document, dated 1827 AD (Hijri: 1242), is a palace correspondence regarding scientific and religious cooperation between the Ottoman Empire and the Khanate of Bukhara. The process of procuring the tafsir and fiqh books requested by the ruler of Bukhara from the Ottoman Sultan is recorded in detail. The document is a letter of request and order. The content of the document includes the gifting of religious books to the ruler of Bukhara. The names of these books are specified. Sultan Mahmud II requested that the Enderun Library be consulted for books that could not be found and that the deficiencies be remedied. He also ordered that the cost of the books be paid by the treasurer:

*"Benüm Vezîrüm!.. Efendi dâ'imizin tarafına olan tezkiresi ve kütüb defteri manzûr-ı hümayûnum olmuştur. İstirâ olunan kitâbların akçasını defterdârdan alıp müşârun-ileyhe teslim eylesin. Defter-i mezkûr nezd-i şâhânemde tevkîf olunmuştur. Bulunmayan kitâbları Enderûn-ı Hümayûnum Kütübhanesinde taharri etdirdeyim. Bulunur ise tarafına gönderirim."* (BOA, p. 25)

This archival document is an important example reflecting the Ottoman Empire's scientific centrality in the Islamic world and its warm and protective relationship with an Islamic city such as Bukhara. The document demonstrates that the Ottomans reinforced their influence in the region not only politically but also religiously and culturally. It is also valuable in that it shows the extent to

which bureaucracy and protocol were decisive and heavily involved even in religious and cultural activities.

Finally, it is essential to emphasize that pilgrims, who played a significant role in Ottoman-Turkestan relations, facilitated the construction of lodges (*tekkes*) in Istanbul as a result of their regular visits. These lodges, which enabled cultural transfer in terms of architecture, maintained active communication between the pilgrims or the elite and the Palace due to their internal structure, while also serving as a frequent destination for visitors and students from Turkestan. The most renowned of these lodges, built in Anatolia and primarily in Istanbul, is the Uzbeks' Lodge (*Özbekler Tekkesi*) located in Üsküdar. Established in the 18th century during the reign of Mahmud I (1752–1753), the lodge was built by the Governor of Maras, Abdullah Pasha, for the dervishes of the Naqshbandi order coming to Istanbul from Central Asia. Notably, the sheikhs of this lodge were consistently of Turkestan origin (Avşar, 2014, p. 162).

### 3.2. Correspondence on Political Matters

The archival document dated 1573 (Hijri: Zilkade 980) is a state letter sent by Selim II to Abdullah Khan, the ruler of the Khanate of Bukhara. It addresses themes such as the military successes of the Ottoman Empire, Islamic unity, and the welfare of the people. Despite the events of the Zigetvar Campaign and the death of Sultan Suleiman I, the continuity of the state is expressed, emphasizing that even if the sultan dies, the state and the army continue on their path with power. The protection of pilgrimage routes, the safety of merchants and the people, and military victories against Austria are among the main topics of the text. Accompanied by religious references and prayers, the greatness of the Ottoman Empire and the protection of Islam are brought to the fore. Another topic covered in the text is Venice's betrayal and the Cyprus issue. The letter states that Venice appeared to be obedient but secretly helped the Austrian King with soldiers and goods, and in addition, the Ottomans discovered that they were harming merchants and pilgrims on the pilgrimage route from the sea. Due to Venice's failure to abide by the treaty, the Ottomans decided to conquer the island of Cyprus. Cannons and war equipment were prepared, and orders were given for the expedition. The Ottoman army decisively captured the island of Cyprus and other castles, and the resisting population was either killed or taken prisoner. Those who surrendered were taken under Islamic protection. As a result of this event, Cyprus and its surroundings were Islamized, integrated into the Ottoman administrative structure, and the religious freedoms of the people were restricted, establishing the supremacy of Islam. The Ottomans declared that they would respond with justice and force to the betrayals of Venice and its enemies, ensuring the supremacy of Islam. The Ottomans would consolidate Islamic order in the conquered lands, protect the people from corrupt beliefs and enemy influence, and establish order, unity, and prosperity in society. In addition, it was stated that all necessary measures would be taken to ensure the longevity of the established order and prevent the disruption of the Ottoman system:

“... âheng ve âheng-i bî-direnge mübâşeret idüp sedd-i sedîd-i tig u teber ve hadd-i hadîd-i gürz ü şeşper ile ebvâb-ı âmed-südləri sed olunıcak kimi tu ‘me-i şîr-i şemşîr-i zafer-te’ sîr ve ehl ü iyâlleri giriftâr u esîr olup ve kimi habl-i metîn-i istîmâna ve urve-i vüskâ-i aqv u ihsâna temessükü takdîm ve kılâ ‘ı nevvâb-ı kâm-yâbımıza teslîm eyleyüp bi-inâyetillâhi'l-Meliki'l-Mu ‘în cezîre-i mezbûre ve nice kılâ ‘ u memâlik dahı musahhar-ı nigîn-i pür-temkînimiz olup ibtidâ ‘-i zuhûr-ı dînden ilâ-hâze'l-hîn ma‘âbid-i evsân olan kenâyis-i rehâbinini mesâcid-i ehl-i îmân ve medâris-i ilm-i dîn kılınup beglerbegi ve sancakbegleri nasb u ta ‘yîn olunup ale'l- vechi'l-kâmil havza-i hükûmetimize dâhil olmuştur. El-hâletü hâzihî bu sâl-i ferhunde-fâlde sanâdîd-i melâ ‘în-i mezbûrînin istîsâli içün sefâyin-i garâyim-i âliye-i şâhânemiz âmâde ve bâdbân-ı himmet-vâlâ-yı pâdişâhânemiz küşâde ve hidâyet-i beşâret-âyet-i hazret-i mürsilü'r-riyâhî pîsvâ ve tevessül-i mu ‘cizât-ı kesîretü'l-berekât-ı mürsil-i fettâhî reh-nümâ kılup evvel-i bahâr-ı huceste-âsârda azîm donanma-yı hümayûn-ı zafer-makrûn tedârük ü ihzâr olunmagın unvân-ı nâmede mezkûr olan mü ‘emmel ü emânînin mukaddemât-ı husûlî; “el-umûru merhûnetün bi-evkâtihâ” fehvâsınca muktezyât-ı kazâ ve takdîr-i bî-tagyîre tefvîz olundu. Gerekdir ki, serâ-perde-i irâdât-ı zi'l-mülki ve'l-melekûtdan suver-i murâdât-ı âlem-i nâsût hüveydâ olunca dâyima nihâd-ı celâlet-âyetinüzde muzmer olan celâdet ü sehâmetinüz

*muktezâsınca kenef-i himâyetinizde mahmî olan re'âyâyı ri'âyet ve âmme-i ahâlî-i İslâmî mazarrat-ı akâyid-i fâside vü ilhâd ve fesâd-ı a'dâyı liyâmdan himâyet eyleyüp inân-ı ta'allukât-ı zamâ'ir-i kudsî-serâ'ir ve zimâm-ı teveccühât-ı havâtır-ı feyz-me'seri hullân u ahibbâyla erkân-ı mersûsu'l-bünyân-ı muhâlesat u vidâd ve bünyân-ı kaviyyü'l-erkân-ı muvâlefet ü ittihâd feyz-ı fazl-ı Sübhânî ve avn ü gavs-i Yezdânî birriyle mümevhed ü ber-karâr olmak savbına ma'tûf kılma ki, bu kâ'ide-i marziyye müstahkem ü üstüvâr olup ferâğ-ı bâl-i cemâhîr-i ulemâ ve sulehâ ve refâhiyyet-i hâl-i âmme-i fukarâ ve zu'afâ bir nev'ile nizâm u intizâm ve sebât ü istihkâm üzre ola ki, min-ba'd anun kavâ'id ü zavâbitına ve ma'âkîd ü ravâbitına inkitâ' u inkirâz-ı devrâna degin ihtimâl-i hâlel ü fütûr ve sevâ'ib-i naks u kusûr yol bulmaya.” (BOA, pp. 6-7)*

The document cited above briefly states that the safety of those who have completed the pilgrimage and are returning to their homelands will be ensured on their journey home, and that the Venetians, who pose a threat to Muslim merchants and engage in piracy, have been stopped in the Mediterranean and Cyprus has been conquered, as reported to the Khan of Bukhara. These statements emphasize the Ottoman Empire's role as protector of the Islamic world and aim to strengthen the friendship between the Ottomans and the Khanate of Bukhara.

The archival document, dated May 5, 1573 (Hijri: 3 Muharrem 981), contains the decree given to the Bey of Kaffa regarding sending a message to the Tatar beys in the Azak region to ensure the safety of the route for the return journey of the Bukhara ambassador and his entourage visiting the Ottoman Sultan. The translation of the document is provided below.

*“Kefe begine hüküm ki: Hâlâ Buhara cânibinden Âsitâne-i sa'âdet-âsiyâneme gelen ilçinin mesâlihi itmâma irişüp girü ol cânibe teveccüh ü azîmete isticâze eylemegin hüsn-i icâzet-i âlî-nehmetime mukârin olup buyurdum ki: Vusûl buldukda Azak cânib[er]inde olan ümerâdan Yahsî Sâ'at Mîrzâ ve İslâm Mîrzâ ve Kâdî Mîrzâ'ya haber ve âdem gönderüp tenbîh eylesin ki, müşârun-ileyhi ve âdemlerini Âdil suyundan sühûlet ile ubûr itdirmek bâbında gereği gibi mu'âvenet ve muzâheret eyleyüp kendüye ve âdemlerine ve esbâb u davarlarına kimesneyi dahl ü ta'arruz itdirmeyüp emîn ve sâlim ulaştırup sen dahî lâzım olan havâyiclerin akçalarıyla tedârük itdüresin.”* (BOA, p. 8)

This brief decree reflects the Ottoman Empire's sphere of influence in trade and diplomacy in the northern Black Sea region and its connections with Turkestan. Local lords and commanders were warned to ensure the safety of the Bukhara ambassador during his arrival in Istanbul and his return journey near Azak. This document is a diplomatic correspondence demonstrating the Ottoman Empire's authority in Crimea, Azak, and the northern Black Sea region. Local beys were requested to refrain from actions such as attacks and robberies that would threaten the safety of the ambassador and his delegation, and they were also obliged to provide protection and assistance. This document guaranteed the safety of the ambassador's property, men, and animals, and the Bey of Kefe was tasked with providing for their needs. Such orders demonstrate the great importance the Ottomans attached to the principle of “diplomatic immunity” in their international relations. Furthermore, the Ottomans' establishment of relations with distant Islamic countries such as Bukhara is noteworthy in terms of strengthening their role as the leader of the Islamic world.

Another example of the strong continuation of relations between the Ottoman Empire and Turkestan is the fact that the Khans in the region sought the opinion of the Caliphate in the Ottoman Empire regarding their disputes. The document dated 1702 (Hijri: 1113) is an imperial decree sent from the Uzbek Khans to the Khan of Balkh, Sayyid Muhammad Mukim Khan. This document was written to resolve the dispute between Sayyid Muhammad Mukim Khan and his uncle, Sayyid Ubeydullah Khan. The letter sent from the imperial court addressed to Sayyid Muhammad Mukim Khan emphasized that the hostility and animosity between him and Sayyid Abdullah Khan, who ruled in Bukhara, must be ended immediately, otherwise enemies would take advantage of the situation. It also states that this situation is contrary to Allah's will. Although it was Mukim Khan's uncle, Sayyid Abdullah Khan, who initiated the hostility, Mukim Khan is advised to show the necessary understanding and leniency, supported by verses and hadiths. It is stated that action should be taken in accordance with verses 59 and 60 of Surah Hashr (O Lord, leave no rancor in our hearts toward

those who believe!). The fact that the Ottoman Sultan was consulted on this matter, despite being quite distant from the geography of Turkestan, is a sign of loyalty to the caliphate held by the Ottoman Empire.

“...Ancak nâme-i muhâlasat-iktirânınızda rakam-zede-i kilik-i beyân kılındığı üzre dârü'l-mufâhare-i Buhara'da fermân-fermâ olan ammîniz Seyyid Abdullâh Hân ile beyninizde peydâ olan adâvet ü bagdâ semâtet-i a'dâ ve tehvîn-i rûkn-i rekîn-i şerî'at-i garrâya mü'eddî bir emr-i nâ-savâb ve muhâlif-i rızâ-yı Cenâb-ı Rabbü'l-erbâb olup bu hilâfın yine i'tilâfı tahvîli ve bu sikâkın yine hüsn-i vifâka ircâ' ve tebdîli ehemmi mehâmm-ı dîniyye ve akvem-i merâm-ı dünyeviyyeden idüğü zâhir olmagla ibtidâ tarîk-ı tecâvüze i'tidâ ammîniz cânibinden vâkı' olmuş ise de meslûk-i mülûk-i sûtûde-sülûk olan mu'âmele-i bi'l-mücâmele kâ'idesi tarafınızdan mürâ'ât ve zuhûr eden münâfesâta musâfât ile mükâfât olunup el-mü'minûne ke'l-bünyânî yesüddü ba'zuhum ba'zan magzâsı üzre beyninizde bünyân-ı vifâkı kuvvet-i ittifâk ile sedd ve râh-ı hilâf-ı sikâkı min-küllil-vücûh sedd idüp nasîhat-i mülûkânemiz ile ihtidâ velâ tec'al fî kulûbinâ gillen li'llezîne âmenû fehvâ-yı serîfine iktifâya bezl-i cidd-i evfâ eylesesiz...” (BOA, p. 72)

The archival document dated July 23, 1789 (Hijri: 23 Shawwal 1203) states that if the Ottoman Empire were at war with Russia, the Khan of Bukhara, Muhammad Khan, would be ready to assist the Ottoman state with his Kazakh and Kyrgyz Tatars. A written order sent from the Ottoman Empire to the Khan of Bukhara states that the Ottomans are at war with Moscow and that fighting the infidels and jihad are obligatory for the entire Islamic community. Upon receiving the written order from the Ottomans, the Khan of Bukhara sent envoys to the Kyrgyz and Kazakh Tatars to explain the gravity of the situation. It was reported that due to the Russians' actions contrary to the agreement made with the Ottomans, the doors of war had been opened on land and sea, and the obligation of jihad had to be fulfilled. The text emphasized that all Muslims had to participate in this war and that this jihad was obligatory for every Muslim. It also stated that the entry of Muscovite merchants into the country had to be prevented and all their trade activities had to be stopped. All this information was reported to the Ottomans by the Bukhara ambassador, Muhammad Bedi Bey. Based on the information provided in the archival document, it is understood that the Ottoman Empire was able to use its influence in Turkestan in the military, commercial, and diplomatic spheres during the war with Russia. This situation demonstrates the extent to which relations between the Ottomans and Turkestan had developed during this period.

“...Buhara'dan ben çıkmazdan beş on gün mukaddem taraf-ı Devlet-i Aliyye'den hân-ı müşârun-ileyhe irsâl buyrulan nâme-i hümayûn vâsıl olup mefhûmunda Moskov keferesinin münâfî-i uhûd ve surût vâkı' olan harekâtı takrîbiyle ber-mûceb-i fetvâ-yı şerîfe berren ve bahren kefer-i mesfûre üzerine muhârebe kapuları açılıp icrâ-yı farîza-i gazâyâ kıyâm buyrulduğu mûnderic ve mastûr olduğundan derhâl hân-ı müşârun-ileyh nüfûs-ı kesîreden ibâret olup taht-ı itâ'atında ve Moskov memleketiyle hem-hudûd olan Kırgız Tatarlarına mahsûs kâğıdlar ve Kazak hânlarına sefirler gönderüp Halîfetü'l-Müslimîn olan Âl-i Osmân Pâdişâhı hazretlerinin Moskov ile seferi var imiş. Küffâr ile muhârebe ve cihâd kâffe-i ehl-i İslâm üzerine farz olmuştur. İçimizde her ne kadar Moskovlu tüccârı var ise cümlesini tard ve def' ve fî mâ ba'd Moskovlunun her bâr ihtiyâclarına mebnî ol taraflardan istirâya mecbûr olduğu bârgîr ve koyun ve yapagı vesâir emti'a ve eşyâyı bey' itmeyesiz. Ve muâmele-i ticâreti külliyyen kat' idesiz. Ve Moskovlu memleketlerini her taraftan urup tâht u târâc ve emvâl ve eşyâların igtinâm ve nisâ ve sıbyânların esîr iderek geregi gibi ahz-ı intikâm eylesesiz ve Devlet-i Aliyye-i dâimü'l-karârın Moskovlu ile hayırlı ve menfaatli musâlahası tahakkuk itmedikçe onlar ile husûmetden fârig olmayasız deyü geregi gibi tavsiye ve te'kid ile Moskovlu memleketleri üzerine zikr olunan Kırgız ve Kazak Tatarlarını sevk ve taslît eyledi. Kırgız ve Kazak tâifesi bî-nihâye olup cümlesi ehl-i İslâmdan ve Hânefiyyü'l-mezheb olmalarıyla muktezâ-yı salâbet-i diniyyeleri üzre hân-ı müşârun-ileyhin emr ü tenbîhi muktezâsınca bilâd-ı küffâra akın idüp bir taraftan memâlik-i a'dâyı tahrîb etmek üzredirler. Bunların egerçi hân-ı müşârun-ileyhe tebe'iyetleri derkârdır. Ancak kendülere muzırr ve icrâsı gayr-ı mümkün olan mâddede hâna itâ'at itmeyizler. Meselâ bu def'a vâkı' olan emrine imtisâl ile memleket-i a'dâyâ hücum ve mallarını igtinâm idiyorlar. Ba'de'l-musâlahâ aldığınız emvâl ve üserâyı yine redd edeceksiz. Böyle kavl olundu ve

*musâlaha bunun üzerinedir denilse bir vechile müfid olmayup aldıklarından hiç bir sey vermezler. Ve bu bâbda söz dinlemezler.”* (BOA, 2004, p. 67)

Another archival document is dated April 7, 1800 (Hijri: 12 Zilkade 1214). This document is a petition requesting passports from the Ottoman Sultan so that Haji Nazar Muhammad, Haji Baba, Haji Kasim, Haji Artuk, Hoca Tahir, and Hoca Abdullah, who had left Bukhara and had been traveling for a long time, could return to their homeland:

*“Devletlü inâyetlü merhametlü sultânım hazretleri sag olsun; arz-ı hâl-i dâ’ileridir ki, bu kulları asıl Buhara’dan olup müddet-i vâfireden beru seyâhatte güzâr olup bu avânda altı nefer kimse beldemize teveccüh itmek murâd eyledikde yedimize bir bâsport [pasaport] kerem [ve] ihsân eyleyüp ve hayır-duâmıza mazhar olunmak bâbında emr u fermân devletlü inâyetlü semâhatlü sultânım hazretlerindir.”* (BOA, p. 10)

This document, dating from the early 19th century, demonstrates that during that period, border and identity control had acquired an institutional character within the Ottoman Empire's diplomacy and bureaucracy. It is noteworthy that the concept of a passport was used at that time in the modern sense as an international travel permit. The fact that those coming from Bukhara had to pray to the Sultan and ask for permission even when passing through Ottoman territories demonstrates that the Ottoman Empire maintained its legitimacy and status as a center of power in the Islamic world. The document also reflects the Ottoman Empire's sensitivity regarding the safety of Muslim merchants, pilgrims, and travelers.

The archival document dated February 14, 1816 (Hijri: 15 Rabi' al-Awwal 1231), which contains information about Turkestan, covers a different subject compared to the others. The Persian document written by Mir Haydar Khan, the ruler of Bukhara, to the Sultan was translated into Ottoman Turkish and presented to the imperial court. In this document, Mir Haydar Khan requests religious books from the Ottoman Sultan. In addition to this request, Haydar Khan asks the Sultan to grant him a government charter, i.e., special permission, to establish authority over the Khanates of Kazan and Khwarezm. He also requests information regarding reports of the Saudis' invasion of Mecca and Medina, the holy lands for Muslims:

*“...Buhara Hâkimi tarafından olduğu ve ile'l-ân ol minvâl üzre olup fakat Kazgan ve Hârezm Eyâleti hükkâmı hiffet-i tab‘ ve hadâsetleri cihetiyle gâh itâ‘at ve gâh adem-i itâ‘at ile tarîk-ı müstakîmden udûl ve inhirâfları meşhûd olduğundan müşârun-ileyh Devlet-i Aliyye’nin mutî‘ ve fermân-ber bendegânından ma‘dûd buyurularak eyâlet-i mezbûrenin hükûmeti mensûruyla ser-efrâz kılınması ve mukaddemâ Su‘ûd-ı nâ-mes‘ûdun Haremeyn-i Muhteremeyn’e istilâsı mesmû‘ları olarak bâdî-i hüzn ü melâlleri olmuş olduğundan itmînân-ı ehl-i İslâm zımnında Hicâz tarafının keyfiyyet ve ahvâlî iş‘âr olunması beyânıyla haddi olmayarak Dîvân Begi Mîrzâ Muhammed Yûsuf ile takdîmine ictirâ eylediği iki cild Delâ’il-i Şerîf ve bir mikdâr itr hediyyesinin nazar-ı iltifât-ı mülûkâne ile meşmûl buyurulması tazarru‘unda ve mîrzâ-yı mûmâ-ileyhin bir ân akdem i‘âde ve ircâ‘ı husûsuna müsâ‘ade-i seniyye erzân buyurulmasını Hâkim-i müşârun-ileyh Mîr Haydar Hân sâlifü’z-zikr nâmesinde tahrîr ider.”* (BOA, p. 14)

In the above document, the Khan of Bukhara demonstrated clear allegiance to the caliphate held by the Ottomans, thereby supporting the central role of the Ottomans in the Sunni Islamic world. Historically, the populations of Turkestan -particularly within the territories of modern-day Uzbekistan- strictly adhered to the Hanafî madhhab. This commitment was characterized by a rigorous stance toward other schools of law, whereby any legal ruling issued by an authority from a different madhhab was deemed invalid. Hence, the religious affinity toward the Ottoman State was rooted not only in the political prestige of the Caliphate but also in this shared jurisprudential identity (Garipova, 2026, p. 58). The request for Islamic sources and books is an effort to strengthen Bukhara's religious administration. His expectation from the Ottomans regarding the Hijaz reveals that the Ottomans are still seen as the most reliable political and religious authority in the Islamic world against the Saudi threat. The Khan behaved like a vassal of the Ottomans in the region, but at the same time demanded recognition of his local authority. This letter was a sign of prestige for the Ottomans, but it also showed that the Islamic world, from India to Bukhara to Khwarezm, expected



support from the Ottomans. The Ottomans, in turn, used such requests to maintain their religious legitimacy and protect their sphere of influence without direct military intervention.

The letter beginning with "To the most noble and honorable ruler of the world, the ruler of Bukhara, in response to the letter received from him, containing the answer and sent as a precious gift, some rare books were sent" (BOA, p. 14) dated April 27-May 6, 1818 (Hijri: Cemaziyelahir 1233), constitutes a response to the requests and information requests mentioned above. The document sent to the Governor of Bukhara, Mir Haydar Shah, contains information that the Hejaz, Mecca, and Medina have been liberated from the Saudi invasion and that some of the requested religious books have been sent. This archival document, which contains the response, does not include information on whether the government decree was given to the Governor of Bukhara.

The imperial decree, written during the reign of Ottoman Sultan Abdülmecid, is dated July 22, 1857 (Hijri: 30 Zilkade 1273). This archival document, which concerns the awarding of the Mecidiye Medal to Sheikh Fethullah of Bukhara for his bravery in the Battle of Silistra, is significant in that it shows that, in accordance with the call of the Caliphate, some Muslim Turks from Turkestan also fought in the Ottoman ranks in certain battles:

*"Nişân-ı hümayûn oldur ki: Saltanat-ı seniyyem hakkında ızhâr-ı gayret ve hamîyyet ve sadâkat eden ve menâfi '-i Devlet-i Aliyye 'm için ibrâz-ı âsâr-ı hayr-hâhî ve istikâmet eyleyenlerin ta 'attufât-ı seniyye-i şâhâneme nâ 'iliyyeti şân-ı me 'âlî-ünvân-ı pâdişâhânem iktizâsından bulunduguna ve tarîk-ı dervîşândan Buharalı Şeyh Fethullâh -zîde kadrihû- 'nun Silistre Muhârebesi'nde meşhûd olan hüsn-i hîdmeti ve ibrâz eylediği mesâ 'î-i makbûlesi cihetiyle âtîfet-i seniyyeme kesb-i istihkâk eyledigine binâ 'en bu def 'a Mecîdiye nişân-ı hümayûnumun beşinci rütbesinden bir küt 'ası kendüsine inâyet ve ihsân kılınmış olmağla işbu berât-ı mekârim-simât-ı şehriyârânem dahı tasdîr ve i 'tâ kılındı."* (BOA, pp. 29-30)

The reward given to Sheikh Fethullah of Buhara for his service in the Battle of Silistra reflects the understanding of the period that military achievements and services should be recognized. Loyalty and service were deemed worthy of praise and were rewarded. In such texts, rewarding individuals loyal to the state is an important element in strengthening the empire's power and authority.

The document dated 1839 (Hijri 1254) is a diplomatic letter sent by the Khan of Kokand to the Ottoman Empire and contains the political and military demands conveyed by the Khanate of Kokand to the Ottoman State. Considering its content, this document is significant in that it demonstrates the close relations between Turkestan and the Ottoman Empire. The beginning of the letter assesses the general situation in Turkestan. It states that the Khan of Hokand had no problems in his relations with either China or the Khanate of Bukhara, but that his relations with Russia were not good. The letter states that Russia has drawn some nomadic Khans, particularly among the Kipchaks, to its side, while some continue to pay taxes to the Khanate of Kokand. Some Khans in the region, however, act independently without allegiance to any side. The article also states that the Kipchak population in the region was around eight million, but only a portion of them belonged to the Khanate of Hokand, while another portion belonged to Russia. It is also noted that due to Russia's current policy, they were in conflict with the Khanate of Kokand from time to time. The Khan of Kokand requested military assistance from the Ottoman Empire in order to maintain the military strength of the Khanate. The Khan of Kokand requested infantry, cavalry, and artillery instructors, and if the requested instructors were not sent, he requested that educational books on these subjects be sent. The reason given for this is that the Hokand Khanate's army previously consisted only of cavalry, and the infantry unit was newly established. It is also stated that training in the newly established infantry unit was provided according to the British system. Furthermore, it was requested that military ranks be granted by the Ottoman Empire to some of the military officials in the Khanate and that this be announced to the other Khans in Fergana, Kazakhstan, and Kyrgyzstan. At the end of the letter, it was requested that the Hokand Khan's twelve-year-old son also be granted the title of Il-i Khan. Due to the important content of the letter, the entire text of this document is reproduced below:

*"Hokand Sefîri Zâhid Hâce-i Gilân dâ 'ileriyle olan mükâlemenin sûretidir. Hâk-i pâ-yi hümayûn-ı hazret-i mülûkâneye Hokand Hânı Muhammed Hân hazretlerinin bu def 'a takdîm eylediği*

nâmesinde ba'zı husûs, zât-ı şerîfinizin şifâhen ifâdesine havâle buyrulduğu muharrer olmagla âna nazaran ifâde ve istid'ânız nedir?" deyü ilçiden sü'âl eyledigimde mûmâ ileyh dahı; "Bizim hânımızın zîr-i hukmünde olan memâlikin bir tarafı Buhara ve bir tarafı Çin-i Mâçîn ve bir tarafı Rusya Devleti olmagla Buhara ile dâ'imâ sulh üzre olup Çin-i Mâçîn'in dahı üzerine varılır ise muhârebeye kıyâm idüp varılmadığı hâlde kendü hudûdundan hârice tecâvüz itmemek âdet-i müstemirresidir. Hattâ Kasgar ve Hoten vesâ'ir yedi şehir Çinîlerin zabtında iken gavgâ ve nizâ'olunmasun için hâkim-i ser'ler bizim tarafımızdan nasb olunup ve hâkân-ı Çin beher sene hânımıza def'-i belâ diyerek bir çok akça dahı virir. Ancak Rusya Devleti müddet-i medîdeden berü Deşt-i Kıpçagın konar-göçer töre ve ba'zı hânlarını akça vesâ'ir hîle ile kendü tarafına celb ve ba'zıları bizim hânımıza itâ'at idüp zekâtlarını virirler ve ba'zıları hiç bir tarafa meyl itmeyüp kendü başlarına gezerler." demekle kulunuz dahı "Deşt-i Kıpçagın nüfûsu sekiz milyondur; ne mikdârı hân hazretlerine ve ne kadarı Rusya Devleti'ne tâbî' olup ve ne mikdârı kendü başınadırlar ve beş-on sene mukaddem Hokand'a yirmi günlük mesâfede Bedbaht nâm çölün başında Rusya Devleti bir palanka inşâ idüp hân hazretleri tarafından asker irsâliyle palankasını hedm ve Rusya askeri tard u def' olunmuş idi; şimdi ne hâldedir?" deyü sü'âlimde; "Deşt-i Kıpçagın nüfûs ve hânımız ile Rusya Devleti'ne ne mikdârı tâbî' olup ve ne kadarı kendü başına oldukları ma'lûmum degildir ve zikr olunan palanka mukaddemâ hedm olup, ben bu tarafa azîmetimden iki gün evvel; -Ol mahalle Rusyalı yine palanka inşâ eyledi.- deyü âmed ü süd iden tüccârdan rivâyet olunmagla hânımız tahkîkına âdem göndermiş idi. İşte ma'lûmunuz olan mahzûrâtı def' için esbâbına teşebbüs lâzım geldüğinden ve bizim askerimizin cümlesi süvârî olup piyâdesi olmadığından ve mukâbele-i bi'l-misl şart idüğinden bir kaç seneden berü Hindistân'dan gelen Mu'allim Kerîm Hân vâsita ve delâletiyle Avrupa usûlî üzre piyâde ve topçu ta'lîmine şürû' olunmuş ise de cebren alınmayup el-hâletü hâzihi istekleriyle yazılan piyâde neferi beş yüz ve takımıyla çarha topu on iki kıt'aya resîde olup inşâ'allâhü te'âlâ sâye-i hazret-i şâhânedâ ahâlî alışıp günden güne tezâyüd bulacağı ve askerinin ta'lîmi İngiliz kâ'ideleri üzre olup hânımızın iltimâsı evvelen; taraf-ı eşref-i şâhânedâ iki piyâde ve iki süvârî ve iki topçu ta'lîmcileri irsâline inâyet buyurulmak ve eger bu mümkün olmaz ise piyâde ve süvârî ve topçu ta'lîmlerine ve sâ'ir harb ü kitâle dâ'ir tab' olunmuş ve olunacak kitâblardan birer nüsha ihsân buyurulması, sâniyen; hânımız ol tarafda zât-ı hümayûn-ı şehin-şâhîlerinin bir ser'askeri olup seyfi nizâmî-i şâhâne ve nişân-ı hümayûn-ı mülûkâneleriyle müftehir ve bendelige kabûl buyrulduğu yedi-sekiz seneye bâlig olup sâ'ir bendegân misillü kat'-ı rütbe ve kesb-i nüfûz itmege iştihkâki olduğundan nâme-i hümayûn-ı ma'delet-nümûn-ı şâhânelerinde kâffe-i mülk-i Fergana ve Deşt-i Kıpçak-ı Kazâkıyye ve Deşt-i Alâ-yı Kırgızıyye, Hânlar Hânı unvânıyla mu'anven buyurulması ve bu vesîle ile hiç bir tarafa itâ'ati olmayup kendü başlarına olan ilât hânlarına nasihat ve üli'l-emre itâ'ate da'vet ile millet-i İslâmiyyeyi ittihâd-ı kulûba ragbete lutf u merhamet-i mülûkâneleri erzânî buyurulması, sâlisen; on iki yasında fakat bir oğlum ve veliyy-i ahdîm olan Muhammed Emîn Hân şehzâdelerine dahı İller Hânı ta'bîr ve unvânıyla mesrûr ve bekâm buyurulmasını istid'â ve iltimâs eylediği" sefir-i mûmâ-ileyhin şifâhen takrîr ve ifâdesinden ma'lûm olmuştur. Bâkî emr u fermân hazret-i men lehü'l-emrindir." (BOA, pp. 41-42)

This document should be regarded not only as a record of diplomatic relations, but also as an important source that thoroughly examines the strategies pursued by the Ottoman Empire in foreign policy and its military preparations. The content of the document reveals the multi-ethnic structure of the Ottoman Empire, its efforts to modernize its military power, and its claims to leadership in the Islamic world. The document focuses particularly on the situation and relations of the Khanate of Kokand. It contains details describing the border issues of Khan Muhammad Khan of Kokand with major powers such as Russia and China, as well as the military and commercial situation in these lands. At the same time, this type of correspondence can also be read as a guarantee of peace and cooperation between governments. The description of the internal turmoil witnessed in Turkestan during this period and Russia's interventions in Hokand requires evaluation within a broader geopolitical context. A large part of the archival document concerns military training, strategy, and security measures. For example, the shortage of infantry in the Khanate of Hokand, defense plans

against Russia, and the provision of European-style military training by military instructors from India reveal a strategic plan aimed at coping with the great powers.

The writings also demonstrate that military training was taken seriously and that modern military methods were being adopted. At the end of the document, there is also a wish regarding the ruler's family. This is another indication of how important the continuity of the dynasty was in the Ottoman Empire. This section reflects the Ottoman Empire's efforts to maintain a balance of power among its own rulers and heirs.

M. Saraylı, who wrote a comprehensive study on the relations between the Ottoman Empire and Turkestan, attributed the Ottoman Empire's failure to achieve its goal of providing military aid to Turkestan to the following reasons:

*"...Ne var ki Türkistan devletleri ile Osmanlı Devleti arasında, şii İran'ın geçit vermez bir set gibi bulunması ve Kafkasların Ruslar tarafından işgal edilmiş olması gibi sebeplerle, istenen askerî malzemeyi gönderecek bir yol bulunamamıştır. Silah yardımı haricinde istenen askerî yardım ise hiç mümkün olmamıştır. Zira bu yardımların istendiği devirlerde Osmanlı Devleti'nin hem Rusya ile sulh halinde olması ve hem de Rusya'dan çekinmesi dolayısıyla, asker yardımı mümkün olmamıştır. Bu istekte bulunan ülkelerin temsilcilerine gönüllü toplama tavsiyesinde bulunulmuş bundan da istenen netice alınamamıştır"* (Saray, 2000, p. 19).

Following this document, the Ottoman Sultan awarded the title of Khan of the Provinces to Seyyid Muhammed Khan, son of the Khan of Hokand, with his imperial insignia.

*"...avâtıf-ı aliyye-i sâhânemden seref-yâfte-i sudûr olan irâde-i mevhîbet-âde-i pâdisâhânem mücebince pederi müsârun-ileyhin zîr-i idâresinde kâ'in mahallerin İller Hânlığı unvânı müfeyvaz-ı uhde-i dirâyet ü necâbeti kılınmagla isbu mensûr-ı lâmi 'u'n-nûr-i fâ'izu's-sürûru virdim ve buyurdum ki:*

*Bundan böyle hân-ı müsârun-ileyh her bir husûsda peder-i âlî-güheri müsârun-ileyh cenâblarının emr ü re'yi üzre hareketle ibrâz-ı me'âsir-i rızâ-cûyî ve mütâbe'at ve müteferri'ât-ı umûru olan mevâdda kemâ-yenbagî icrâ-yı muktezâ-yı fetânet-kârî ve revîyyete bezl-i cell-i miknet eyleye; söyle bileler; alâmet-i serîfe i 'timâd kılalar."* (BOA, p. 44)

The document dated July 21-30, 1849 (Hijri: Ramadan/1265) is a response to a letter sent by Muhammad Emin Bahadır Khan, the ruler of Khwarezm, one of the Turkestan Khanates, requesting that Russia be prevented from attacking his territories. The reply letter indicates that Bahadır Khan's letter requesting assistance from the Ottoman Empire stated that the security and peace of the Khwarezm people would be ensured under Ottoman protection, and that the Ottoman-Khwarezm alliance was considered very important. It was stated that the necessary support and all kinds of assistance would be provided for the consolidation of the state's power and the continuation of its prosperity against Russia's cross-border violations. Furthermore, it was stated that the Khwarezmian ruler appreciated the support and assistance he received from the Ottoman Empire, and a strong statement was made that strengthening friendly relations was in the interests of both states. In this context, it was expressed that both countries would continue to cooperate against such possible external threats and were determined to maintain their friendly relations.

*"...ta'arruzât-ı vâkı'anın indifâ'ını kalben ve kavlen temennî ve istid'âdan hâlî olmayacağımızdan ol bâbda Rusya Devlet-i fahîmesi tarafına ifâdât-ı lâzime-i dostâne icrâ olunmuş ve hükûmet-i fahîmâneleriyle dostâne ve muhibbâne mu'âmelâtda bulunmak kendülerinin dahî dil-hâhları olduğu beyân kılınmış ve tarafımızdan her dürlü mesâ'î-i mümkünenin sarfında tecvîz-i müsâmahe olunmayacağından inşâa'llâhü'l-Kerîm husûl-i matâlib-i hamîyyet-kârîleri eltâf-ı lâhiyyeden kaviyyen me'mûl bulunmuşdur. Cenâb-ı sûtûde-elkâblarının mütehallik u mevsûf oldukları hilye-i hasene-i diyânet-kârî ve hamîyyet iktizâsınca dâhil-i dâ'ire-i hükûmetleri bulunan mahâll ü memâlikde sâkin ü mutavattın kâffe-i ahâlî ve re'âyâ ve berâyânın vikâye-i emn ü âsâyişine bezl-i mâ-hasal ikdâm ü ihtimâm buyuracakları bî-istibâh olduğu misillü devlet-i müsârun-ileyhâ ile hükûmet-i Kaanîleri beyninde mün'akıd olan uhûd ü surûta dahî dikkat ü ri'âyet olunarak her hâlde levâzım-ı müsâlemet-kârî ve musâfâta i'tinâ ve himmet buyruldukca bi't-tab' ser-rîşte-i tahattiyât mündefi' olacağına istibâh olmamagın bu husûslar üzerine dostâne ve hâlisâne olarak icrâ-yı*

*iẖtârât ile dikkat-i behiyyelerinin celbi lâzime-i zimmet-i yek-cihetî vü dostî add olunmuş olduğu beyânıyla tesyîd-i bünyân-ı hullet ve temhîd-i erkân-ı hubb ü muhâlesat zımnında işbu cevâb-nâme-i hümayûnumuz terkîm ve tahrîr ve sefîr-i mûmâ-ileyhimâyâ tevdî'an taraf-ı şerîflerine ba's ü tesyîr kılındı. İnsâa'llâhü te'âlâ lede'-sa'di'l vusûl ma'lûm-ı necâbet-melzûmları buyruldukda bundan böyle cânib-i seniyyü'l-cevânib-i mülûkânemiz âsâr-ı tevâdd ü müvâlât-ı Kaanîleriyle meşmûl ve her hâlde; 'Esra'u'd-du'â icâbeten du'â'ü'l-gâ'ibi li'l-gâ'ib' tarîka-i müstahsenesine himem-i behiyyeleri masrûf buyurulması tevakku'-gerde-i hâlisânemizdir. Bâkî hemîşe ravâbıt-ı müvâlât mü'eyyed ve zavâbıt-ı musâfât mü'ebbed ve mebânî-i hullet ü mu'âhât mümevhed ü müseyyed bâd; bi'n-nebiyyi ve âlihi'l-emcâd." (BOA, p. 59)*

On September 30, 1861 (Hijri: 25 Rabi' al-Awwal 1278), a diplomatic archive document requested assistance from the Ottoman Empire against Russia, which sought to seize Uzbekistan and the Hokand region. In this document presented by the Hokand ambassador to the Ottoman Empire, it is stated that although the Hokand Khanate appeared to be capable of governing itself militarily, economically, and administratively, the mines could not be operated due to the lack of regular training, and the military structure was in disarray. The document also stated that the people of Hokand took pride in their religious affiliation with the Ottomans and therefore needed Ottoman protection under all circumstances. The ambassador was tasked with requesting the Ottoman Empire's assistance to prevent Russian intervention. The letter also states that the people of Mâverâünnehir and its surroundings have deep respect and affection for the Ottomans.

*"...Ancak bir müddetden berü Rusya Devleti'nin havâlî-i Özbekistân'a aralıkda hücum iderek ba'zı hudûdu tecâvüz itmek ve envâ'î desâyis ile Hokand ve ol havâlîyi zabt idüp almak efkâr-ı sahîhinde bulunduğuna ve ol havâlî ahâlîsi ise Devlet-i Aliyye'nin bir du'â-gûy-ı kadîmleri olduğuna ve her ne kadar asker ve mühimmât ve ma'deniyât ve sâ'irece idâre-i mülküne iktidâr hâlinde ise de taht-ı terbiyede olmadıkları cihetle ma'denleri metrûk ve askerleri nizâmsız bir hâl ve hey'etde bulunup ahâlî-i Hokand, Devlet-i Aliyye-i Ebed-müddet'e kadîmden berü min-cihet'l-mezhebiyye tâbî'iyet şerefiyle müftehir oldukları cihetle herhâlde himâyâ ve sahâbet-i saltanat-ı seniyyeye muhtac bulunduğuna..." (BOA, p. 52)*

The document cited above states that the people of Hokand and its surroundings were religiously affiliated with the Ottoman Empire and needed its protection. This reinforced the Ottoman Empire's sovereignty in the region and its power in the struggle against such regional powers. The people of Hokand expressed their allegiance to the state and requested its assistance. Such diplomatic texts emphasize that aid and support must be provided on the basis of mutual understanding. Here, too, the request for "protection" demonstrates the Ottoman Empire's intention to maintain its regional sovereignty and protection. The document also mentions requests for military aid and training. The state's desire to modernize its military power is also evident here. The military and strategic aspects of the document provide important information about the Ottoman Empire's strategies for ensuring regional security, protecting its borders, and using military force. In short, this document shows the Ottoman Empire's diplomatic relations, particularly the tensions with Russia and China along its borders, and its approach to internal and external threats. At the same time, this document reveals that the Ottoman Empire used it as an opportunity to demonstrate its power and reinforce its leadership claims, especially in regions with Muslim populations. This document provides highly significant information about the Ottoman Empire's outward-looking strategies and its understanding of regional sovereignty.

An archival document containing a letter written by Grand Vizier Mehmed Rüşdi Pasha during the reign of Ottoman Sultan Abdülaziz on January 10, 1867 (Ramadan 4, 1283 AH) was addressed to the Governor of Bukhara for the appointment of Tashkent Hanzade Sultan Khan to a suitable position.

*"Sehâmetlî, fahâmetlî, nebâhatlî hân-ı celîlî'l-ünvân hazretleri;*

*Devlet-i Aliyye ile hükûmet-i fahîmâneleri beyninde mevcûd ve müterakkî olan ravâbıt-ı ma'neviyye-i ittihâdiyye ve meveddet-i kâmile-i hakîkiyyenin icâb-ı tabî'isinden olmak üzere âsitân-ı fahâmet-ünvân-ı hükümdârîlerinden hâcet-mend olanlar bu taraftan vesâtat-ı tahrîriyyeye*

*mürâca'ati medâr-ı husûl-i matlab bildikleri cihetle, Taşkend hânzâdelerinden olup bu kerre pâ-yi taht-ı hükümdârîlerine âzim olan Sultân Hân Efendi dâ'îlerinin asâlet ve necâbet-i zâtîyyesine taraf-ı müstecmi' uş-şeref-i fahîmânelerinden ibrâz-ı hürmet ve merhamet buyrulacağı ümîd- varlığı ile kendüsünün oraca hâline münâsib bir hüdmetde istihdâmıyla hâ'iz-i nisâb-ı mefâharet olmaklığı emrinde...*" (BOA, 2004, p. 34)

The report dated March 21, 1872 (Hijri: 10 Jumada al-Ula 1289) is a petition submitted to the Ministry of Foreign Affairs by Hacı Osman, a merchant from Bukhara. According to the memorandum submitted by Hacı Osman of Bukhara, Russia is implementing a plan to encircle the Ottoman Empire. According to this plan, Russia, the old enemy of the Sublime Porte, is resorting to all kinds of tricks to achieve its goal; it is acting on misguided ideas such as threatening England via India and encircling Ottoman territories by invading Iran through the Turkmenistan valley. In this vein, it first occupied many parts of the Khanate of Bukhara, then destroyed the Khanates of Khiva and Khokand, and inflicted unspeakable cruelty on the Muslim people living in these regions. Considering what the Russians have done in the past, it is clear what evil they will do in the future. It is the clear duty of the Ottoman Empire to protect all believers on earth and to remove the oppression of the enemies that afflict them. This truth is known and accepted by everyone. The glory and power of the Sublime Porte, its victory over its enemies, will increase in proportion to the number of Muslim peoples under its protection. For this reason, Hacı Osman requests assistance from the Ottoman Empire and states that the more than fifteen million Muslims of Turkestan are ready to come under Ottoman protection if support is provided. Hacı Osman offered some practical solutions to the Ottoman Empire so that this sacred and beneficial goal could be achieved as soon as possible. These solutions are as follows:

- The Afghan people are an extremely brave and combative nation. As of today, they have the power to deploy over 100,000 trained soldiers equipped with modern weapons. If officers and soldiers are sent from Afghanistan to Bukhara as trainers, the currently disorganized Bukhara army can be brought under discipline in a short time. This would enable the creation of a regular army of 100,000 from Bukhara's population of over two million.

- Modern weapons could be brought in via Afghanistan.

- If the Emirate of Kashgar also joins this alliance, it too has the capacity to deploy 100,000 soldiers. This would create a very powerful alliance.

- Russia currently has only about 20,000 troops in Khokand, Tashkent, Samarkand, and Khiva. Therefore, thanks to this powerful Islamic alliance, Russian troops can be easily removed from these regions, and their castles, outposts, and trenches can be destroyed.

- Furthermore, the Emirate of Baluchistan is a small but independent state on the coast of the Indian Ocean. It is hoped that it will comply with the orders of the Caliphate in every respect.

- If an agreement is reached with Baluchistan, weapons and ammunition can be shipped through a port on its coast. Using this route would facilitate the transport of weapons to the regions mentioned above.

If Hacı Osman Bey's proposed solutions are accepted, regions such as Hokand, Tashkent, and Samarkand could be annexed to Bukhara, while the lands of Khiva and the warrior Turkmen tribes could be annexed to Afghanistan. Three large emirates could be established, including Kashgar, and placed under Ottoman protection. If the Ottoman Empire oversees the military and administrative development of these units, they will grow stronger day by day. If necessary, military operations could be carried out in the Caucasus, Dagestan, and Circassia regions, bringing a large part of the Black Sea back under Ottoman control. In this way, the Ottoman Empire would both be protected from Russia's schemes and become a deterrent force against Russia. The original content of the archival document is provided below:

*"...Afganistan ahâlisi fevka'l-hadd gayûr ve cesur ceng-âver oldukları gibi Afgan Emâreti'nin bu günkü günde esliha-i cedîde ile mücehhez yüz binden ziyâde asâkir-i mu'alleme sevkına iktidârı olduğundan ma'a havâli-i Buhara ahâlîsinin tebe'iyeti ve Afgan'dan Buhara'ya mu'allim ve zâbit irsâliyle pek az müddet zarfında Buhara'nın asâkir-i gayr-ı muntazaması dahı taht-ı intizama*

*alınarak iki milyondan ziyâde olan Buhara ahâlîsinden dahı yüz bine karîb asâkir-i muntazama tertîb ve Afgan tarîkıyla esliha-i cedîde celb edilebilir. Bu ittifâka Kaşgar Emâreti dahı dâhil olduğu sûretde emâret-i müşârun-ileyhâ dahı yüz bin asker sevkına muktedir olduğundan bir kuvve-i kesîre hâsıl olarak Rusya'nın ise şimdiye kadar yed-i istilâsına aldığı Taşkend ve Hokand ve Semerkand ve Hive memâlikinde ancak yirmi bin askeri bulunabildiğinden Rusya asâkirini memâlik-i mezkûreden kolaylıkla tard ve teb'îd ve çöllere vesâir mevâkı'a yapmış olduğu kuyu ve istihkâm ve karakol-hâneleri hedm ve tahrîb ile fî mâ ba'd memâlik-i mezkûre Rusya'nın istilâsından te'min edilmiş olur. Bir ciheti Afgan ve bir ciheti İran'a müntehî olan Belûcistan Emâreti, Bahr-i Muhît-i Hindî sâhilinde bir hükûmet-i sagîre-i müstakille olup evâmîr-i seniyye-i Hilâfet-penâhîlerine ez her cihet inkıyâd edeceği cihetle te'yîd-i esâs-ı dîn-dest ve te'yîd-i bünyân-ı Hilâfet ve devlet niyyet-i hâlisasıyla teşebbüs edilecek tedâbir lisân-ı münâsib ile tefhim olunarak lede'l-îcâb taraf-ı saltanat-ı seniyyeden hükûmet-i mezkûre sevâhilinden bir iskele zabtıyla mahâll-i sâlifetü'z-zikre sâhilden bir tarîk kûşâdına hükûmet-i mezkûre muvâfakat edeceğini ve bu cihetle emâret-i mezkûreye esliha ve mühimmât-ı sâire kolaylıkla celb olunabileceğini kaviyyen ümid iderim. Bundan sonra Hokand ve Taşkend ve Semerkand ve havâlisi kemâ fî's-sâbık Buhara'ya ve Hive memâliki ile gayet ceng-âver ve seci' olan Türkmen asâyiri Afganistan'a ilâve olunarak Kaşgar ile üç büyük emâret teşkiliyle emârât-ı mezkûre zir-i tebe'îyyet ve himâyet-i Saltanat-ı seniyyede bulunur ve cânib-i seniyyü'l-cevânib-i Devlet-i Aliyye'den dâima bunların ittihâd ve ittifâkına ve umûr-ı mülkiye ve askeriyece terakkîlerine nezâret buyurulur ise günden güne kesb-i kuvvet ve lede'l-îcâb Kafkasya ve Dagistan ve Çerkesistan taraflarına hücum iderek Karadeniz'in ekser sevâhili Devlet-i Aliyye'nin yed-i zabtına geçmek suhûlet kesb edeceğinden Devlet-i Aliyye-i Osmâniyye her vechile Rusya desâyisinden emin ve dâima Rusya aleyhine tehdîdini ikâ'a muktedir olur..." (BOA, p. 121)*

The above document is directly related to the Pan-Islamism policy pursued by the Ottoman Empire at the end of the 19th century and the beginning of the 20th century. The Ottoman Empire, particularly during the reign of Sultan Abdulhamid II, pursued a policy of uniting Muslims in Central Asia, India, and Africa under the umbrella of the ummah and achieving unity against colonialism. This document provides clear support for that policy from the field and, in addition, offers a highly feasible strategic plan. It can also be seen as an attempt to establish an alternative Islamic union in response to the geopolitical balance of the time, particularly Russia's advance in Asia.

The archival document dated June 24, 1910 (Hijri: 15 Jumada al-Thani 1328) is a military correspondence. The document addresses a letter from the Petersburg Military Attaché regarding the admission of a young man named Taş Polat Bey, a Fergana native from the Hokand region in the Tashkent province, to one of the Ottoman military schools. The fact that a Fergana youth sought admission to an Ottoman military school at the beginning of the 20th century is significant in that it demonstrates the continued admiration for the Ottoman Empire even during this period. The members of the Ottoman Council of Ministers deemed this application appropriate and decided that the government would cover the necessary expenses until Taş Polat Bey completed his education. The original content of the archival document, which includes this decision, is as follows:

*"Mûmâ-ileyhin is'âf-ı istid'âsıyla Der-sa'âdet mekâtib-i askeriyyesinden birine kabûlü muvâfık-ı hikmet ve maslahat olacığından ana göre îcâbının icrâsıyla ikmâl-i tahsîl idinceye kadar muktezi masârîfinin muhassasât-ı mukannene miyânında deverân itdirilerek tesviye olunması ve mürâca'ât-ı mümâsile vukû'unda her def'ası için Bâb-ı Âlî'ye iş'âr-ı keyfiyetle teblîg idilecek karâra göre mu'âmele îfâsı lâzım geleceğinin Nezâret-i müşârun-ileyhâya cevaben teblîgi tezekkür kılındı." (BOA, p. 54)*

As can be understood from the content of the above archival documents, the relations established between the Ottoman Empire and Turkestan from the 16th century until the early 20th century did not reach the desired level in the political sphere, but showed a certain degree of development. Three main factors can be cited as reasons for this: geographical distance, regional power balances, and the fronts prioritized by the Ottoman Empire during the relevant period. The Ottoman Empire's political influence over Turkestan was shaped indirectly through the caliphate and Islamic unity, rather than through military power. In practice, this influence did not reach a level that would shape regional

policies or limit the spheres of influence of the powers operating in the region. However, it should be emphasized that the Ottoman Empire did not ignore requests for assistance from Turkestan and endeavored to respond to them in a reasonable and desirable manner.

### 3.3. Correspondence on Social and Economic Issues

The vast majority of the documents examined in this section encompass the 1800s. During this century, the Ottoman Empire having lost its former power and attempting to implement internal reforms strove to maintain its relations with Turkestan despite experiencing significant fractures in its international authority. Aiming to establish a permanent embassy to strengthen ties with the Porte, the Emir of Bukhara declared his allegiance to the Ottoman Sultan. Emir Haydar (1800–1826) dispatched envoys to Istanbul in 1816, followed by another delegation led by Khoja Mahmoud Sharif in 1819. These political visits demonstrate that the Ottoman Empire was the authority consulted for the restoration of order and the resolution of regional turmoil. However, the burgeoning Russian influence in the region compelled certain khanates to avoid antagonizing Russia to protect their own interests; consequently, while Ottoman influence in Turkestan was not entirely dismantled, it was substantially weakened (Urakov, 2018, pp. 176-177).

Social relations between the Ottoman Empire and the Turkestan region were mostly based on religion, and in the second phase, they extended to the fields of culture and education. However, these relations were limited and indirect due to the economic crisis, geographical barriers, regional competition, and the intervention of great powers. At the social level, the Ottoman Empire's role as caliphate and its religious and cultural appeal had a powerful influence on the people and rulers of Turkestan.

A document dated March/1568 (Hijri: Ramadan/975) written in the 16th century is significant in that it demonstrates the power and sphere of influence of the Ottoman Empire at that time. In response to a letter written by the Khan of Samarkand, Abu Said, requesting the construction of a mausoleum for the tomb of Sheikh Hussein Harezmi in Damascus, a royal decree was issued along the following lines:

*"... hengâm-ı adâlet-bünyânımızda hayâtlarında mezîd-i inâyet-i şâhâne ve re'fet-i husrevânemizden dâyimâ mer'î vü müreffehü'l-ahvâl olmaları âdet-i hasene-i cihân-bânîmüz olduğu gibi memâtlarında dahı eger ervâh-ı tayyibeleri için ba'zı hasenât ve mezâr-ı şerîflerinin ta'mîr ü tathîri bâbında ihtimâm olunmak kâ'ide-i marziyyemiz olmagın müteveffâ-yı müsârun-ileyhün ol zamânda mezârları üzre kubbe binâ olunup evlâd ü fukarâsına istih[k]âklarına göre Beytü'l-mâl'den vazîfe ta'yîn olunmuş imis." (BOA, p. 56)*

This text clearly reveals the Ottoman administration's perspective on religious leaders, Sufi orders, and sheikhs. Sufi figures such as Sheikh Hüseyin-i Harezmî were seen not only as religious figures but also as leading personalities who ensured the moral and political unity of society. The state supported such individuals during their lifetimes through patronage and, after their deaths, through commemoration and charitable deeds. This was defined as an activity that strengthened the state's religious legitimacy and its bond with the people. The original content of the archive document is as follows:

*"... hengâm-ı adâlet-bünyânımızda hayâtlarında mezîd-i inâyet-i şâhâne ve re'fet-i husrevânemizden dâyimâ mer'î vü müreffehü'l-ahvâl olmaları âdet-i hasene-i cihân-bânîmüz olduğu gibi memâtlarında dahı eger ervâh-ı tayyibeleri için ba'zı hasenât ve mezâr-ı şerîflerinin ta'mîr ü tathîri bâbında ihtimâm olunmak kâ'ide-i marziyyemiz olmagın müteveffâ-yı müşârun-ileyhün ol zamânda mezârları üzre kubbe binâ olunup evlâd ü fukarâsına istih[k]âklarına göre Beytü'l-mâl'den vazîfe ta'yîn olunmuş imiş." (BOA, pp. 56-57)*

The document dated 1839 (Hijri: 1254) is a distribution ledger containing a list of gifts sent from the Khanate of Kokand to the Ottoman Sultan. It is also a material expression of obedience, respect, and allegiance to the Ottoman Sultan. Among the gifts sent, the Holy Quran conveys a message of religious allegiance to the sultan; musk, silk, works of art, fabrics, wealth, and cultural interaction are indicators; and Hokand fabrics reflect geographical and cultural identity. The letter begins with the

words, “This is the list of items to be presented to the blessed feet of our glorious, powerful, and majestic sultan, the protector of the world,” and contains a list of the following gifts:

Holy Quran (Kur'an-ı Kerim) 1 piece; Shawl 7 pieces; Sevâî (silk fabric type) 7 rolls; Chinese-style black seylan (patterned black fabric) 5 rolls; Chinese-style blue and purple 2 rolls, Tehvâr wrapped (striped silk fabric) 2 rolls; Hokand-kari red headband (Hokand-made red headband or sash) 27 rolls; esp (probably a type of fabric or weave) 7 pieces; Chinese paintings and pictures (Chinese-made paintings and pictures) 75 pieces; Hoten musk (musk scent from the Hoten region) 3 pieces; Tenevvuh-ı Hitâyî (various items of Chinese origin) 3 pieces.

This document can be regarded as a product of diplomatic contact and mutual respect between the Ottoman Empire and the Khanates of Turkestan. The exchange of gifts was not only a sign of friendship; it was also a kind of demonstration of loyalty and a symbolic expression of the will to unite around the Caliphate.

The document dated January 16, 1846 (Hijri: 18 Muharrem 1262) is a typical example of an official petition or memorandum from the Ottoman period. Written in the high bureaucratic language of the period, this text essentially requests the reinstatement of a person named Rahmet Efendi from Bukhara, who had previously been dismissed from his position, to the Mekteb-i Tıbbiye-i Şahâne (Imperial Medical School). This document is also important as it provides an example of the Ottoman education system. Buharalı Rahmet Efendi, who was reinstated to his previous position as a Persian language teacher with a salary of two hundred and fifty kuruş, was required to teach two students daily. This document is also valuable in that it shows a bureaucratic initiative for the reemployment of a civil servant in the Ottoman Empire. Rahmet Efendi of Bukhara's request, which was submitted directly to the Sultan, was deemed appropriate by the relevant persons and resulted in final approval.

“...Ma ‘rûz-ı çâker-i musâdakat-güsterleridir ki, Hâme-pîrâ-yı tevkîr olan işbu tezkire-i sâmiye-i âsafâneleri manzûr-ı me‘âlî-mevfûr-ı hazret-i pâdişâhî buyurulmuş ve mezkûr hâfız-ı kütüblük me‘mûriyyetinden sarf-ı nazarla şehriyye iki yüz elli gurus müceddeden ma‘âş ve ol mikdâr ta‘yînât tahsîsıyla efendi-i mûmâ-ileyhin Fârisî hâceligine me‘mûriyyeti şeref-rîz-i sünûh ve sudûr buyurulan irâde-i seniyye-i cenâb-ı cihân-bânî iktizâ-yı âlisinden bulunmuş olmagla ol bâbda emr u fermân hazret-i veliyyü'l-emrindir.” (BOA, p. 27)

The letter dated December 25, 1847 (Hijri: 17 Muharrem 1264) contains the request of Hokand and Deşt-i Kıpçak Ruler Hüdâyar Hân for the Ottoman Empire to send mining experts to extract minerals from the lands under his rule. The letter also describes the conflict between the Khanate of Hokand and the Khanate of Bukhara. It highlights that upon the death of Hüdâyar Khan's brother, Muhammad Ali Khan, the Khan of Bukhara seized the opportunity to attack the Fergana region; however, with the help of allies and the Kipchaks, Hüdâyar Khan recaptured his territories as far as Tashkent, Ispicab, Osrad, Deşt-i Kıpçak, and Turkestan. Hüdâyar Khan reports that there are abundant mineral resources such as gold, silver, rubies, turquoise, copper, and tin in the mountains under his control, and even that a market called “lekkan” has been established in Hokand under the name of the mineral market. He then states that there are no experts who know how to extract and process minerals. Help is requested from the Ottoman Empire in this regard. He now requests from the supreme caliphate the same favor that Sultan Mahmud Khan had previously shown to his brother Muhammad Ali Khan. The original content of the document is as follows:

“Zîr-i idâre-i âcizânemde bulunan memâlikde vâkı‘ cibâlde altun ve gümüş ve yâkût ve firûze ve nühâs ve kalay ve sâ‘ir bu misillü şeylerin ma‘denleri pek çok olup hattâ Hokand şehrinde “lekkân” demek ile ma‘rûf ve meşhûrdur. Fakat bu taraflarda ma‘âdin fennini bilür ve tefrik ve ihrâcına muktedir ma‘denciler olmadıgından hâk-i pâ-yi hümayûn-ı şâhâneyi tasdî‘a cesâret olundu. Vâlid-i mâcid-i hazret-i Pâdişâhî cennet-mekân, rıdvân-âşiyân Sultân Mahmûd Hân -tâbe serâhu ve ce‘ale'l-cennete meşvâhu- hazretlerinin birâderim müteveffâ Muhammed Ali Hân hakkında lütf u âtifet-i seniyye-i şâhâneleri bî-dirîg buyrulduğu misillü zât-ı merâhim-simât-ı şehin-şâhîlerinin hakk-ı âcizânemde dahî enzâr-ı merâhim-nisâr-ı Hilâfet-penâhîleri şâyân buyrularak iki üç nefer ma‘âdin fennini bilür üstâdın bu cânibe ta‘yîn ve i‘zâmına müsâ‘ade-i seniyye-i şehin-şâhîleri erzânî buyrulması müsted‘â-yı âcizânemdir.” (BOA, s. 47)



In the mid-19th century, the Khanates of Hokand, Bukhara, and Khiva in Turkestan occasionally fought each other. During these conflicts, they requested assistance from the Ottoman Empire, which they regarded as the legitimate leader of the Islamic world, and sometimes asked the Ottoman Empire to mediate in order to make peace with each other. In this text, Hudayar Khan demonstrates both religious allegiance and requests technical assistance. This situation is noteworthy in terms of revealing the Ottoman Empire's sphere of influence. Furthermore, the request for assistance from the Ottomans in the extraction and processing of minerals is significant in that it demonstrates the Turkestan Khanates' demand for economic cooperation.

The Grand Vizier's Office (equivalent to the Prime Minister's Office today) submitted the imperial decree to the sultan for the preparation of the miners requested in the above document. However, due to the timing coinciding with the month of Ramadan, it was decided that the envoy from Hokand would be hosted as a guest during Ramadan and provided with financial assistance. The content of the archival document containing the response to this decision is as follows:

*"...mezkûr ma'dencilerin tedârik ve irsâli husûsu müşârun-ileyh Ser'asker Paşa hazretleriyle dahi bi'l-müzâkere icrâ-yı iktizâsına bakılacağı musammem olduğundan istizân-ı âlî-i Âsafâneleri vechile ilç-i mûmâ-ileyhe atıyye-i mahsûsa-i cenâb-ı mülûkâne olmak ve Ramazân harçlığı itmek üzere on bin gurus i'tâ kılınması müte'allik ve şeref-sünûh buyrulan emr ü irâde-i seniyye-i cenâb-ı pâdişâhî icâb-ı âlisinden bulunmuş ve evrâk-ı mezkûre yine savb-ı sâmi-i Âsafîlerine i'âde ve tisyâr kılınmış olmakla ol bâbda emr ü fermân hazret-i veliyyü'l-emrindir."* (BOA, p. 49)

The archival document dated July 27, 1848 (Hijri: 25 Sha'ban 126) provides a highly detailed reflection of the diplomatic and economic relations and symbolic ties between the Ottoman Empire and the Khanate of Kokand. The arrival of the Hokand envoy in Istanbul, the acceptance of gifts, the content of the discussions, and requests for rewards and assistance involve a multi-layered cooperation. An envoy (sefir) sent by Hokand Khan Hudayar Khan arrived at the Ottoman palace, bringing a letter, a Mushaf-ı Şerif, a prayer rug, a piece of fabric, and a sal and horse as gifts for the Ottoman Minister of Foreign Affairs (in today's terms, the Minister of Foreign Affairs). A copy of the letter written by the Khan of Kokand was also presented. The envoy was scheduled to be received at the palace at five o'clock on Saturday. It was decided that during the meeting, the gifts would be accepted, the envoy would stay in Istanbul during Ramadan, and a mining expert would be sent to Kokand.

The ambassador had previously been given 7,500 kuruş, but it was deemed appropriate to give him an additional 10,000 kuruş as Ramadan allowance and a special gift. Hüdâyâr Hân had previously stated in his letter that he was unable to work the mines in his region and requested that mining experts be sent from the Ottoman Empire. It was decided that this request would be discussed with Serasker Pasha and evaluated. It was anticipated that the mining experts would be prepared before the ambassador's return. When the archive document is evaluated as a whole, we see a profile of the Ottoman Empire establishing diplomacy with Turkestan through technical assistance and cultural channels. All these documents were resubmitted to the Grand Vizier's office, and it was expected that action would be taken in accordance with the order to be issued by the Sultan:

*"...Ma'rûz-ı çâker-i kemîneleridir ki, Esâbî'-zîb-i tefhîm olan işbu tezkire-i sâmiye-i Sadâret-penâhîleriyle evrâk-ı ma'rûza meşmûl-i nigâh-ı şevket-iktinâh-ı hazret-i Hilâfet-penâhî buyurulmuşdur. Nâzır-ı müşârun-ileyh hazretleri birlikde bulunduğu hâlde Sefîr-i mûmâ-ileyhin bi-mennihî te'âlâ işbu Cum'a irtesi sâ'at beş karârlarında Mâbeyn-i hümayûn-ı şâhâne taraf-ı eşrefine i'zâm olunması ve ber-vech-i muharrer virilmiş olan hedâyânın kabûlüyle mezkûr ma'dencilerin tedârik ve irsâli husûsu müşârun-ileyh Ser'asker Paşa hazretleriyle dahi bi'l-müzâkere icrâ-yı iktizâsına bakılacağı musammem olduğundan istizân-ı âlî-i Âsafâneleri vechile ilç-i mûmâ-ileyhe atıyye-i mahsûsa-i cenâb-ı mülûkâne olmak ve Ramazân harçlığı itmek üzere on bin gurus i'tâ kılınması müte'allik ve şeref-sünûh buyrulan emr ü irâde-i seniyye-i cenâb-ı pâdişâhî icâb-ı âlisinden bulunmuş ve evrâk-ı mezkûre yine savb-ı sâmi-i Âsafîlerine i'âde ve tisyâr kılınmış olmagla ol bâbda emr u fermân hazret-i veliyyü'l-emrindir."* (BOA, p. 50)

Archival document dated October 12, 1875 (Hijri: 12 Ramadan 1292) concerning the payment, under a special arrangement, of thirty-three thousand seven hundred and one and a half kuruş for the rent of the house previously rented in Istanbul and the thirty-three thousand seven hundred and one and a half kuruş spent on food and other necessities during his stay there be paid under a special arrangement. This letter was submitted to the Grand Vizier's Office (the office of the Prime Minister). The Grand Vizier also presented this request to the Sultan. After the Sultan approved, it was decided that the payment procedures would be referred to the Ministry of Finance. The original content of the document is as follows:

*“Resîde-i dest-i ta ‘zîm olan işbu tezkire-i sâmiye-i âsafâneleriyle zıkr olunan takrîr manzûr-ı âlî-i hazret-i pâdişâhî buyurulmuş ve sûret-i ma ‘rûzanın bermûceb-i istîzân ifâ-yı muktezâsının nezâret-i müşârunileyhâya havâlesi müte‘allik ve şeref-sudûr buyurulan emr ü irâde-i seniyye-i hazret-i şehinşâhî mantûk-ı münîfinden olarak mezkûr takrîr yine savb-ı sâmi-i Sâdaret-penâhîleri’ne i‘âde kılınmış olmağla ol bâbda emr u fermân hazret-i veliyyü'l-emrindir.”* (BOA, p. 63)

This document is significant in that it demonstrates the hospitality and humility shown by the Ottoman Empire in its diplomatic relations with the Khanates of Turkestan. Relations were maintained with the Khanate of Khiva and other Muslim Khanates within the framework of religion-based diplomatic and cultural ties. The fact that the Ottoman Empire covered the expenses of a figure at the level of crown prince can be interpreted as an effort to maintain its influence and preserve its prestige in the region.

An archival document detailing the payment of thirty-three thousand seven hundred and one and a half kuruş for the rent of the house leased for Seyyid Ahmed, the brother and heir apparent of Hive Khan Muhammad Rahim Khan, who had previously come to Istanbul, as well as for his food, drink, and other necessities during his stay, demonstrates both the Ottoman Empire's hospitality towards the Muslim and Turkish-origin population in the region and its tendency to always maintain its prestige in diplomatic relations. The original content of this document is as follows:

*“Atûfettü Efendim Hazretleri,*

*Hive Hânı Muhammed Rahîm Hân'ın birâder ve veliyy-i ahdi olup mukaddemâ Der-sa‘âdet’e gelmiş olan Seyyid Ahmed için istîcâr olunan hâne icâresiyle müddet-i ikâmetinde me‘kûlât ve mâlzeme-i sâ‘iresine sarf edilen otuz üç bin yedi yüz bir buçuk guruşun tertîb-i mahsusundan tesviye ve i‘tâsı istîzânına dâ‘ir Mâliye Nezâret-i Celîlesi’nin vürûd iden takrîri leffen arz u takdîm kılınmış olmağla muvâfık-ı irâde-i seniyye-i cenâb-ı pâdişâhî buyurulur ise ber-mûceb-i iş‘âr ifâ-yı muktezâsı nezâret-i müşârun-ileyhâya havâle olunacağı beyânıyla tezkire-i senâverî terkîm olundu efendim.”* (BOA, p. 62)

The archival document dated 1895 addresses the settlement of a group of 76 migrants from Bukhara in the Zor Sanjak (present-day northern Iraq) within the framework of the Ottoman Empire's migration and settlement policies. The involvement of high-level state departments such as the Ministry of the Interior (today's Ministry of Internal Affairs) and the Grand Vizier's Office indicates that the settlement of this group of migrants was directly coordinated by the state. The group from Bukhara who came to the Zor Sanjak and wished to settle there applied to be resettled. These individuals needed to be settled in suitable locations within the Zor Sanjak, provided with 25,000 kuruş in aid for seeds and farm animals, and supplied with the necessary daily provisions (food expenses) to support themselves until they could harvest crops. According to the document, all these expenses were covered by the general allocation set aside for migrants from the Hazine-i Celile (the Imperial Treasury).

*“... Atûfettü Efendim Hazretleri,*

*Buhara ahâlîsinden olup Zor sancagına gelerek orada iskânlarını istid‘â eden yetmiş altı nüfûsun livâ-i mezkûr dâhilinde emr-i iskânlarının icrâsıyla tohumluk ve çift hayvânâtı bedeli olarak yirmi bes bin guruşun ve mahsûle dest-res olununcaya kadar i‘âşeleri-y-çün iktizâ eden yevmiyenin Hazîne-i Celîle’ce muhâcirîn tahsîsât-ı umûmiyesinden mahsûbu icrâ olunmak üzere mahallî mal sandığından i‘tâsı hakkında Dâhiliye Nezâret-i Celîlesi’nden meb‘ûs tezkire üzerine Meclis-i Mahsûs-ı Vûkelâ’dan kaleme alınan mazbata melfûfâtıyla arz ve takdîm kılınmış olmağla ol bâbda her ne*

*vechile irâde-i seniyye-i hazret-i Hilâfet-penâhî şeref-müte'allik buyurulur ise mantûk-ı âlîsi infâz edilecegi beyânıyla tezkire-i senâverî terkîm kılındı efendim...*” (BOA, p. 30)

The archival document above is an important document that clearly shows the implementation of the Ottoman Empire's immigrant settlement policy in the 19th century and the mechanism established for this purpose. In particular, it provides information about the Ottoman Empire's resettlement policy at that time, including the acceptance of Muslim immigrants from Turkestan, their settlement in strategic regions such as the “Zor Sancağı,” and the provision of livelihood and production support to immigrants. The document is also important in that it shows the decision-making process within the administrative-central structure.

During the reign of Sultan Abdulhamid II, an archival document from 1899 concerning a declaration of loyalty and assistance from Bukhara states that Muhammad Abbas, the son of the Bukhara Gulkuşbeği (a high-ranking bureaucrat in the Bukhara Khanate), sent 3,000 rubles to support the Ottoman military institutions. The document also mentions that the individual requested that gifts such as carpets and prayer rugs be presented to the sultan. This aid, symbolic and meaningful given the financial conditions of the period, demonstrates support for the military institutions and emphasizes the loyalty expressed to the Ottoman Sultan. The original content of the document is as follows:

*“Yıldız Sarây-ı Hümâyûnu Başkitâbet Dâiresi,*

*Buhara Gülkuşbegi ibn-i Muhammed Abbâs'a tahrîrât sûreti.*

*Atebe-i seniyye-i hazret-i Hilâfet-penâhîye arz-ı ta'zîmât-ı ubûdiyyet-kârâneyi ve te'sîsât-ı askeriyye i'ânesi için üç bin ruble irsâl kılındığını hâvî arz-ı behiyyeleri manzûr-ı âlî buyurularak Halîfe-i Müslimîn pâdişâhımız efendimiz hazretlerine bu sûretle te'yîd-i ravâbıt-ı sadâkat-mendî olunması mûcib-i mahzûziyyet-i seniyye-i mülûkâne oldugunun ve zikr olunan üç bin rublenin Te'sîsât-ı Askeriyye İ'âne Komisyonu'na tevdi' olunarak alınan makbûz senedinin cânib-i vâlâlarına irsâl kılındığının ve ol tarafın ma'mûlât-ı dâhiliyyesinden halı ve seccâde gibi gönderilen şeyler dahı arz-ı huzûr-ı âlî kılınup istilzâm-ı memnûniyyet-i seniyye-i hazret-i Hilâfet-penâhî eylediginin şeref-sudûr buyurulan emr u fermân-ı hümâyûn-ı hazret-i Hilâfet-penâhî mantûk-ı âlîsine tevfiķan teblîg ve iş'ârına ibtidâr idilmiş olmagın ol bâbda...*” (BOA, p. 31)

The Council of Ministers' resolution dated March 31, 1912 (Hijri: 12 Rabi' al-Awwal 1330); It addresses the fact that Muslims coming from the Bukhara and China regions for the pilgrimage ran out of money in Ottoman territories, and that the expenses for these people to reach Jeddah or return to their homeland, Andijan, should be covered from the “masârif-i gayr-ı melhûza” item in the state budget, meaning “unforeseen expenses.” There was a separate payment item for such expenses in the Ottoman Empire. However, the amount remaining in the aforementioned payment item was insufficient to transport the stranded Muslims to Mecca, and the issue was resolved by creating an additional budget for the pilgrims with the signatures of the members of the Council of Ministers. The original content of the document is as follows:

*“Buhara ve Çin ahâlisinden olup edâ-yı hacc-ı şerîf için memâlik-i Osmâniye'ye gelerek fakr u zarûretlerinden sokak ortalarında kalan hacıların Cidde'ye ya Odesa tarîkıyla Andican'a sevkleri için masârif-i gayr-ı melhûza tertîbinden muhassas otuz bin guruşdan yirmi bin guruşu geçen üç yüz yirmi yedi senesinde sarf edilerek bakıyyesi sene-i cedîdenin hulûlüne binâ'en nezâret mu'temedinin tesviyeyi hesâb itmesi zımında Hazîne-i Mâliyyeye iâde edilmesi ve huccâc-ı merkûmeden çoğu hâl-i sefâlet ve perişânîde kaldığından mebleg-ı mezbûrun tekrar verilmesi taleb olunmuş ise de bu husûsda ayrıca tahsisât alınması lüzûmu beyân edildiği ve el-yevm Der-sa'âdet'de ve yolda bulunan fukarâ-yı huccâcın masârif-i sevkıyyesine zikr olunan on bin guruşun da kifâyetsizliği cihetle bunların sevkleri için müceddeden yirmi bin guruşun Mâliyyeye masârif-i gayr-ı melhûza tertîbinden Dâhiliye Nezâreti'nde müteşekkîl komisyona i'tâsı hakkında nezâret-i müşârûn-ileyhânın 7 Rebi'ü'l-âhîr, sene [1]330 ve 13 Mart sene [1]328 târihli tezkîresi okundu. Son def'a olmak üzere onbeş bin guruşun ber-vech-i iş'âr masârif-i gayr-ı melhûza tertîbinden mezbûr komisyona tesviyesi husûsunun Maliye ve ba'de-ez-în bu husûsda icâb eden tahsisâtın bütçeye vaz'ı lüzûmunun Evkâf-ı Hümâyûn Nezâretleri'ne tebliği ve Dâhiliye Nezâreti'ne ma'lûmât i'tâsı tezekkür kılındı.”* (BOA, p. 106)

The document cited above demonstrates the Ottoman Empire's efforts to ensure that Muslims coming from outside the country for the pilgrimage were not left unattended during their journey, as well as the economic and bureaucratic aspects of protecting Muslims within the Ottoman Empire's borders who wished to reach the Kaaba. Muslims from regions such as Andican and Bukhara were protected by the Ottoman Empire from the moment they entered Ottoman territory for the pilgrimage, and utmost care was taken regarding their personal and property safety. The Ottoman Empire's stance and sensitivity in this regard strengthened the religious ties between the Muslims of Turkestan and the Ottoman Empire and increased the loyalty of Muslims living outside the country's borders to the Caliphate.

### Conclusion

This study aims to make an original contribution to researches in this field by drawing on document-based inferences to understand the position of the Ottoman Empire in the Islamic world between the 16th and 20th centuries and how the Turkestan Khanates perceived the Ottoman Empire and the Caliphate. Based on the archival documents examined in this study, the findings regarding the relations between the Ottoman Empire and Turkestan during this period can be briefly summarized as follows:

The archival documents examined within the scope of this study reveal that mutual interaction was intensively maintained within the framework of practices such as the reception of envoys arriving from Turkestan to the Ottoman Empire, the presentation of gifts, the dispatch of pilgrims and ensuring the safety of the pilgrimage route, requests for religious books, requests for military aid, and requests for passports. The Ottoman Empire assumed a central role in this geography through cultural leadership and diplomatic representation, as it was unable to establish direct political sovereignty for various reasons, such as geographical distance and the hegemony of other powerful states in the region. In addition, the caliphate office, which the Ottoman Empire held until the first quarter of the 20th century, appears to be an important factor in terms of the Ottomans' influence in this region. Due to the influence of the caliphate, despite geographical distance and various negative factors, the Turkestan Khanates viewed the Ottomans as a religious and administrative center and a means of protection until the early 20th century, requesting assistance from the Ottoman Empire in the face of regional threats.

Ottoman–Turkestan relations did not take the form of a classic center-periphery or colonial-colony relationship, but rather emerged as a multidimensional network of relations based on Islamic unity, cultural affinity, and mutual religious ties. These relations, which developed particularly from the 16th century onwards, deepened through religious solidarity and connections, scientific cooperation, and symbolic diplomacy rather than political contacts. The fact that the Ottoman sultans bore the title of “caliph” ensured that they were recognized as religious authorities by khanates such as Bukhara, Khiva, and Khokand; this was concretely reflected in caliphate-centered diplomatic correspondence, gift exchanges, and the granting of insignia and titles.

Within this framework, Ottoman-Turkestan relations during the period mentioned should be understood not merely as historical ties and ethnic kinship, but as a manifestation of processes of mutual commitment, solidarity, and the construction of a shared identity within the Islamic world. These relations, which were interrupted during the Soviet era, should be seen as an important reference point today in the process of uncovering historical memory and rebuilding relations.

### Abbreviations

Nu. : Number.

BOA : Başbakanlık Osmanlı Arşivi (Prime Ministry Ottoman Archives).

p. : Page.

### References

1. Aköz, A., Amandıqqızı, B. L. (2025). Osmanlı-Səfəvi münasibətləri və Türkünstan zəvvarları. *Türk Mədəniyyəti və Hacı Bektaş Veli Araşdırma Jurnalı*. 115, 145-166.  
<https://doi.org/10.60163/tkhcbva.1643841>

2. Avşar, A. (2014). Türk ictimai rəyində “Xarici Türklər” anlayışına töhfə: Birinci Dünya Mühəribəsinə qədər Türkünstan türkləri ilə Türkiyə türkləri arasındakı münasibətlər və Türkünstan xalqının mühəribədə dəstəyi. *Çanaqqala Araşdırmaları Türk İllik Kitabı*, 12(16), 157-179. <https://doi.org/10.17518/caty.17733>
3. Bekenova, F., Tulekova, M., Naimanbayev, B., Duisen, S., & Giritlioglu, M. (2025). The role of religious traditions in the development of Turkic culture and their importance for contemporary society. *Pharos Journal of Theology*, 106(3), 1–15. <https://doi.org/10.46222/pharosjot.106.3025>
4. BOA. (2004). *Belgelerle Osmanlı–Türkistan İlişkileri (XVI–XX. Yüzyıllar)* [Ottoman–Turkestan Relations in Documents (16th–20th Centuries)]. Ankara: Osmanlı Arşivi Daire Başkanlığı Yayın Nu. 70.
5. Budak, M. (2024). “Türkiye–Özbekistan İlişkilerinin Tarihi Zemini: Osmanlı–Türkistan Arasındaki Siyasi ve Kültürel İlişkiler (XVI–XX. Yüzyıllar)” [Historical Background of Türkiye-Uzbekistan Relations: Political and Cultural Relations Between the Ottoman Empire and Turkestan (16th-20th Centuries)]. *Avrasya İncelemeleri Dergisi*, 13(2), 123–148. <https://doi.org/10.26650/jes.2024.1532450>
6. Garipova, R. (2026). Islamic Law and Legal Authority in Inner Asia Under Russian Imperial Rule: A Historiographical Survey, *Religions*, 17(1), 58. <https://doi.org/10.3390/rel17010058>
7. Karabulut, A. (2021). Diplomatic instrumentation of the Caliphate authority in the relationship between the Ottoman Empire and the Turkestan Khanates in the 19th Century. *History Studies*, 13(6), 1831-1851. <https://doi.org/10.9737/hist.2021.1062>
8. Mahmudov, S. (2025). The selected envoys in the diplomatic relations of Turkestan with the Ottoman Empire. In E. Onay (Ed.), *Turkish Ministry of Foreign Affairs at the centenary of the Republic: Centuries of diplomatic practices*, 127–136. <https://doi.org/10.37879/978-975-17-4790-7.2025.127>
9. Ospanova, A., Shorayev, B. (2025). Religious connections between the Ottoman Empire and Turkistan (during the XIXth and early XXth centuries): Istanbul as a pilgrimage road. *Türk Kültürü ve Hacı Bektaş Velî Araştırma Dergisi*. 114, 351-366. <https://doi.org/10.60163/tkhcbva.1427348>
10. Sarımay, Y. (2010). “İstanbul Türkünstanlı Zəvvarlar üçün Ziyarət Mərkəzi kimi”. *Bilig*, 88, 1-18. <https://doi.org/10.12995/bilig.523058>
11. Saray, M. (2000). “Xanlıqlar dövründə Osmanlı İmperiyasının Türkünstan Siyasəti”. *Türk Dünyası İncelemeleri Dergisi*, 4(2), 17–20. <https://dergipark.org.tr/tr/pub/egetdid/issue/34414/380118>
12. Saray, M. (2017). *Rus işğalı dövründə Osmanlı İmperiyası ilə Türkünstan Xanlıqları arasında siyasi münasibətlər (1775-1875)*. Türk Tarix Cəmiyyəti Nəşrləri.
13. Türkoğlu, İ. (2010). "Şeybânî Han", *TDV Encyclopedia of Islam*, Vol. 39, 43-45.
14. Ullah, A. A. (2025). Empire, Colonialism, and Religious Mobility in Transnational History. *Religions*, 16(4), 403. <https://doi.org/10.3390/rel16040403>
15. Urakov, D. (2019). From the history of relations between the Central Asian Khanates and the Ottoman Turks (XIX. Century). In M. Bulut, R. Rakhmonov, C. Korkut, & N. Muminov (Eds.), *Rejuvenating Silkroad: Past, present and future of Turkey-Uzbekistan relations* (1st ed.,). Istanbul Sabahattin Zaim University Publications, 176-178.
16. Ülker, H. (2019). “Osmanlı Özbekistan Siyasi İlişkileri (1514-1873)” [Political Relations between Ottoman and Uzbekistan (1514-1873)]. *Manas Sosyal Araştırmalar Dergisi*, 8(4), 3977–4006. <https://doi.org/10.33206/mjss.523155>

Received: 20.09.2025

Accepted: 24.01.2026

DOI: <https://doi.org/10.36719/2663-4619/127/201-212>

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## **Azərbaycan folklorunda qadın baş örtüyünün etno-mədəni və funksional xüsusiyyətləri**

### **Xülasə**

Bu məqalədə Azərbaycan geyim adları, yaylıq, örpək, şal, kəlağayı – etnik kimliyin formalaşması və mədəni dəyərlərin qorunması kontekstində sistemli şəkildə araşdırılır. Tədqiqatın əsas məqsədi geyim terminlərinin Azərbaycan xalqının kollektiv kimliyində və mədəni yaddaşında tutduğu yeri müəyyənləşdirməkdir. Araşdırmada folklor nümunələri, dastanlar, nağıllar, bayatılar və mərasim mətnləri, xalqın tarixi yaddaşını, sosial münasibətlər sistemini və mədəni dünyagörüşünü əks etdirən əsas mənbələr kimi götürülmüşdür. Məqalədə geyim adları yalnız maddi mədəniyyət nümunələri kimi deyil, eyni zamanda sosial statusun, cinsiyyət fərqlərinin, yaş kateqoriyalarının, regional xüsusiyyətlərin və estetik zövqün ifadəçisi olan simvolik göstəricilər kimi təhlil olunur. Folklor mətnlərində yaylıq, örpək kimi geyim elementlərinin qoruyucu, ayırdedici və tənzimləyici funksiyalar daşdığı müəyyənləşdirilir. Araşdırma nəticələri göstərir ki, bu geyim adları folklor mətnlərində milli və etnik kimliyin əsas göstəricilərindən biri kimi çıxış edir və kollektiv kimliyin nəsil-dən-nəslə ötürülməsində mühüm rol oynayır. Geyim terminlərinin istifadəsi vasitəsilə cəmiyyətin dəyərlər sistemi, etik normaları və sosial davranış modelləri kodlaşdırılaraq qorunur. Məqalədə həmçinin geyim adlarının dilçilik və etnoqrafik aspektləri nəzərdən keçirilir, onların semantik xüsusiyyətləri və funksional yükləri təhlil edilir. Bu kontekstdə geyim terminlərinin mədəni yaddaşın qorunması və etnik kimliyin davamlılığının təmin olunmasındakı rolu xüsusi olaraq vurğulanır. Nəticə etibarilə, folklor mətnlərində işlənən geyim adlarının Azərbaycan xalqının etnik kimliyinin və mədəni irsinin ayrılmaz tərkib hissəsi olduğu qənaətinə gəlinir. Bu məqalədə Azərbaycan cəmiyyətində yaylıq etnik-mədəni kimliyin formalaşmasındakı rolu empirik metodlar əsasında araşdırılmışdır. Tədqiqat müşahidə, sorğu və statistik analiz üsullarından istifadə etməklə aparılmışdır. Tədqiqatın empirik hissəsində şəhər və kənd mühitində aparılan sorğuların (n=133) nəticələri əsasında geyim elementlərinin müasir dövrdəki simvolik funksiyaları təsnif edilir.

**Açar sözlər:** *Azərbaycan, Naxçıvan, qadın statusu, mədəni yaddaş, mədəni dəyərlər, baş örtüyü*

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## **Ethno-Cultural and Functional Characteristics of Women's Head Coverings in Azerbaijani Folklore**

### **Abstract**

This article systematically examines Azerbaijani clothing terminology specifically *yaylıq*, *örpək*, *şal*, and *kəlağayı* within the context of ethnic identity formation and the preservation of cultural values. The primary objective of the study is to determine the significance of clothing terms in the collective identity and cultural memory of the Azerbaijani people.

Folklore samples, including epics, fairy tales, *bayatis*, and ritual texts, serve as the foundational sources reflecting the historical memory, social relations, and cultural worldview of the nation. In this study, clothing names are analyzed not merely as artifacts of material culture, but as symbolic indicators expressing social status, gender distinctions, age categories, regional characteristics, and aesthetic taste. The research identifies that clothing elements such as the *yaylıq* and *örpək* perform protective, distinctive, and regulatory functions within folklore texts. The findings indicate that these terms act as key markers of national and ethnic identity, playing a vital role in the intergenerational transmission of collective heritage. Through the use of clothing terminology, the society's value systems, ethical norms, and social behavior models are encoded and preserved. The article also reviews the linguistic and ethnographic aspects of these terms, analyzing their semantic features and functional weight. In this framework, the role of clothing terminology in safeguarding cultural memory and ensuring the continuity of ethnic identity is emphasized. Ultimately, the study concludes that the clothing names utilized in folklore texts are an integral part of the ethnic identity and cultural heritage of the Azerbaijani people. Furthermore, the role of the *yaylıq* in the formation of ethno-cultural identity within Azerbaijani society is investigated through empirical methods. The research was conducted using observation, surveys, and statistical analysis. The empirical component classifies the modern symbolic functions of clothing elements based on the results of surveys (n=130) conducted in both urban and rural environments.

**Keywords:** *Azerbaijan, Nakhchivan, status of women, cultural memory, ethnic identity, cultural values, headgear*

## Giriş

Etnografiya yunan mənşəli termin olub, “xalqların maddi və mənəvi mədəniyyətini, eləcə də onların tarixi-mədəni münasibətlərini öyrənən elm sahəsi” (Orucov, Əlihəydər və b., 2006, s.42) kimi izah olunur. Lakin bu elm yalnız tarixi faktlarla məhdudlaşmır, o, eyni zamanda xalq ədəbiyyatında, xüsusən də folklorda öz canlı əksini tapır. Çünki folklor janrları xalqın maddi dəyərlərini, sosial normalarını və gündəlik həyat tərzini ən təbii şəkildə əks etdirən bir güzgüdür. Bu baxımdan, folklor mətnləri cəmiyyətin tarixi inkişaf prosesində formalaşmış etnik kimliyinin və mədəni dəyərlərinin mühüm ifadə vasitəsi kimi çıxış edir.

Müasir dövrdə milli dəyərlərin qorunması fonunda geyim terminləri mühüm etno-mədəni əhəmiyyət kəsb edir. “Geyim məhsulları mədəni məhsulların vizual təzahürü kimi tez-tez cəmiyyət üçün işarə və sosial kimlik vasitəsi kimi istifadə olunur” (Tajuddin, 2018, s. 22). Bu elmi yanaşma Azərbaycan folklorundakı geyim sisteminin semantik yükünü tam şəkildə izah edir.

Xalqın dil yaddaşında qorunan “yaylıq”, “kəlağayı” və digər geyim adları sadəcə bir əşyanı ifadə etmir; onlar Tajuddinin qeyd etdiyi həmin “işarə və sosial kimlik” funksiyasını daşıyaraq fərdin mənsub olduğu etnosun mədəni kodlarını vizuallaşdırır. Xüsusilə “yaylıq” elementinin etno-semantik təhlili göstərir ki, bu detal Azərbaycan məişətində sülh, namus və status simvolu kimi çıxış edərək, cəmiyyət daxilində mühüm bir ünsiyyət və kimlik vasitəsinə çevrilmişdir.

Bu araşdırmada məqsəd folklor mətnlərindəki geyim adlarının, xüsusən də Naxçıvan bölgəsi kontekstində, mədəni kimliyindəki yerini və bu gün də davam edən simvolik əhəmiyyətini işıqlandırmaqdır. Çünki folklor nümunələri yalnız estetik dəyər daşımır, eyni zamanda kollektiv kimliyin, sosial quruluşun və mədəni kodların qorunduğu mühüm bir “yaddaş məkanı” funksiyasını yerinə yetirir. Mədəniyyətin cəmiyyətlərin kimliyini ifadə etməsi və zamanla formalaşaraq nəsildən-nəslə ötürülməsi də məhz bu yaddaş mexanizmləri vasitəsilə mümkün olur” (Akcan & Blaha, 2023, s. 2). Azərbaycan da tarix boyu öz etnik kimliyini və milli-mədəni dəyərlərini qoruyub saxlamış, bu irsi həm daxili, həm də beynəlxalq müstəvidə tanıtmış qədim mədəniyyətlərdən biridir.

Geyim mədəniyyəti, hər bir nümunəsinin “əcdadlarımızın mənəvi prinsipləri ilə hopdurulması və əsrlər boyu təkmilləşdirilməsi baxımından...” (Babayewa, 2022, s.128) xalqların etnik kimliyinin formalaşmasında və mədəni dəyərlərinin ifadəsində mühüm rol oynayan əsas göstəricilərdən biri hesab olunur. Tarixi inkişaf prosesində geyim yalnız məişət ehtiyaclarını qarşılayan maddi vasitə kimi deyil, eyni zamanda sosial statusu, cinsiyyət rollarını, estetik zövqü və kollektiv mənsubiyyəti

əks etdirən simvolik sistem kimi çıxış etmişdir. Bundan əlavə, geyimlər “tez-tez nəsillərdən-nəsillərə ötürülən bir cəmiyyətin adət-ənənələrini, dəyərlərini və həyat tərzini təmsil etmişdir” (Jhangra, 2025, s. 13) ki, bu hal bu gün də müşahidə olunur. Bu baxımdan folklor mətnləri geyimlə bağlı mədəni kodların qorunduğu və nəsildən-nəslə ötürüldüyü etibarlı mənbələrdən biri hesab olunur. Azərbaycan folkloru zəngin süjet və obrazlar sistemi ilə yanaşı, geyim terminləri baxımından da geniş və rəngarəng material təqdim edir.

Müasir etnik və mədəni araşdırmalarda kimlik anlayışının dinamik və çoxqatlı xarakter daşması geyim kimi vizual və semantik göstəricilərin yenidən elmi təhlilə cəlb olunmasını zəruri edir. Lakin Azərbaycan folklor mətnlərində geyim adlarının etnik kimlik və mədəni dəyərlər kontekstində sistemli şəkildə araşdırılması hələ də məhdud xarakter daşıyır. Mövcud tədqiqatlar əsasən təsviri-etnoqrafik yanaşma ilə kifayətlənir, geyim terminlərinin semantik, simvolik və ideoloji funksiyaları isə kifayət qədər dərindən araşdırılmır.

Bu məqalənin məqsədi Azərbaycan folklor mətnlərində işlənən geyim adlarını etnik kimliyin ifadə vasitəsi və mədəni dəyərlərin daşıyıcısı kimi sistemli şəkildə təhlil etmək, onların sosial, semantik və simvolik funksiyalarını üzə çıxarmaqdır.

Araşdırmalar göstərir ki, folklor mətnlərində çoxsaylı geyim adları mövcuddur və bu terminlər əksər hallarda xalqın etnik kimliyini və mədəni dəyərlərini əks etdirir. “Geyim mədəniyyətinin inkişafında təbii-coğrafi şərait, xüsusilə iqlimin rolu böyük olmuşdur. Buraya əhalinin dünyagörüşü, mənəvi-əxlaqi, sosial-iqtisadi durumu da daxildir” (Bünyadov, 2007, s. 8), Bununla yanaşı, geyim mədəniyyəti etnik xüsusiyyətlər, adət-ənənələr və texnoloji inkişaf amillərinin təsiri ilə də formalaşmışdır. Diqqətəlayiq məqamlardan biri folklor mətnlərində işlənən geyim terminlərinin böyük hissəsinin türk mənşəli olmasıdır ki, bu da xalqın dilinə, mədəniyyətinə və etnik kimliyinə verdiyi önəmi aydın şəkildə nümayiş etdirir.

Beləliklə, folklor mətnlərində geyim (baş örtüsü) terminlərinin təhlili xalqın etnik kimliyini, mədəni yaddaşını və tarixi təcrübəsini anlamaq baxımından mühüm elmi əhəmiyyət kəsb edir.

### **Ədəbiyyat İcmalı**

Folklor və geyim mədəniyyəti etnoqrafiya və antropologiya sahələrində hər zaman aktual olan, geniş tədqiqat keçmişinə malik mövzulardır. Ənənəvi geyim elementləri sadəcə bir maddi mədəniyyət nümunəsi deyil, əksinə, etnik kimliyin və mədəni irsin maddi strukturlar daxilində kodlaşdırılmış formasıdır (Niinimäki, 2021). Bu yanaşma geyim terminlərinin həm semantik, həm də simvolik funksiyalarını dərindən anlamaq üçün bizə geniş elmi kontekst təmin edir.

Son illərin araşdırmaları göstərir ki, geyim terminologiyası yalnız lingvistik bir məsələ deyil, o həm də etnik kimliklə birbaşa bağlı olan dinamik bir strukturdur. Mənim qənaətimə görə, geyim burada sadəcə zahiri görünüş vasitəsi kimi çıxış etmir. O, eyni zamanda bir xalqın, tayfanın və ya nəslin tarixi yaddaşını, sosial statusunu və fərdi rollarını özündə birləşdirən mədəni bir nümunədir. Bu baxımdan, geyimlə bağlı hər bir termin cəmiyyətin daxili nizamını və mənəvi dəyərlərini şifrələyən simvolik bir dil rolundadır.

Türk xalqlarında, xüsusən də baş örtüyünün etnik və mədəni funksiyaları Arslan (2022) tərəfindən xüsusi vurğulanmışdır. Müəllif qeyd edir ki, folklor mətnlərindəki baş geyimləri və aksesuarlar sosial sinif, gender və regional fərqləndirmə göstəricisidir. Azərbaycan folkloru kontekstində geyim terminlərinin yalnız sənətkarlıq obyekti kimi deyil, sosial strukturun “dil kodları” kimi öyrənilməsi böyük əhəmiyyət kəsb edir. Xalqın tarixi yaddaşını və etnik təfəkkürünü qoruyan folklor janrlarında geyim nümunələrinin geniş yer alması bu mətnləri daha da zənginləşdirir (Rzayeva, 2020). Bu maddi mədəniyyət nümunələri sadəcə bədii təsvir vasitəsi deyil, xalqın məişət mədəniyyətini və estetik dünyagörüşünü sənədləşdirən əsas informativ qaynaqlardır.

Buna baxmayaraq, Azərbaycan geyim adlarının etnik kimliklə bağlı ifadə funksiyasının təhlilində hələ də ciddi boşluqlar qalmaqdadır. Bu məqalə məhz həmin boşluğu doldurmağı – folklor mətnlərimizdəki geyim terminlərinin simvolik analizini zəngin mənbə bazası və sistemli faktoloji təhlillə tamamlamağı hədəfləyir. Beləliklə, bu iş həm nəzəri, həm də metodoloji baxımdan mövcud ədəbiyyata yeni bir qatqı verəcəkdir.



Geyim folklor kontekstində sadəcə praktik məqsəd daşıyır, o həm də zəngin məna ifadə edən vizual ünsiyyət vasitəsidir. Məsələn, “Toy adətlərimizdən biri də gəlini evdən çıxardanda üzünə qırmızı yaylıq örtülməsidir” (Rzayeva, 2024, s. 170). Qeyd edək ki, bu yaylıq adı bir örtük kimi yox, yeni həyat mərhələsinə keçidin rəmzi kimi qəbul olunur. Bu element gündəlik məişətdə istifadə olunan yaylıqlardan funksional və simvolik baxımdan kəskin şəkildə fərqlənir. Gündəlik geyim fərdin sosial statusunu əks etdirirsə, ritual geyimləri cəmiyyətə yönəlmiş “örtülü mesajlar” və xüsusi mənalara daşıyır (Tajuddin, 2018). Bu simvolizmin ən bariz nümunələrindən biri də qadın baş örtüyünün (yaylıq/ləçək) münaqişə tərəfləri arasına atılaraq davanın dayandırılmasıdır. Bu barışdırıcı missiya türk xalqlarının orta q etno-etik dəyərlərinin və sosial nizamı qoruyan vizual kodların təzahürüdür (Arslan, 2021). Qadınların bu rituallar vasitəsilə sülhün inşasına verdiyi töhfələr, bir növ “yumşaq güc” və alternativ barış modelləri kimi qiymətləndirilməlidir (Mbabazi et al., 2020).

Nəticə etibarilə, folklor mətnlərindəki geyim terminləri sadəcə etnoqrafik material deyil, xalqın sosial davranışını tənzimləyən mühüm vahidlərdir. Müasir dövrdə moda və kimlik əlaqəsi güclü bir mədəni ifadə formasına çevrilmişdir (Nair, 2024). Bu proses ənənəvi geyimlərin praktik tərəfini zəiflətsə də, onların simvolik və nümayiş xarakterini daha da önə çıxarmışdır (Niinimäki, 2021). Xalq geyimləri keçmişin statik bir qalığı deyil, mənalara müasir cəmiyyətdə daim yenilənən dinamik mədəni əsərlərdir (Rašić, 2026). Bunun ən canlı nümunəsi olan kəlağayı həm ailə dəyərlərinin simvolik təməli, həm də müasir vizual mədəniyyətin ayrılmaz bir hissəsidir.

### Metodologiya

Bu tədqiqat empirik araşdırma metodlarına əsaslanaraq aparılmışdır. Əsas məqsəd baş örtüsü və yaylığın müasir dövrdə etnik-mədəni kimliklə əlaqəsini real məlumatlar əsasında müəyyən etməkdir. Araşdırmada müşahidə, sorğu və statistik təhlil üsullarından istifadə edilmişdir. Müşahidələr kənd və şəhər mühitlərini əhatə etmiş, sorğuda isə ümumilikdə 133 respondent iştirak etmişdir. Respondentlər yaş, cins və yaşayış yerinə görə qruplaşdırılmışdır.

Sorğu sualları baş örtüsü və yaylığın istifadə tezliyi, istifadə səbəbləri və bu geyimlərin etnik kimliklə əlaqəsi üzərində qurulmuşdur. Toplanmış məlumatlar faiz göstəriciləri əsasında sistemləşdirilmiş və nəticələr cədvəllər vasitəsilə təqdim edilmişdir. Əldə olunan empirik məlumatlar müqayisəli təhlil yolu ilə araşdırılmış, tədqiqat zamanı obyektivliyin qorunmasına xüsusi diqqət yetirilmişdir.

Tədqiqatın etibarlılığını və nəticələrin obyektivliyini təmin etmək üçün kəmiyyət və keyfiyyət metodlarının kombinasiyasından (qarışıq metod) istifadə edilmişdir. Tədqiqat iki fərqli sosial mühitdə – kənd və şəhər yaşayış məntəqələrində aparılmışdır ki, bu da geyim mədəniyyətinin urbanizasiya səviyyəsindən asılı olaraq necə dəyişdiyini izləməyə imkan vermişdir.

Tədqiqatın seçmə məcmusu 133 respondentdən ibarət olmuşdur. Respondentlərin yaş həddi 18-dən 65+ yaşa qədər geniş aralığı əhatə etmişdir ki, bu da nəsillərarası fərqlərin və mədəni ötürülmə yollarının daha dərinə təhlilə şərait yaratmışdır.

| Göstəricilər | Kateqoriya | Say (n) | Faiz (%) |
|--------------|------------|---------|----------|
| Yaşayış Yeri | Şəhər      | 73      | 54.9%    |
|              | Kənd       | 60      | 45.1%    |
| Cəmi         |            | 133     | 100%     |
| Yaş Qrupu    | 18–35 yaş  | 26      | 19.5%    |
|              | 36–50 yaş  | 44      | 33.1%    |
|              | 51–65+ yaş | 63      | 47.4%    |
| Cəmi         |            | 133     | 100%     |

Aparılmış sorğu və müşahidələr göstərir ki, geyim elementləri yalnız estetik xarakter daşıyır, eyni zamanda mühüm sosial və mədəni funksiyalar yerinə yetirir. Kənd və şəhər mühitində əldə olunan nəticələr yaşayış yerinin geyim seçiminə və bu geyimə verilən mənaya birbaşa təsir etdiyini göstərir. Kənd yerlərində ənənəvi geyim elementləri daha çox kimlik göstəricisi kimi qorunduğu halda, şəhər mühitində bu elementlər daha çox simvolik xarakter daşıyır.

Yaş faktorunun da mühüm rol oynadığı müəyyən edilmişdir: yaşlı nəsil (51–65+ yaş) geyimi daha çox “mədəni miras” kimi qəbul etdiyi halda, gənc nəsil (18–35 yaş) onu mərasimlərdə istifadə olunan simvolik element kimi qiymətləndirir. Bu nəticələr geyim vasitəsilə etnik kimliyin və mədəni yaddaşın zamanla dəyişən, lakin davamlı xarakter daşdığını göstərir. Bu da Akcan və Blaha-nın (2023) qeyd etdiyi kimi, etnik yaddaşın zaman içində necə dinamik şəkildə dəyişdiyini bir daha sübut edir.

### **Etnik Kimlik Və Mədəni Dəyərlər Kontekstində Geyimin Təhlili**

Geyim mədəniyyəti etnik kimliyin formalaşması və ifadəsində mühüm rol oynayan sosial və simvolik göstəricilərdən biridir. Geyim mədəniyyətinin inkişafında təbii-coğrafi şərait, xüsusilə iqlimin rolu böyük olmuşdur. “Buraya əhalinin dünyagörüşü, mənəvi-əxlaqi, sosial-iqtisadi durumu da daxildir” (Bünyadov, 2007, s. 8). Tarix boyu geyim yalnız insanın fiziki ehtiyaclarını qarşılayan maddi vasitə kimi deyil, eyni zamanda fərdin cəmiyyət daxilindəki mövqeyini, mənsub olduğu sosial qrupu və mədəni kimliyini nümayiş etdirən əsas vasitələrdən biri kimi çıxış etmişdir. Xüsusilə ənənəvi cəmiyyətlərdə geyim formaları yazısız mədəniyyətin vizual dili funksiyasını daşıyaraq sosial münasibətlərin tənzimlənməsində mühüm rol oynamışdır. Çünki, “ənənəvi geyimlər etnik kimliyin vizual dili kimi fəaliyyət göstərir, sosial statusu və mədəni irsi maddi strukturları daxilində kodlaşdırır” (Niinimaki, 2021, s. 258). Bu baxımdan geyim etnik kimliyin həm fərdi, həm də kollektiv səviyyədə ifadə olunmasında əhəmiyyətli göstərici hesab olunur.

Azərbaycan folklor mətnlərində yer alan geyim adları xalqın tarixi təcrübəsini, dünyagörüşünü və mədəni dəyərlər sistemini əks etdirən əhəmiyyətli mədəni kodlar kimi çıxış edir. Çünki “hər bölgədəki insan mədəniyyətinə görə bir bölgə ilə digər bölgə arasındakı geyim fərqli olmağa meyllidir və bu da ətraf mühitin təsirinə məruz qalır. Hər bölgədəki geyimdəki fərq, hər bölgənin bir-birindən fərqli ola biləcək adət-ənənələri, vərdisləri, həyat tərzləri və fərqli sosial-mədəni mühitləri olmasıdır” (Tajuddin, 2018, s. 24). Bu da göstərir ki, dastanlar, nağıllar, bayatılar və mərasim folkloru nümunələrində geyim terminlərinin istifadəsi təsadüfi xarakter daşımır, əksinə, mətnin ideya yükünü gücləndirən semantik vasitə kimi işlədilir. Bu terminlər folklor mətnlərində sosial mühitin, tarixi dövrün və mədəni kontekstin tanınmasına imkan yaradır. Geyim adları vasitəsilə oxucu və ya dinləyici mətndə təsvir olunan obrazın sosial statusu, cinsi, yaşı və bəzən də regional mənsubiyyəti haqqında dolayısı ilə məlumat əldə edir. Çünki yaylıq, şal, örpək, kəlağayı kimi geyim elementləri folklor mətnlərində yalnız zahiri təsvir vasitəsi deyil, eyni zamanda cinsiyyət rolları, sosial status və mərasim kontekstləri ilə bağlı simvolik mənalar daşıyır.

Qadın geyimlərinə dair terminlər isə folklor mətnlərində daha çox ailə dəyərləri, namus, təvazökarlıq və estetik anlayışlarla əlaqələndirilir. Məsələn, kəlağayı yalnız baş örtüyü kimi deyil, qadın kimliyinin, ailə statusunun və sosial davranış normativlərinin göstəricisi kimi təqdim olunur. Kəlağayı, baş örtüsü, əsasən Azərbaycan qadınları tərəfindən geyilən ipək sapdan hazırlanmış kvadrat formasında olur. “Azərbaycanda kəlağayıları bir vaxtlar yeni qurulan bir ailənin təməli hesab olunurdu” (İsmayılov, Khudiyeva, 2025, s. 712). Bu toy mərasimi zamanı nişan üzüyü qırmızı kəlağayıya bükülərək qız tərəfinə hədiyyə edilirdi.

Müxtəlif folklor nümunələrində qadının geyimi onun ailə daxilindəki mövqeyini, cəmiyyətdə qəbul edilən davranış çərçivələrini və əxlaqi dəyərləri əks etdirən mühüm elementə çevrilir. Bu baxımdan geyim terminləri gender rollarının mətn daxili qurulmasında və legitimləşdirilməsində mühüm funksiyaları yerinə yetirir.

Folklor mətnlərində geyim adlarının sabit semantik çərçivədə işlədilməsi mədəni yaddaşın qorunmasına və nəsillərarası ötürülməsinə xidmət edir. Bu sabitlik sayəsində geyimlə bağlı mədəni məlumatlar zaman və məkan dəyişsə belə kollektiv şüurda öz yerini qoruyub saxlayır. Geyim terminləri folklor mətnlərində dəyişməz mənalarla təqdim olunaraq etnik kimliyin davamlılığını təmin edən vasitələrdən birinə çevrilir. Beləliklə, folklor mətnlərini həm də mədəni yaddaşın qorunaraq saxlandığı xəzinə sandığı da adlandırıla bilərik. Folklorlardan fərqli olaraq müasir dövrdə isə geyimin funksional və simvolik məzmununda müəyyən dəyişikliklər müşahidə edilir. Qloballaşma, urbanizasiya və kütləvi mədəniyyətin təsiri nəticəsində ənənəvi geyim elementləri gündəlik istifadədən tədricən çıxmışdır. Müasir şəhər mühitində geyim daha çox qlobal moda trendləri və fərdi

estetik seçimlər əsasında formalaşır. “Moda, kimlik, cəmiyyət və üslub arasındakı mürəkkəb qarşılıqlı əlaqəni təcəssüm etdirən güclü bir mədəni ifadə forması kimi xidmət edir” (Nair, 2024, s. 34). Həmçinin “moda istehlakçıların sosial qəbul, yenilik, gözəllik və dəyişiklik üçün emosional ehtiyacları ilə əlaqələndirilir” (Niinimäki, 2021, s. 257). Bu proses ənənəvi geyimlərin praktik funksiyasını zəiflətməmiş, lakin onların simvolik və nümayiş xarakterini gücləndirmişdir. Bu da onu göstərir ki, “xalq geyiminə keçmişin qalığı kimi deyil, keçmişə güvənərək indiki dövrdə istehsal olunan müasir mədəni əsər kimi baxılmalıdır” (Rašić, 2026, s. 1083).

Bununla belə, ənənəvi geyim elementləri milli bayramlar, folklor festivalları, toy mərasimləri və mədəni tədbirlər vasitəsilə simvolik dəyərini qorumaqda davam edir. Bu kontekstlərdə geyim artıq gündəlik məişət elementi deyil, milli kimliyin nümayiş etdirilməsi və kollektiv yaddaşın canlandırılması vasitəsi kimi çıxış edir. Müasir dövrdə ənənəvi geyimlər daha çox səhnə, muzey və mərasim mühiti ilə əlaqələndirilir ki, bu da onların funksional statusunun dəyişdiyini göstərir.

Müasir kontekstdə geyim daha çox fərdi seçim və estetik ifadə vasitəsi kimi çıxış etdiyi halda, folklor mətnlərində kollektiv kimliyin və mədəni bütövlüyün göstəricisi kimi təqdim olunur. Bu fərq geyimin sosial funksiyasının zamanla necə transformasiyaya uğradığını açıq şəkildə nümayiş etdirir. Folklor mətnlərində geyim kollektiv dəyərləri möhkəmləndirən və normativ çərçivələri qoruyan vasitə olduğu halda, müasir dövrdə geyim fərdi kimliyin ifadəsinə xidmət edir. “Araşdırma göstərir ki, müasir kulturoloji tədqiqatlarda geyim fakturası etnik irsin və kollektiv yaddaşın vizual göstəricisi kimi qəbul edilir” (Rocamora & Smelik, 2022, s. 24). Xüsusilə ənənəvi xalq geyimlərində rənglər estetik seçimdən daha çox, mədəni dəyərləri və mərasim mənalarını ifadə edən bir vasitədir.

Bizim apardığımız sorğu nəticələri də bu elmi yanaşmanı tamamilə təsdiqləyir. Belə ki, respondentlərin 92.5%-i kənd mühitində ənənəvi geyimi (məsələn, ağ və ya qırmızı yaylıq) sadəcə moda deyil, məhz mədəni və ritual bir simvol kimi qəbul edir. Maraqlıdır ki, şəhər mühitində bu göstərici 70%-ə düşsə də, hələ də yüksəkdir, bu isə o deməkdir ki, geyimin daşdığı sosial-semiotik mənə mühitdən asılı olmayaraq insanların kollektiv yaddaşında öz dəyərini saxlayır. Bu rəqəmlər sübut edir ki, Azərbaycan insanı üçün geyim hələ də öz kimliyini ifadə etməyin ən kəsə yollarından biridir.

Bu kontekstdə baş örtüyü, yəni xalq arasında “yaylıq” adlandırılan geyim elementi Azərbaycan folklorunda həm gündəlik həyatın bir parçası, həm də müxtəlif mərasimlərdə istifadə olunan mühüm simvol kimi çıxış edir. O, yalnız örtük funksiyası daşımır, eyni zamanda dərin mədəni və mənəvi məzmun ifadə edir. Məhz buna görə də Azərbaycan cəmiyyətində yaylıq yalnız geyim elementi kimi deyil, həm də müəyyən sosial sərhədləri və dəyərləri ifadə edən mühüm mədəni göstərici kimi qəbul olunur. Bu “mənəvi sərhəd” anlayışı xüsusilə Naxçıvan bölgəsində və ümumilikdə Azərbaycan folklorunda geniş şəkildə özünü göstərir. Dastanlarda, bayatılarda, əfsanələrdə, ata sözlərində, eləcə də toy və yas mərasimlərində yaylığın bu mənası açıq şəkildə hiss olunur.

Burada yaylıq artıq bədəni örtən sadə bir əşya olmaqdan çıxaraq etnik kimliyin, ictimai normaların və mədəni dəyərlərin maddi ifadəsinə çevrilir. Xalq yaddaşında isə yaylıq həm ailə namusunun qoruyucusu, həm də nəsillər arasında mənəvi bağlılığı təmin edən güclü bir inanc simvolu kimi qəbul olunur.

Yaylıq Azərbaycan folklorunda və milli geyim mədəniyyətində sadəcə qadınların başını örtmək vasitəsi deyil, eyni zamanda etnik kimliyin və türk mənşəli mədəni dəyərlərin qorunmasına xidmət edən əsas elementlərdən biridir. Bu geyim növü xüsusilə qadınlar arasında kimliyin, ailə və cəmiyyət daxilindəki sosial rolun, eləcə də adət-ənənələrin görünən simvolu kimi çıxış edir. Məsələn, Naxçıvan folkloruna nəzər saldıqda yaylığın gəlinin və ya gənc qızın mərasim geyiminin ayrılmaz tərkib hissəsi olduğu aydın şəkildə müşahidə olunur.

Yaylığın naxışları, rəngləri və ornamentləri bölgədən bölgəyə dəyişir ki, bu da regional etnik xüsusiyyətləri və cəmiyyət daxilində müxtəlif sosial statusları ifadə edir. Bu baxımdan yaylıq etnik kimliyin ifadəsində çoxqatlı funksiyaya malikdir:

**Fiziki və vizual simvol kimi:** Geyilən yaylıq qadının yaşını, evli olub-olmamasını və hansı bölgədən olduğunu dərhal bildirir. Aparılan müşahidələr də bunu təsdiqləyir: kənd yerlərində baş

örtüyü istifadə edən qadınların böyük əksəriyyəti - təxminən 80%-i (50 qadından 40-ı) 50-90 yaş arasındadır. Bu isə ənənənin daha çox yaşlı nəsillər tərəfindən qorunduğunu göstərir.

**Mədəni və simvolik funksiya:** Toy və digər mərasimlərdə yaylıqdan istifadə olunması onun milli və sosial dəyərlərin daşıyıcısı olduğunu göstərir. Yaylıq vasitəsilə toplumsal nizam və mədəni davamlılıq qorunur.

Bu xüsusiyyətlər folklor nümunələrində də açıq şəkildə əks olunur. Naxçıvan bayatılarında, nağıllarında və xalq hekayələrində yaylıq xüsusilə gəlin, gənc qız və qadınların cəmiyyətdəki statusunu və rolunu vurğulayan mühüm detal kimi təqdim edilir. Xınayaxdı və digər mərasimlərdə yaylığın gəlinin başında və ya çiynlərində nümayiş etdirilməsi onun yalnız fərdi geyim elementi deyil, həm də sosial və mədəni mərasimlərin ayrılmaz hissəsi olduğunu göstərir.

Yaylığın rəngləri və naxışları da xüsusi simvolik mənə daşıyır. Belə ki, ağ rəng saflığı və təmizliyi, qırmızı isə sevgi və xoşbəxtliyi ifadə edir. Ornamentlər isə bölgələr üzrə fərqli estetik zövqü və yerli mədəni xüsusiyyətləri əks etdirir.

Fərqli bölgələrdə istifadə olunan yaylıqlar, ictimai status, evlilik ənənələri və qadının cəmiyyətdəki roluna aid məlumat verir. Müqayisəli araşdırmalar göstərir ki, Anadolu və Qafqaz folklorunda da yaylıqlar, gəlinin sosial statusunu və ailəyə bağlılığını ifadə edən simvol kimi önə çıxır. Bu baxımdan, yaylıq həm estetik, həm də sosial-mədəni baxımdan çoxsəhəli əhəmiyyətə malikdir. Nəticədə, yaylıq yalnız gəlinin kimliyini və ictimai mövqeyini simvollaşdırmaqla kifayətlənmir, eyni zamanda Azərbaycan cəmiyyətində kollektiv dəyərlərin və ritual normaların qorunmasını təmin edən mədəni vasitədən biridir.

Araşdırmalar göstərir ki, yaylıqların istifadəsi yer və sosial mühitə uyğun olaraq dəyişir. Toy, bayram və digər mərasimlərdə qadınlar baş örtüklərində əsasən qırmızı, ağ və müxtəlif rənglərdən istifadə edirlər ki, bu rəng seçimi mərasimlərin sevinc və bayram xarakterini əks etdirir. Hüzün və matəm günlərində isə baş örtüklərində daha çox tünd rənglər, xüsusilə qara, göy və qəhvəyi üstünlük təşkil edir. Bu rəng seçimi, həm vizual, həm də simvolik olaraq ictimai duyğuların ifadəsini təmin edir.

Empirik müşahidələr göstərir ki, bəzi bölgələrdə yaylıqdan gündəlik istifadə də mövcuddur. Bu hallar əsasən yaşlı nəsillər arasında daha çox rast gəlinir. Məsələn, sahə tədqiqatlarında kənd ərazilərində (Naxçıvanın Nəhrəm kəndi, Ordubad rayonunun Gənzə kəndi) 50 yaşlı qadından 40-ı (80 %) 50–90 yaş arası, yalnız 10 nəfəri (20%) isə 20–50 yaş arası idi. Bir çox kənd və rayonlarda müşahidələr aparanda demək olar 50+ yaşlı xanımların çoxu başı örtülü idi. Şəhər mühitində də yaşlı nəsillərin ənənəyə bağlılığı müşahidə olunsada, rəqəmlər kəndlə müqayisədə daha aşağıdır. Şəhərdə 65+ yaşlı xanımlar arasında aparılan müşahidədə 25 nəfərdən yalnız 5-nin (20%) baş örtüyündən (gündəlik həyatda) istifadə etdiyi müəyyən edilmişdir. Ancaq dərin araşdırma onu göstərdi ki, bu qadınların çoxu əslən kənd, rayon adamı olmuş, sonralar şəhərə köçüb kök salmışlar. Ona görə də onlarda kənd adət və ənənəsi davam etdirilir. Bu nəticə yaylığın ənənəvi funksiyasının kənd və rayonlarda yaşayan yaşlı nəsildə daha çox qorunub saxlanıldığını göstərir.

Qeyd edək ki, bölgələrdə yaylığın rəngi həm də sosial məlumat daşıyır. Yolda rast gəlinən xanımın baş örtüyünün rəngi onun gedəcəyi yer və ya haradan gəldiyi barədə müəyyən ipuçları verir. Sahə tədqiqatı zamanı biz də buna şahid olduq. Belə ki, kənddə bir çox qadınla rastlaşdıq. Onların al-əlvan, rəngli, bəzəkli yaylıqlarından bilmək olurdu ki, bunlar toy bayrama gedir. Bu da onu göstərir ki, yaylıq yalnız geyim deyil, həm də insanların sosial və mədəni vəziyyətini göstərən vasitədir.

### **Gəlinin Evdən Çıxarılması Mərasimində Milli Dəyərlərin Qorunması**

Azərbaycan folklorunda yaylıq, xüsusilə toy mərasimlərində həm estetik, həm də mədəni vəzifə daşıyır. Məsələn, “toy adətlərimizdən biri də gəlini evdən çıxardanda üzünə qırmızı yaylıq örtülməsidir” (Rzayeva, 2024, s. 170). Bu isə gəlinin yeni həyata qədəm qoymasını və qoruyucu simvolik mənasını ifadə edir. Həmçinin bu hər gün istifadə edilən yaylıqlardan fərqlənir. Çünki “...gündəlik fəaliyyətlər üçün istifadə edilən geyimlər və müəyyən tədbirlərdə geyilən, üzərində örtülü mesajlar olan geyimlər” (Tajuddin, 2018, s. 22) bir-birindən seçilir. Gəlinin evdən çıxarılması mərasimində, uzun yaylıq gəlinin başından və çiynlərindən aşağıya doğru örtülür. Bu örtü yalnızca gəlinin bədənində olan mahrəmiyyəti qorumaqla qalmır, həmçinin milli və cəmiyyətə aid dəyərlərin

qorunmasını simvollaşdırır. Bəzi bölgələrdə yaylığın uzunluğu, gəlinin ailə və toplum içərisindəki nüfuzunu, iffətini (ismət-abır) təmsil edir.

Gəlin evdən çıxarkən başına və çiynlərinə örtülən yaylıq, onu sosial və mədəni baxımdan yüksək dəyərlərə malik bir şəxsiyyət olaraq təqdim edir. Xalq inanışına görə, yaylığın geniş və uzun olması gəlinin ailəsinin sosial hörmətini və nüfuzunu qoruyur, həm mənəvi, həm də fiziki müdafiə funksiyasına malikdir. Bu örtü, yalnız estetik və pragmatik deyil, eyni zamanda mədəni bir əhəmiyyət daşıyır. Folklor materialları gəlinin evdən çıxarılması zamanı örtükdən istifadənin ritualın mərkəzi elementi olduğunu təsdiqləyir. Məsələn, Qərbi Azərbaycan folklor nümunələrində gəlinin geyim kompleksi belə təsvir olunur: “Gəlinin əyninə tuman və kofta geyindirilir, başına qırmızı kəlağayı atırdılar, üstündən də ağ örpək örtürdülər” (Rüstəmzadə, 2024, s. 53). Bu təsvirdəki rəng simvolikası (qırmızı və ağ) saflığın, bərəkətin və yeni ailəyə keçidin mənəvi kodlarını daşıyır.

Bu kontekstdə gəlin, fərdi kimliyindən ayrılaraq ictimai bir simvola nəslin şərəf və mənəviyyət daşıyıcısına çevrilir. Yaylığın gəlinin üzünü örtməsi həm də bir “keçid dövrü” sakrallığını qoruyur. Naxçıvan (Şərur) folklorundan gətirilən növbəti nümunə bu ritualın lokal-spesifik xüsusiyyətlərini və mədəni davamlılığını nümayiş etdirir: “Gəlini evdən çıxaranda onun üzünə qırmızı qlas yaylıqdan örpək salar, örpəyin üstündən isə ayna vurardılar” (Süleymanova, 2023, s. 91).

Burada ayna elementi xüsusi diqqət cəkir. O, təkcə işığı və aydınlığı əks etdirmir, həm də gəlini “yad nəzərlərdən” qoruyan simvolik bir qalxan rolunu oynayır. Bu ayna, əslində, cəmiyyətin gəlinə baxışını vizuallaşdırır, insanlar bu örtüyə və aynaya baxarkən orada sadəcə bir fərdi deyil, bir nəslin namusunu, gələcəyini və mənəvi bütövlüyünü görür. Bu ritual vasitəsilə etnik kimlik və əxlaqi dəyərlər sözlə deyil, vizual simvollarla nəsil-dən-nəslə ötürülür. Şərur folklorunda qorunub saxlanılan bu detal, Azərbaycan türklərinin məişətində ailə şərəfinin necə yüksək tutulduğunun və bu keçid ayınınin nə qədər sakral bir mənə daşdığına canlı sübutudur. Bundan başqa aynanın bu ritualdakı funksiyası qədim türk mifologiyasındakı işıq fəlsəfəsi ilə dərinlən bağlıdır. Türk təfəkküründə işıq sadəcə fiziki bir hadisə deyil, ilahi varlığın (Yaradılışın) yer üzündəki təzahürü və qaranlıq güclərə (şərə) qarşı ən güclü səddir. Gəlinin üzünə ayna vurulması da məhz bu işığı maddi müstəvidə canlandırır. Ayna özünə düşən nuru əks etdirərək gəlini və onun gətirdiyi bərəkəti metaforik bir “ışıq dairəsi” içinə alır. Bu, qədim “ışıqdan doğulma” və ya “nurla qorunma” inancının toy adətindəki vizual qalıqdır. Nəticədə gəlin sadəcə bir ailədən digərinə keçmir, həm də işığın himayəsində olan müqəddəs bir missiyanın daşıyıcısına çevrilir.

Örpək sadəcə qoruyucu bir vasitə deyil, həm də qadın zərifliyini və milli kimliyi tamamlayan ən vacib atributdur. Məşhur folklor nümunəsində deyildiyi kimi:

Bal kimidir dilləri,  
Pambıq kimi əlləri,  
Örpəkdə də gözəldi,  
Təbrizin gözəlləri

(Ceferli vd., 2012, s. 378).

Bu nümunə yaylığın, örpəyin, kəlağayının təmizlik və incəliklə bağlı olan simvolik mənalarını da vurğulayır. Burada “örpəkdə də gözəldi” ifadəsi xüsusi əhəmiyyət kəsb edir. Bu, o deməkdir ki, örtük gəlinin gözəlliyini gizlətmir, əksinə, ona mənəvi bir nur və milli kolorit qataraq həmin gözəlliyi daha da ucaldır. Təbriz gözəllərinin örpəklə vəsf olunması bu geyimin həm də geniş bir coğrafi arealda – bütöv Azərbaycan mədəniyyətində ortaq bir dəyər simvolu olduğunu göstərir.

Qeyd edək ki, folklorda qıza nişan taxılan zaman başına qırmızı örpək örtülməsi adətinə də rast gəlirik: “Hamı xeyir-dua verər, üzük qızın sol əlinin adsız barmağına taxılar, başına qırmızı kəlağayı-yaylıq örtülər, hamı əl çalardı” (Süleymanova, 2023, s. 81).

Bu müasir dövrdə belə, yaylıq, yalnız bir geyim əşyası olmaqdan daha çox, mədəni dəyərlərin qorunması və sosial nizamın təmin edilməsi baxımından böyük əhəmiyyət kəsb edir. Həm şəhər, həm də kənd əhalisi arasında sorğu keçirildi. Aparılan sahə araşdırması göstərir ki, Azərbaycan ənənəsində gəlinin evdən çıxarılması ritüeli həm sosial, həm də mədəni dəyərlərin qorunmasına xidmət edir.

Tədqiqata cəlb olunmuş 73 qadından 51 nəfəri evdən gəlin köçərkən ənənəvi qırmızı örpəkdən istifadə etdiyini, 22 nəfəri isə müasir trendlərə uyğun olaraq bu adətdən imtina etdiyini bildirmişdir. Bu statistik fərqlilik simvolik davranışların nəsillər arasındakı dəyişməsinə göstərir. Belə ki, “müxtəlif yaş qrupları ətraf mühitdəki hadisələrə fərqli şəkildə reaksiya verir və bu reaksiyalar onları xarakterizə edən dəyərləri və davranış qanunlarını formalaşdırır” (Bartha ed.al, 2025, s.284). Əslində 73 nəfərdən 51-nin (təxminən 70%) hələ də bu ənənəni yaşatması, Barthanın qeyd etdiyi “davranış qanunlarının” cəmiyyətdə hələ də güclü olduğunu sübut edir. 22 nəfərin (təxminən 30%) müasir yanaşması, ətraf mühitdəki global trendlərin (modernləşmənin) gətirdiyi yeni dəyərlərin nəticəsidir.

Kənd mühitində apardığım sorğu (60 qadın arasında) mənzərənin şəhərdən xeyli fərqli olduğunu üzə çıxardı. Burada gəlinlərin 55-i (91.7%) üzünü örtüyünü, cəmi 5-i (8.3%) isə örtmədiyini bildirdi. Bu empirik nəticələr göstərir ki, kənddə toy günü qırmızı örpəkdən istifadə edənlərin sayı şəhərlə müqayisədə kəskin şəkildə çoxdur (Şəhərdəki 70%-ə qarşı kənddə 91.7%). Bu fərq birbaşa onu sübut edir ki, milli və mənəvi dəyərlər, eləcə də qədim adət-ənənələr bölgələrdə daha stabil qalıb və qorunur. Şəhərdə modernləşmənin təsiri daha güclü hiss edilsə də, kənd mühitində ənənəvi davranış modelləri hələ də dominantlığını qoruyur.

Bu tendensiya, urbanizasiyanın və modernləşmənin milli geyim və ritual elementlərinin qorunmasına təsirini əks etdirir. Şəhər əhalisi yeni trendləri daha tez mənimsəyərək ənənəvi praktikaları arxa plana keçirdiyi halda, kənd mühitində mənzərə fərqlidir.

Sorğu nəticəsində diqqətçəkən digər bir məqam gəlinlərin bu ritualı hansı motivlərlə yerinə yetirməsidir. Məlum oldu ki, respondentlərin böyük əksəriyyəti qırmızı örpəkdən hər hansı kənar təzyiq olmadan, öz istəyi ilə istifadə edib. Bununla belə, müəyyən bir qisim gəlin bu addımı ana, nənə və ya qaynananın tövsiyəsi/istəyi əsasında atdığını bildirmişdir. Bu fakt onu göstərir ki, yaşlı nəsil adət-ənənələrin qorunub saxlanılmasında “ötürücü” və “nəzarətçi” rolunu oynayır. Gəlinlərin fərdi seçimi ənənənin daxili mənimsənilməsinə, yaşlı nəslin müdaxiləsi isə sosial mirasın davamlılığını təmin edən əsas amillərdir.

Gəlinin evdən çıxarılması ritualında qırmızı örtükdən istifadənin mühitə görə müqayisəsi.

| Mühit | Respondentlərin sayı (N) | Qırmızı örtüklə (Sayı) | Örtməyənlər (Sayı) | Qırmızı örtüklə (%) | Örtməyənlər (%) |
|-------|--------------------------|------------------------|--------------------|---------------------|-----------------|
| Şəhər | 73                       | 51                     | 22                 | 69.9%               | 30.1%           |
| Kənd  | 60                       | 55                     | 5                  | 91.7%               | 8.3%            |
| Cəmi  | 133                      | 106                    | 27                 | 79.7%               | 20.3%           |

### Yaylığın Münaqişələri Yatırmadakı Rolu

Yaylıq folklorik mətnlərdə yalnız gündəlik məişət əşyası kimi deyil, eyni zamanda dərin mənəvi və simvolik funksiyalara malik bir mədəni obyekt kimi çıxış edir. Azərbaycan xalq ənənəsində olduğu kimi digər türk dilli xalqların mədəniyyətində də baş örtüyü və ya yaylıq müqəddəslik, toxunulmazlıq və qoruyuculuq məzmunu daşıyır. Tədqiqat göstərir ki, Azərbaycan və digər türk dilli xalqların folklorunda yaylığın, baş örtüyünün yerə atılması sadəcə fiziki bir akt deyil, münaqişəni dərhal dayandıran bir ritualdır. Bu ənənə yaşlı qadınların ənənəvi cəmiyyətdə bəzi məqamlarda kişi sözündən keçərli sözə sahib olduğunu göstərir. “Belə bir barışdırıcı missiya türk xalqlarının ortaq etno-etik dəyərlər sisteminin və sosial nizamı qoruyan vizual kodların təzahürüdür” (Arslan, 2021, s. 318). “Qadınların sülh və barış üçün söyləri barış inşasına fərqli yanaşmaları gətirir...” (Mbabazi, ed. al. 2020, s. 134) Və bu qadın mənəviyyatının ənənəvi cəmiyyətdəki sarsılmaz nüfuzunu və sosial nizamın bərpasındakı tənzimləyici rolunu təsdiqləyir. Bu kontekstdə yaylığın münaqişə tərəfləri arasına atılması, sadəcə bir sülh çağırışı deyil, həm də qadın şərəf və ləyaqətinin toxunulmazlığına söykənən mənəvi bir avtoritetin nümayişidir. Mbabazi-nin vurğuladığı bu “adın gücü”, Azərbaycan folklorunda yaylığın müqəddəsliyi və ana haqqının ucalığı ilə birləşərək, ən mürəkkəb sosial qarşıdurmaları dayandırmaq qüdrətinə malik olan unikal bir sülh vasitəsinə çevrilir. Bu xüsusiyyət türk xalq ənənəsində yaylığın dava yatırtma funksiyasının qədim dövrlərdən formalaşdığını və bu günədək yaşadıldığını göstərir. Xüsusilə tayfa, aşirət və ya qəbilələrarası qarşıdurmalar zamanı yaşlı

qadının başındakı örtünü açaraq mübahisə edən tərəflərin önünə atması müqəddəs bir işarə kimi qəbul edilir. Bu hərəkət qarşıdurmanın dərhal dayandırılmasını və tərəflər arasında barışığın təmin olunmasını şərtləndirir. Bu fakt qadın müdrikliyinin və ana haqqının toxunulmazlığını ifadə edir. Burada Peyğəmbər əfəndinin “Cənnət anaların ayağı altındadır” ifadəsi də xatırlanır. Belə inanılır ki, yaylığın üzərindən keçmək və ya ona hörmətsizlik etmək ağır mənəvi günah sayılır. Sözügedən ənənə yalnız tarixi mənbələrdə deyil, müasir dövrdə də müxtəlif formalarda yaşamaqdadır.

Xalq yaddaşında qorunan bu motiv türk filmlərində və televiziya əsərlərində tez-tez müşahidə olunur. Bu isə yaylığın mədəni simvol kimi aktuallığını qoruduğunu göstərir. Yaylığın barışdırıcı missiyası kollektiv şüurda sülh və ədalət ideyalarının daşıyıcısı kimi çıxış edir. Bu mədəni praktika türk dilli xalqların ortaq dəyərlər sistemini əks etdirir. Onun folklorik mətnlərdə və canlı ənənədə yaşaması etnik kimliyin formalaşmasında mühüm rol oynayan amillərdən biridir. Beləliklə, yaylıq türk dilli xalqları digər etnik qruplardan fərqləndirən əsas mədəni göstərici kimi qiymətləndirilə bilər.

Yaylığın dava yatırma funksiyasının empirik təhlili folklor nümunələri, vizual materiallar və mədəni praktikaların müşahidəsi əsasında aparılmışdır. Xüsusilə yaşlı nəsillər arasında kök salmış ənənəyə görə, hörmətli bir qadının yaylığını açaraq münafişə tərəflərinin ortasına atması mütləq sülh signalı hesab olunur. Bu hərəkətin sosiokültürəl mənası “namusumu yerə atdım” deməkdir. Əgər silahlar susmasa və dava dayanmasa, bu, qadın şərəfi və kollektiv namusun tapdalanması kimi qəbul edilir. Folklor nümunələrində də bu ritualın barışdırıcı gücü açıq şəkildə ifadə olunur: “Yaylığımı açır bunun ayağının altına tulluyur ki, mənim bu yaylığıma bağışdıyn” (Qasımova, Rüstəmzadə, 2020, s. 95). Folklor mətnindəki “yaylığa bağışlamaq” ifadəsi cəmiyyətin mənəvi dəyərlər sistemini ortaya qoyur. Burada yaylıq sadəcə bir parça deyil, tərəflər arasında hüquqi və mənəvi bir saziş (müqavilə) rolunu oynayır. Qadının yaylığını ayaq altına atması öz şəxsi nüfuzunu sülh naminə fəda etməsidir ki, bu da rəqib tərəf üçün geri çəkilməkdən başqa seçim qoymur. Çünki bu ritualdan sonra davanı davam etdirmək artıq qarşı tərəflə deyil, birbaşa cəmiyyətin toxunulmaz saydığı “ana namusu” ilə mübarizə aparmaq deməkdir.

Müasir dövrdə gənc nəsillər bu hadisəyə fərqli interpretasiyalarla yanaşsa da, yaylığın “sülh yaratma missiyası” nəsillərarası transformasiyaya uğramayan nadir və toxunulmaz ənənələrdən biri kimi qalmaqdadır. Bu, ritualın funksional dəyərinin zamanın sınağından keçərək öz sosial çəkisini qoruduğunu sübut edir.

Maraqlıdır ki, bu simvolik güc yalnız bizim coğrafiya ilə məhdudlaşmır. Eyni kökdən gələn bənzər davranış modelləri Anadolu türklərinin etnoqrafik mənzərəsində də aydın şəkildə özünü göstərir. Xüsusilə Şərqi və Cənub-Şərqi Anadolu bölgələrində aparılan müşahidələr təsdiq edir ki, yaşlı qadınların yaylıq vasitəsilə münafişəyə müdaxilə etməsi bu gün də kollektiv yaddaşda canlılığını qoruyur. Sahə araşdırmalarında iştirak edən respondentlərin əksəriyyəti yaylığın yerə atılmasının birbaşa “davanın bitməsi” mənasına gəldiyini xüsusi vurğulayırlar. Bu fakt bir daha göstərir ki, yaylıq sadəcə bir parça deyil, real sosial təsir gücünə malik olan, həm Azərbaycanda, həm də Anadoluda eyni dərəcədə hörmət edilən tarixi bir “sülh aləti”dir. Bu sosiokültürəl fenomenin müasir cəmiyyətdəki yerini və vizual yaddaşdakı gücünü izləmək üçün audiovizual mətnlərə kino və serial sənətinə müraciət etmək vacibdir. Belə ki, xalq yaddaşına həkk olunmuş bu ritual müasir türk kinematografiyasında da mənəvi avtoritetin simvolu kimi davamlı şəkildə təmsil olunur.

Bu baxımdan “Halef: **Köklərin Çağırışı**” serialının 15-ci bölümündə təqdim edilən səhnə tədqiqatımız üçün əhəmiyyətli empirik nümunə kimi dəyərləndirilə bilər. Sözügedən epizodda Sultan xanımın silahlı qarşıdurma təhlükəsi yaranan anda başındakı yaylığı açaraq münafişə tərəflərinin arasına atması, ritualın dramatik və real gücünü nümayiş etdirir. Bu hərəkətlə tərəflərin silahlarını yerə qoyaraq geri çəkilməsi, yaylığın fiziki bir qüvvəyə deyil, kollektiv mədəni yaddaşda əsaslanan sarsılmaz bir barışdırıcı bir vasitə olduğunu təsdiqləyir. Beləliklə, Sultan xanımın timsalında “ağbirçək” qadın obrazı və onun yaylığı, ən gərgin münafişə anında belə qanunları üstələyən mənəvi bir hakim funksiyasını yerinə yetirir.

Bu sosiokültürəl fenomenin vizual yaddaşdakı davamlılığını təkcə “Halef: **Köklərin Çağırışı**” serialında deyil, həm də geniş auditoriyaya malik olan “Hercai” serialında da izləmək mümkündür. Serialın üçüncü bölümündə Azize obrazının baş örtüyünü (yaylığını) münafişənin ortasına atma anı,

ritualın mənəvi gücünün ən kəskin təsvirlərindən biridir. Əgər Sultan xanım timsalında yaylıq daha çox “mərhəmətli sülh” rəmzi idisə, Azizə obrazında bu hərəkət nəsillər arasındakı “şərəf və kollektiv intizamın” ən yüksək həddi kimi təqdim olunur.

Hər iki ekran əsərindən gətirilən bu nümunələr sadəcə bədii təxəyyülün məhsulu deyil, real mədəni davranış formalarının kino dili ilə təsdiqidir. Bu səhnələr sübut edir ki, yaylıq ritualı həm Azərbaycanda, həm də Anadoluda hələ də ən gərgin sosial münasibətləri dayandıra biləcək “yazılmamış qanun” statusunu qoruyur. Beləliklə, aparılan empirik təhlil aydın göstərir ki, yaylığın dava yatırma funksiyası yalnız mifoloji və ya folklorik mətnlərlə məhdudlaşmır. Türkiyə nümunələri (Hələf və Hercai serialları) əsasında aparılan bu analiz yaylığın barışdırıcı və qoruyucu missiyasının sadəcə keçmişin qalığı olmadığını, praktik və müşahidə edilə bilən canlı mədəni fakt olduğunu sübut edir. Yekun olaraq deyə bilərik ki, yaylıq ritualı türk dilli xalqların ortaq etnik-mədəni kodlarından biri kimi nəsillərarası körpü rolunu oynayır.

### Nəticə

Araşdırmalar göstərir ki, Azərbaycan folklorunda başörtüsü, yaylıq, örpək və kəlağayı yalnız estetik və funksional əşyalar deyil, həm də etnik kimliyin və mədəni dəyərlərin ifadəsində mühüm simvollarıdır. Xüsusilə başörtüsü və yaylıq qadınların mədəni və sosial statusunu müəyyənləşdirir, həmçinin türk xalqlarında qədimdən gələn ənənə olaraq münasibətləri yumşaltmaq və sosial ahəngi qorumaq funksiyasına malikdir. Bu geyim elementləri Azərbaycanda etnik kimliyin qorunması və mədəni dəyərlərin nəsillərarası ötürülməsində əvəzsiz rol oynayır. Onlar milli mədəniyyətin və folklor ənənələrinin zamanla dəyişsə də davamlılığını qoruyan simvolik strukturlar kimi çıxış edir. Və bu geyim analizi cəmiyyətin etnik kimliyi, sosial dəyərləri və mədəni bütövlüyünü daha dərinlən anlamağa imkan yaradır.

### Ədəbiyyat

1. Akcan, E., & Blaha, K. (2023). Opinion of primary school teachers about culturally responsive education practices used in life studies lessons: Implementation of practices from the US to Turkey. *International Journal of Modern Education Studies*, 7(1), 1–20. <https://files.eric.ed.gov/fulltext/EJ1395938.pdf>
2. Arslan, S. (2021). Ethno-ethics and material culture in Turkic traditions. *Asian Anthropologist*, 20(4), 312–329. <https://doi.org/10.1080/1683478X.2021.1945672>
3. Babayewa, A. (2022). National belts as ethnographic wealth of our country. *Journal of National Culture Studies*, 6(2), 127–133. <https://doi.org/10.55774/mikad.1202173>
4. Bartha, A., Jánosi, K., & Malatyinszki, S. (2025). Generational bridges and gaps. *Journal of Cultural Analysis and Social Change*, 10(3), 282–292. <https://doi.org/10.64753/jcasc.v10i3.2408>
5. Bünyadov, T. (2007). *Azərbaycan etnoqrafiyası* (C. 2). Bakı: Şərq-Qərb.
6. Cəfərli, M., & Babayev, R. (2012). *Naxçıvan folkloru* (C. 3). Naxçıvan: Əcəmi.
7. İsmayılov, N., & Khudiyeva, V. (2025). Azerbaijani cultural heritage tradition – Kelaghayi (documentary flow and source studies). *Akademik Tarih ve Düşünce Dergisi*, 12(3), 706–717.
8. Jhangra, S. (2025). The role of traditional attire in modern fashion: A study of cultural resilience and adaptation. *Indian Journal of Fashion Technology*, 2(1), 12–16. <https://doi.org/10.36676/ijft.v2.i1.9>
9. Mbabazi, V., Naiga, R., & Nambalirwa, H. N. (2020). Towards gendered peacebuilding processes for sustainable peace. *Jadavpur Journal of International Relations*, 24(2), 133–151. <https://doi.org/10.1177/0973598419896441>
10. Nair, M. (2024). Fashion as cultural expression: Exploring the intersection of identity, society, and style. *Shodh Sagar Journal of Language, Arts, Culture and Film*, 1(1), 31–35. <https://doi.org/10.36676/jlacf.v1.i1.6>



11. Niinimäki, K. (2021). Clothes sharing in cities: The case of fashion leasing. In T. Sigler & J. Corcoran (Eds.), *The modern guide to the urban sharing economy*. Edward Elgar, 254–266 <https://doi.org/10.4337/9781789909562.00027>
12. Orujov, A., və b. (2006). *Azərbaycan dilinin izahlı lüğəti* (C. 1). Şərq–Qərb.
13. Özdil, M. A. (2021). The effect of clothing as a marker on identity. *Motif Akademik Halkbilimi Dergisi*, 14(33), 117–130. <https://doi.org/10.12981/mahder.867867>
14. Qasimova, S., & Rüstənzadə, İ. (2020). *Tovuz folklor örnəkləri* (II kitab). Elm və təhsil.
15. Rasic, M. (2026). Tailoring identity: Folk costume in contemporary society. *Etnoantropološki Problemi*, 20(4), 1073–1097. <https://doi.org/10.21301/eap.v20i4.5>
16. Rocamora, A., & Smelik, A. (2016). *Thinking through fashion: A guide to key theorists*. I.B. Tauris.
17. Rüstənzadə, İ. (2024). *Qərbi Azərbaycan folkloru* (III kitab). Elm.
18. Rzayeva, Ç. V. (2020). Ərəb və fars mənşəli geyim adlarının Naxçıvan folklor mətnlərində işlənmə yeri. *Filologiya məsələləri*, 5, 110–117.
19. Rzayeva, Ç. V. (2024). *Naxçıvan şəhər folklorundan örnəklər*. Əcəmi.
20. Süleymanova, L. (2023). *Şərur folklor örnəkləri* (II kitab). Elm və təhsil.
21. Tajuddin, F. N. (2018). Cultural and social identity in clothing matters: Different cultures, different meanings. *European Journal of Behavioral Sciences*, 1(4), 21–25. <https://doi.org/10.33422/EJBS.2018.07.63>

Daxil oldu: 13.11.2025

Qəbul edildi: 26.01.2026

DOI: <https://doi.org/10.36719/2663-4619/127/213-222>

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## **Evaluation of the use of Alternative Energy Sources (NPP) in Agroecotourism as a Stage of Our Republic's Transition to a "Green Economy"**

### **Abstract**

The COVID-19 pandemic and its aftermath have demonstrated that natural factors, beyond macro- and microeconomic indicators, have no place in modern economic development. Simply put, human nature is the bridge that connects free decisions, financial outcomes, and social events. This complements the integrity of the economy, making its development sustainable. In this context, this article examines both alternative energy sources in a broad sense and their application in agroecotourism within the context of sustainable development.

**Keywords:** *alternative energy sources, sustainable development, sustainable tourism, agricultural ecotourism, and green economy*

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## **Respublikamızın “Yaşıl İqtisadiyyat”a keçidinin bir mərhələsi kimi aqroekoturizmdə alternativ enerji mənbələrinin (AES) istifadəsinin qiymətləndirilməsi**

### **Xülasə**

COVID-19 pandemiyası və onun sonrakı təsirləri göstərdi ki, makro və mikroiqtisadi göstəricilərlə yanaşı, təbii amillər müasir iqtisadi inkişafda mühüm yer tutur. Sadə şəkildə desək, insan təbiəti azad qərarları, maliyyə nəticələrini və sosial hadisələri bir-biri ilə əlaqələndirən körpüdür. Bu isə iqtisadiyyatın bütövlüyünü tamamlayaraq onun inkişafını dayanıqlı edir. Bu kontekstdə məqalədə alternativ enerji mənbələri geniş şəkildə, eləcə də onların davamlı inkişaf çərçivəsində aqroekoturizmdə tətbiqi araşdırılır.

**Açar sözlər:** *alternativ enerji mənbələri, davamlı inkişaf, davamlı turizm, aqroekoturizm, yaşıl iqtisadiyyat*

### **Introduction**

Historically, economic development has been closely correlated with rising energy consumption and increasing greenhouse gas (GHG) emissions. Renewable energy can help break this correlation, promoting sustainable development. While the precise contribution of renewable energy to sustainable development must be assessed in the context of each country, renewable energy offers opportunities to support socio-economic development, expand access to energy, ensure a reliable energy supply, mitigate climate change, and reduce negative environmental and health impacts. Access to modern energy services will contribute to achieving the Millennium Development Goals (REN21, 2024).

Our planet offers a diverse range of renewable energy sources, enabling humanity to meet its needs with minimal environmental impact. Despite the increasing adoption of alternative energy sources, the transition from traditional to conventional energy sources is slow—that is, not fast enough—due to implementation costs and the interests of various political and economic actors. (International Energy Agency, Key World Energy Statistics, 2024).

### **Literature Review**

#### **Alternative Energy Sources**

There are alternative energy sources to traditional forms of energy, such as those derived from fossil fuels. For this reason, they are often referred to as "alternative energy " or "alternative energy sources." Currently, there is no uniform definition of these types of energy. Therefore, in many cases, alternative energy refers to sustainable energy sources, while in other cases, the term refers to sources

that do not rely on the combustion of fossil fuels (International Energy Agency, World Energy Investment, 2024):

There are different forms of energy, and surprisingly, they can be converted into each other.

Let us look at a few examples:

- The sun radiates a tremendous amount of energy into space, which we perceive as light and heat. When sunlight strikes a substance, such as the molecules that make up water, those molecules begin to move, releasing heat—a form of energy.

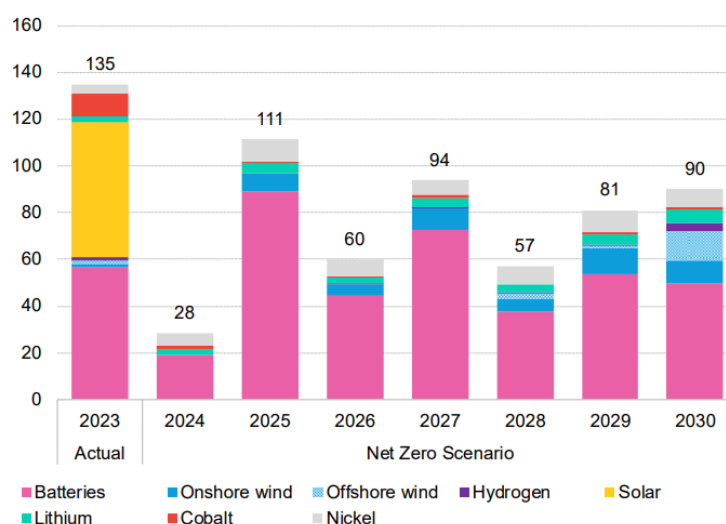
- When you turn on a lamp, the electrical energy supplied through the outlet is converted into light and heat energy.

- The chemical energy of fossil fuels is converted into mechanical energy through combustion in an engine that powers a vehicle.

Alternative energy sources are methods of generating energy that differ from traditional sources. This type of energy offers significant advantages: it is non-polluting, renewable (inexhaustible), and uses clean, naturally occurring resources. Examples of such energy sources include solar, wind, and hydroelectric power, which are environmentally friendly and produce no waste.

The use of modern energy sources, such as oil, natural gas, and coal, brings with it problems, including pollution and increased greenhouse gas emissions. The debate over "alternative" and "traditional" energy represents a shift that will inevitably occur in the near future. It is important to emphasize that alternative energy sources, even renewable ones, are also limited and, like any other natural resource, have their limits. Therefore, even if we transition to these new energy sources gradually, it will not allow us to continue with the current economic model based on constant growth. This is precisely why the concept of sustainable development emerged (Table 1).

**Table 1**  
 Clean-tech supply chain investment, actual 2023 and  
 Net Zero Scenario to 2030 \$ billion (real 2023)



Bloomberg New Energy Finance, Global Trends in Renewable Energy Investment 2024

Currently, Azerbaijan's total power generation capacity is 8320.8 MW, and the capacity of power plants using renewable energy sources, including large hydroelectric power plants, is 1687.8 MW, which is 20.3% of the total capacity. The main goal is to increase this figure to at least 30% by 2030 (Table 2).

**Table 2**  
Cost of Alternative Energy Projects in Azerbaijan (AZPROMO).

| Project name                            | Project cost      |
|-----------------------------------------|-------------------|
| Lokbatan Wind Power Station             | 74.4 mln. manat   |
| Khizi-3 Wind Power Station              | 377.7 mln. Manat  |
| Khizi-2 HEPP                            | 193 mln. Manat    |
| Absheron Hybrid Station                 | 154.4 mln. Manat  |
| Hybrid electric and thermal power plant | 96.3 mln. Dollar  |
| Samukh Agroenergy Residential Complex   | 165 mln. Dollar   |
| Wind Island-1                           | 408.9 mln. Dollar |
| PV Siyazan Solar Station                | 60 mln. Dollar    |
| Pirallahi Wind Power Station            | 800 mln dollar    |
| Samukh-Agroenergy Project               | 150 mln dollar    |

## Methods and materials

### 1. Sustainable Development and Sustainable Tourism

When it comes to sustainability, the first thing that comes to mind is environmental protection. The three main components of sustainability—environmental protection, economic growth, and social development—must be managed in a balanced manner.

Sustainability is the use of resources without depleting them and ensuring their sustainability (Fleischer, et al., 2018).

According to the UNWTO definition, sustainable tourism not only meets the needs of tourists and local communities but also contributes to the preservation and expansion of opportunities for future development. While using resources to meet economic, social, and aesthetic needs, it is also necessary to consider the preservation of cultural integrity, essential ecological processes, biodiversity, and existing systems as sources of life ([www.unwto.org/content](http://www.unwto.org/content)). Of course, such a broad definition risks limiting the term's scope. Therefore, the concept of sustainable tourism can only fully realize its potential if the following prerequisites and characteristics are taken into account. Sustainable tourism is a concept that is gaining increasing importance among tourism industry stakeholders seeking to counter the perceived negative impacts of globalization (Garda, & Temizel, 2016).

The natural, cultural, social, architectural, and other attractions of regions attract tourists. The primary objective of sustainable tourism is to meet tourists' needs, ensure the successful completion of their trips, and transmit the values underlying tourism to future generations without compromising them. In this way, tourism values will be preserved, and the region's sustainable tourism potential will be ensured.

Sustainable tourism is the only way to conserve natural, ecological, biological, and sociocultural resources, minimize losses, and increase future tourism activity and revenues (United Nations Sustainable Development Solutions Network, 2020).

Sustainable tourism:

- Creates offerings for all types of tourism – both niche and mass tourism;
- Monitors a broader perspective encompassing all stakeholder groups in the destination, while also considering indirect impacts;
- Recognizes the need for support from political and institutional bodies that provide the fundamental conditions and strategies for long-term development;
- Develops as a process aimed at optimizing the destination's initial position in the sector.
- Implements and develops continuous situation assessments and appropriate monitoring mechanisms to maintain awareness of the current situation;
- It is linked to customer satisfaction and seeks to raise awareness of a higher quality of life.

Developing sustainable tourism requires a holistic approach encompassing the three dimensions of sustainability: economic, environmental, and social. These three dimensions are complemented by

an overall strategic management approach as the core institutional dimension. (<https://www.untourism.int/standards/measuring-sustainability-tourism>).

In the process of tourism development in the region, investments in tourism can also play an essential role in the development of tourist facilities (destinations) without harming the environment or the socio-cultural sphere. In destinations with intensive tourism, the concept of sustainable tourism is of great importance to ensure the sustainability and development of tourist attractions within the broader environment, as well as to improve visitor satisfaction, market position, and destination popularity.

Sustainable tourism is a positive approach that aims to minimize tensions and conflicts arising from the complex relationships among the tourism industry, visitors, the environment, and the communities visited. Thus, it aims to improve the quality of both natural and human resources and ensure their long-term survival. It is consistent with growth theory, but emphasizes that growth has its limits. These limits will vary by region and the experience of the governing bodies. This approach aims to support tourism development in the area while simultaneously increasing visitor satisfaction (United Nations Sustainable Development Solutions Network, 2020).

Sustainable tourism – considering existing and future economic, social, and environmental impacts- meets the needs of visitors, the tourism sector, the environment, and host communities. The objectives of sustainable tourism can be summarized as follows:

- Develop a high level of awareness and understanding of tourism's contribution to the environment and the economy.
- Minimize air, water, and soil pollution, as well as waste generation by tourism businesses and visitors.
- Promote equitable development.
- Improve the quality of life of the host community.
- Increase employment in the host community.
- Respect and develop the historical heritage, distinctive culture, traditions, and customs, as well as the unique characteristics of host communities.
- Sustainably offer high-quality products.
- Preserve the essence of the tourism workforce and host community.
- Offer visitors a high-quality experience.
- Preserve and protect historical, cultural, aesthetic values, and natural resources, and maintain and enhance environmental quality for future generations.
- Plan and manage tourism development in a manner that does not lead to environmental and socio-cultural problems in tourism destinations.
- Involve and strengthen local communities in planning and decision-making processes related to tourism management in their regions and their future development, in collaboration with other stakeholders (United Nations Tourism, n.d.-b).

The main goals of sustainable tourism are to preserve the economic, environmental, social, and cultural values that underpin tourism, ensure a balanced use of these values, and create conditions for future generations to engage in tourism activities in a supportive environment.

We must not forget that sustainable development is achieved with the participation of local communities.

Sustainable tourism encompasses 12 of the 17 Sustainable Development Goals (United Nations Tourism, n.d.-b).

The goal of developing sustainable tourism strategies for a given destination is to increase tourist numbers while adhering to sustainable development principles. The primary goals of sustainable tourism are economic development and the preservation and, where possible, enhancement of environmental values through tourism activities. Furthermore, the United Nations Environment Programme (UNEP) has defined 12 goals of sustainable tourism as follows:

1. Economic Sustainability: Ensuring the sustainability and competitiveness of tourism destinations and enterprises to ensure continued long-term benefit and growth.

2. Local Prosperity: Maximizing the contribution of tourism to the host destination, including increasing the share of domestic visitor expenditure.

3. Quality of Employment: Increase the quantity and quality of jobs created by tourism by raising wages and providing services without discrimination based on race, gender, or disability.

4. Social Equity: Ensure the equitable distribution of the economic and social benefits of tourism, including improving opportunities, incomes, and services for people experiencing poverty.

5. Visitor Satisfaction: Ensuring a safe and satisfying experience for all visitors without discrimination based on race, gender, or disability.

6. Local Control: Engaging local governments in tourism planning, management, and development through consultation with other tourism stakeholders and strengthening their capacity to plan, manage, and develop tourism in the region.

7. Social Welfare: Maintaining and improving the social fabric and quality of life of local populations, including access to resources, infrastructure, and livelihoods, without compromising social stability or exploitation.

8. Cultural Wealth: Respecting and promoting the culture, traditions, and historical heritage of host communities.

9. Physical Integrity: Maintaining and enhancing the quality of urban and rural areas, preventing physical and visual deterioration of the environment.

10. Biodiversity: Supporting the conservation of natural areas, habitats, and wildlife, and minimizing potential damage.

11. Resource Efficiency: Minimizing the use of limited and non-renewable resources in the development or operation of tourism facilities and services.

12. Environmental Cleanliness: Minimizing air, water, and soil pollution, as well as waste, generated by tourism facilities or visitors (United Nations Tourism, n.d.-b).

The principles of sustainable development promote the environmental, economic, and socio-cultural development of tourism. To ensure the long-term sustainability of tourism, it is necessary to achieve an appropriate balance between these three aspects. Innovation and knowledge development in the tourism sector significantly impact the implementation of these principles.

General principles of sustainable tourism:

- Principles of public benefit: informing local communities about the advantages and benefits of tourism, educating local communities on environmental protection issues, and ensuring their benefits to society.

- Principle of extending the tourist season: minimizing potential negative impacts by distributing tourism across different locations and time intervals (12-month tourism).

- Principle of tourism investment: ensuring flexibility, openness to development, and long-term investment in tourism.

- Principle of planning: planning and management for the controlled development and sustainability of tourism in the region.

- Principle of naturalness: developing tourism in accordance with the natural appearance of the environment.

- Principle of economic development: supporting the improvement and protection of the environment while strengthening the local economy.

- Sustainability principle: ensuring the provision of natural, cultural, and other resources for the use of future generations.

- Local ecosystem principle: attention to the aesthetic features of the environment, natural life, and local culture.

- Satisfaction principle: ensuring the satisfaction of tourists and residents.

- Participation principle: involving residents and other stakeholders in decision-making processes (United Nations Tourism, n.d.-b).

The principles of sustainable tourism play an important role in increasing residents' contributions to it. Therefore, the importance of residents' participation in sustainable tourism planning, decision-making, and action is emphasized.

The United Nations Environment Programme has published four core principles to promote sustainable tourism. They are as follows:

1. The principle of social sustainability ensures the development of society in accordance with traditional values and promotes the strengthening of social identity.

2. The principle of environmental sustainability improves the development of vital ecological processes in accordance with biodiversity and biological resources. It aims to promote the concept of responsible tourism, which minimizes air, water, soil, and environmental pollution caused by tourism enterprises and visitors. It aims to protect natural habitats and reduce environmental damage and harm to animals.

3. The principle of cultural sustainability ensures cultural development in accordance with the cultural values of human society and promotes the strengthening of its identity.

The principle of sustainable economic development ensures the management of resources so that future generations can use them at minimal financial cost. It advocates implementing policies to ensure the success of commercial enterprises in tourism destinations (United Nations Tourism, n.d.-a).

## **2. Agro-ecotourism**

The primary goal of rural ecotourism is to stay in a village, on a farm, or in a mountain lodge, to experience rural culture, socialize, and relax. Rural ecotourism typically refers to the use of rural areas by city residents, within or across countries, for leisure, recreation, and small-business activities. Indeed, there are some differences in the goals and activities. Despite being located miles from populated areas, meeting tourists' recreational needs, and easily adapting to various types of tourism and agriculture, agro-ecotourism has become a growing tourism activity in many countries (León-Gómez A. et al., 2021).

As approaches to tourism and conditions in rural areas change, agro-ecotourism has emerged, promoting rural lifestyles and their characteristics to tourists seeking to better understand local culture and way of life (Deb, S.K. et al. 2023). This can range from an extended rural vacation to a few minutes' stroll through the countryside in the afternoon. Such vacations can be linked to emotional goals, such as proximity to the city, participation in excursions, cultural or recreational activities, sports, or visiting family and relatives (Sayed Elhoushy, et al., 2025). The richness of traditional culture and the untouched natural environment of the countryside attract urban populations who prefer to spend their holidays there. Agro-ecotourism, a type of residential tourism, is presented in all its diversity. Tourists seek not only to relax but also to observe, participate, learn, and exercise. Furthermore, the village's location is unique, offering a wide range of outdoor activities. Traditional houses, streets, and village mosques are integral elements of the tourist attraction. In these areas, it is important to interact with local villagers, drink tea, eat, and take long walks.

Rural areas are typically dominated by agriculture and livestock farming, but they also host other economic activities such as tourism, small- and medium-sized industries, and handicrafts. Villages are defined as places with social and economic structures, such as markets, that have ecological value and are in constant interaction with urban areas (Roberts, et al., 2018).

Due to their location, villages integrated into the natural environment can organize a wide range of outdoor sports (mountaineering, trekking, paragliding, horseback riding, rafting, etc.). There is no need to build hotels in villages for this purpose. Rural houses are sufficient for accommodation. The presence of an office, organization, equipment, and guides provides a wide range of services. Travel through untouched natural areas to admire and explore the region's natural beauty, flora, and fauna; experience cultural activities typical of these places; and establish a direct connection with nature, observing, learning, and analyzing (Barbieri, et al., 2019).

Agricultural ecotourism is a priority area of tourism. This model, developed on the principles of sustainable development, is rapidly spreading across many developed countries. Agricultural



ecotourism is considered an important tool for both agricultural and ecotourism development. Thus, the development of agricultural ecotourism contributes to creating new jobs in the country, fostering local entrepreneurship, and preventing migration. Factors determining the distribution of tourism throughout the year and the length of the tourist season include the country's geographic conditions, tourist demand, the type of tourism, tourism policy, and global events (Tourism Teacher, n.d.).

Rural ecotourism is a type of tourism that is not 100% seasonally dependent and has no seasonal characteristics. The four-season nature of agricultural ecotourism increases the diversity of activities. Thus, tourists can enjoy eco-friendly winter sports, villagers can take long walks through the countryside in the spring, and farmers can exploit the appeal of agricultural products in the summer and autumn (Tourism Teacher, n.d.).

With changing global vacation ideas, people's move away from the sea, a vacation based on sand and sun, the rapid spread of technology and information, travelers' desire and experience to participate in various types of recreation, the desire to relieve fatigue, the concrete and population density of large cities, and the tranquility and natural environment, the development of agro-ecotourism is a priority and shows that its importance will only grow. In this context, to diversify tourism and expand it across all four seasons, it is necessary to identify agro-ecotourism areas, a type of alternative tourism that has a positive impact on the global economy, and ensure their sustainability (United Nations Sustainable Development Solutions Network, 2020).

Tourism is an economic sector shaped by the values offered by the environment. Therefore, ecology and tourism are vitally interrelated. In today's world, when environmental problems have reached alarming proportions, it is essential to develop environmental awareness. It is now recognized that tourism fosters an understanding that local resources have universal value. Sustainability is the most discussed topic in relation to tourism and ecology today. The difference between sustainable tourism and the classic understanding of tourism lies in living alongside local people in their environment, embracing their culture, and engaging with nature rather than relying on its comforts. A region's sustainability depends on the quality of the environment, the pursuit of a "balance between conservation and use" of all natural resources, and the continued preservation of all the values that attract tourists to a given destination (<https://files.unsdsn.org/2020%20Guide-to-a-sustainable-tourism-web.pdf>).

### **3. Green Economy**

Research on the green economy and sustainable development is among the most important areas of research devoted to growth, development, and progress, attracting the attention of researchers and scientists for its role in advancing all sectors of society. It is the essence and foundation of sustainable development. Carl Burkart defined the green economy as based on six core sectors (United Nations Environment Programme, n.d.):

1. Renewable energy
2. Green buildings
3. Sustainable transport
4. Water management
5. Waste management
6. Land management

A green economy is considered a viable and ideal model for sustainable development, particularly economic development that impacts all aspects of life. Its concept has emerged in recent years due to its importance in reducing hunger and poverty, improving living standards, and ensuring human well-being. It is important to remember that sustainable development can only be realized through the implementation of a green economy program and the protection of a healthy environment. This can only be achieved by replacing harmful economic instruments with beneficial ones. For example, since fuel sources pollute the environment and harm all forms of life, thermal energy can be produced from safe sources rather than fuel sources (United Nations Environment Programme, n.d.).

In the face of environmental pollution, depleting natural resources, and growing global demand, expanding the green economy is crucial to achieving sustainable development. It is no coincidence

that the fifth priority of the "Azerbaijan 2030: National Priorities of Socioeconomic Development" program, approved by President Ilham Aliyev, is "Clean Environment and Green Development." The document sets specific goals for the widespread use of environmentally friendly technologies, waste recycling, and the rehabilitation of contaminated areas, as well as expanding the use of environmentally friendly "green" technologies (Ministry of Economy of the Republic of Azerbaijan, n.d.).

### **Results and discussions**

A green economy recognizes the value of people and nature, improves well-being, reduces poverty, and utilizes limited natural resources efficiently and optimally. It forms the basis for new economic concepts, such as recognizing the value of people and nature, improving well-being, reducing poverty, and utilizing limited natural resources efficiently and optimally.

The concept of sustainable development is based on the economic, political, social, and cultural well-being of the world we live in. Today, the production of all goods and services necessary for human survival is possible thanks to healthy ecosystems. Countries around the world are seeking ways to achieve sustainable development. In this context, the concept of sustainable development emerged. Its fundamental idea is to create conditions and mechanisms for the interdependence of socio-economic and environmental development, and to address environmental issues comprehensively within socio-economic processes.

The sustainable energy model is based on the following assumptions:

- Use of renewable energy sources, as currently exploited fossil fuel reserves will eventually be depleted.
- Use of clean energy sources, eliminating traditional and nuclear combustion processes.
- Widespread exploitation of energy sources, with incentives for self-consumption offered as an alternative, thereby avoiding, where possible, the construction of large-scale electricity generation and distribution infrastructure.
- Reducing energy demand by increasing the efficiency of electrical equipment (appliances, lamps, etc.).
- Reducing or eliminating unnecessary energy consumption. This is not simply about more efficient consumption, but about consuming less, which means developing an awareness and culture of energy conservation and condemning waste.

The production of clean, alternative, and renewable energy is a necessity humanity must meet in the short term; therefore, it is not a fad or trend, but an apparent necessity. The efficient use of clean energy sources (CER) in large industrial and agricultural parks, as well as multi-purpose tourism complexes, is noteworthy. Thus, large-scale enterprises play a positive role in the sustainable development of any country's economy, both by maintaining employment levels and by generating economic benefits. Unfortunately, however, in most countries, these enterprises rely on traditional energy sources. The main reason for this is the lack of awareness among their managers. Our country also faces this problem. We see the solution to this problem in the implementation of awareness-raising measures.

### **Conclusion**

This article argues that:

- Transitioning to renewables is not optional but a necessity.
- Agro-ecotourism can serve as a practical stage in this transition, linking rural development with sustainable energy use.
- Awareness campaigns are crucial, since many enterprises still rely on traditional energy due to a lack of knowledge.

"The production of clean, alternative, and renewable energy is a necessity humanity must meet in the short term; therefore, it is not a fad or trend, but an apparent necessity."

## References

1. Barbieri, C., Sotomayor, S., & Aguilar, F. X. (2019). Perceived benefits of agricultural lands offering agritourism. *Tourism Planning & Development*, 16(1), 43–60.
2. Bloomberg New Energy Finance. (2024). *Global trends in renewable energy investment 2024*.
3. Deb, S. K., Das, M. K., Voumik, L. C., Nafi, S. M., Rashid, M., & Esquivias, M. A. (2023). The environmental effects of tourism: Analyzing the impact of tourism, global trade, consumption expenditure, electricity, and population on the environment in leading global tourist destinations. *GeoJournal of Tourism and Geosites*, 51(4spl), 1703–1716. <https://doi.org/10.30892/gtg.514spl11-1166>
4. Fleischer, A., Tchetchik, A., Bar-Nahum, Z., & Talev, E. (2018). Is agriculture important to agritourism? The agritourism attraction market in Israel. *European Review of Agricultural Economics*, 45(2), 273–296.
5. Garda, B., & Temizel, M. (2016). Sürdürülebilir turizm çeşitleri. *Selçuk Üniversitesi Sosyal ve Teknik Araştırmalar Dergisi*, 83–103.
6. International Energy Agency. (2024a). *Key world energy statistics 2024*.
7. International Energy Agency. (2024b). *World energy investment 2024*.
8. International Renewable Energy Agency. (2024). *Renewable market analysis 2024*.
9. León-Gómez, A., Ruiz-Palomo, D., Fernández-Gámez, M. A., et al. (2021). Sustainable tourism development and economic growth: Bibliometric review and analysis. *Sustainability*, 13(4), 2270. <https://doi.org/10.3390/su13042270>
10. Roberts, R., & Robinson, J. S. (2018). The motivational changes pre-service agricultural education teachers endure while facilitating quality supervised agricultural experiences: A six-week project-based learning experience. *Journal of Agricultural Education*, 59(1), 255–270.
11. Sayed Elhoushy, Y., Elzek, Y., & Font, X. (2025). Sustainable tourism certification: A systematic literature review and suggested ways forward.
12. United Nations Environment Programme. (n.d.). *About green economy*. <https://www.unep.org/explore-topics/green-economy/about-green-economy>
13. United Nations Sustainable Development Solutions Network. (2020). *Guide to a sustainable tourism*. <https://files.unsdsn.org/2020%20Guide-to-a-sustainable-tourism-web.pdf>
14. United Nations Tourism. (n.d.-a). *Tourism in the 2030 agenda*. <https://www.untourism.int/tourism-in-2030-agenda>
15. United Nations Tourism. (n.d.-b). *Measuring sustainability in tourism*. <https://www.untourism.int/standards/measuring-sustainability-tourism>
16. Ministry of Economy of the Republic of Azerbaijan. (n.d.). *Green economy*. <https://www.economy.gov.az/en/page/yasil-iqtisadiyyat>
17. REN21. (2024). *Global status report 2024*. <https://www.ren21.net/gsr-2024/>
18. Sustainability Magazine. (n.d.). *What are the UN's updated sustainable development goals?* <https://sustainabilitymag.com/news/what-are-the-uns-updated-sustainable-development-goals>
19. Tourism Teacher. (n.d.). *Importance of tourism*. <https://tourismteacher.com/importance-of-tourism/>

Received: 30.12.2025

Accepted: 24.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/223-229>

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## Səssiz kino dövründə komediyanın formalaşması: Lümyerlərdən Çaplinə

### Xülasə

Bu məqalədə komediya anlayışı qısa olaraq tarixi-mədəni kontekst daxilində nəzərdən keçirildikdən sonra diqqət əsasən səssiz kino dövründə komediyanın formalaşma prosesinə yönəldilir. Komediyanın ilkin olaraq kollektiv gülüş və ictimai davranışların tənzimlənməsi funksiyası daşdığı göstərilir və kino sənətinin yaranması ilə bu funksiyanın vizual ifadə müstəvisinə keçidi araşdırılır. Slapstik komediyanın formalaşmasında Lümyer qardaşlarının “İslanmış bağban” filmi nümunə kimi təhlil olunur, ardından Pate şirkətinin fəaliyyətinə və erkən kino sənayesində rəqabət dinamikasına diqqət yetirilir. Məqalədə Maxs Linder, Çarli Çaplin, Baster Kiton və Harold Lloyd kimi komediya ustalarının yaradıcılıqları səssiz kino estetikasının müxtəlif istiqamətlərini təmsil edən mühüm mərhələlər kimi dəyərləndirilir. Nəticə olaraq müəyyən edilir ki, komediyanın ilk illəri kino dilinin formalaşmasında fundamental rol oynamış, vizual ifadə, bədən dramaturgiyası və sosial məna qatlarının inkişafına şərait yaratmışdır. Bu tarixi mənzərə komediyanın mahiyyəti və komik situasiyanın nəzəri əsasları mövzusunə keçid üçün zəmin təşkil edir.

**Açar sözlər:** komediya tarixi, səssiz kino, slapstik, Maxs Linder, Çarli Çaplin, Baster Kiton, Harold Lloyd, kino dili, vizual komediya

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## The Evolution of Comedy in the Silent Film Era: From the Lumières to Chaplin

### Abstract

After briefly examining the concept of comedy within a socio-cultural context, this article primarily focuses on the developmental process of comedy during the silent film era. It demonstrates that comedy initially functioned as a tool for collective laughter and the regulation of social behavior, and explores how this function transitioned into the realm of visual expression with the birth of cinema. The Lumière brothers' film *L'Arroseur Arrosé* (The Sprinkler Sprinkled) is analyzed as a foundational example of slapstick comedy, followed by an examination of the Pathé company's activities and the competitive dynamics of the early film industry. The works of comedy masters such as Max Linder, Charlie Chaplin, Buster Keaton, and Harold Lloyd are evaluated as pivotal stages representing various facets of silent film aesthetics. In conclusion, it is determined that the early years of comedy played a fundamental role in the formation of cinematic language, facilitating the development of visual expression, physical dramaturgy, and layers of social meaning. This historical overview provides the groundwork for transitioning to the essence of comedy and the theoretical foundations of comic situations.

**Keywords:** history of comedy, silent cinema, slapstick, Max Linder, Charlie Chaplin, Buster Keaton, Harold Lloyd, cinematic language, visual comedy

## Giriş

Komik vəziyyətlərin təsir mexanizmi zahirən sadə görünsə də, onun əsl mahiyyəti insan şüurunun dərinlikləri, fəlsəfi və psixoloji qatlarla sıx bağlıdır. Bu səbəbdən, komik effekt yalnız formal struktur olaraq deyil, arxasında dayanan mənalıdırma sistemləri kontekstində təhlil edilməlidir. Şərq mədəniyyətində komik ifadə üsulları özünü "məzhəkə" kimi spesifik formalarda göstərdiyi halda, Qərb ənənəsində komediyanın kökləri e.ə. VI əsrə gedib çıxır. Antik Yunan cəmiyyətində komediya kənd icmalarının kollektiv bayramlarından və Dionis kultu ilə əlaqəli mərasim nəğmələrindən (komos) yaranmışdır. Siciliyalı Epixarm (e.ə. VI–V əsrlər) və Formiy kimi erkən dramaturqlar ilkin xalq tamaşalarına süjet, dialoq və dramatik quruluş əlavə etməklə janrın bədii keyfiyyətini inkişaf etdirmişlər (Poetika, 2019, s. 94). İlkin komik ifadə formaları əsasən oyun, improvizasiya və fiziki jestlərə əsaslanan tamaşalarla səciyyələnirdi. Qeyd etmək lazımdır ki, "komediya" (kōmōidia) sözü yunanca "komos" (şən məclis, yürüş) və "ōdē" (nəğmə) sözlərinin birləşməsindən yaranmışdır, bu da onun mərasim və şənlik köklərini bir daha təsdiqləyir (Etymological Dictionary of Greek, 2010, s. 814).

E.ə. V əsrdən, xüsusilə Attika komediyası dövründən etibarən, komediya janrı yeni bir funksiya qazanmışdır. Aristofanın yaradıcılığı sayəsində o, estetik və ictimai-fəlsəfi məzmun daşımağa başlamışdır (Aristophanes the Democrat, 2009, s. 9). Bu mərhələdən etibarən komediya sadəcə kollektiv əyləncə vasitəsi olmaqdan çıxaraq, ictimai münasibətlərə dair satirik münasibətin bədii təzahürü, etik və sosial davranış modellərinin tənqidi şərh üçün güclü bir platformaya çevrilmişdir. Beləliklə, janr ictimai normların, siyasi fiqurların və cəmiyyətdəki neqativ halların cəsarətlə tənqid olunduğu, düşüncəyə təkan verən bir sənət formasına çevrilmişdir.

### Tədqiqat

Komediya kinoda da bənzər inkişaf xətti yaşandı və ilk komediya filmləri sadəcə əyləncə məqsədi ilə çəkilmiş slapstik - yəni fiziki komediya filmləri idi. İlk komediya ulduzları sayılan Maks Linder və Andre Didin də erkən filmləri məhz bu üslub əsasında qurulmuşdu. Lakin, tezliklə müəlliflər kinoya bədii dil qazandıra bildilər və satirik elementlər əlavə edərək kinonu estetik bir sənət və ifadə vasitəsinə çevirə bildilər. Ümumiyyətlə, kinonun ilk misionerləri bu sənət sahəsinin ifadə bacarığını və gələcək kommersiya gücünü erkən kəşf etdilər ki, bu da öz növbəsində kinonun qısa müddətdə inkişafına və müstəqilləşməsinə gətirib çıxardı. Biz bu gün də kinonu sintetik sənət növü olaraq qəbul edirik və kinonun unikalığı da məhz ədəbiyyat, musiqi, təsviri-sənət, teatr kimi köklü sahələri özündə birləşdirə bilməsindən qaynaqlanır. Lakin, ilk öncə komediya kontekstində kinonun ilk illərinə nəzər salaq.

### Lümyerlər və slapstik komediya

İlk komediya filmlərinin sadəcə əyləncə məqsədi ilə çəkildiyi hipotezini irəli sürərkən əslində biz gülüş və komik situasiyanın çoxqatlı struktura sahib olduğunu unuduruq. İlk nizamlı komik süjetli film sayılan Lümyer qardaşlarının "İslanmış bağban" (1895) filmindəki personajların belə psixoloji bir tərəfi var ki, bunu anlamaq üçün məhz çevrəmizdəki insanlara diqqətlə nəzər yetirmək lazım gəlir. Bəs həqiqətdən də çevrəmizdəki insanları diqqətlə müşahidə edərək onları anlamaq bilirikmi? Məsələn, uşaq niyə su şlanqının üzərinə çıxdı? Bağbandan qisasını alır? İnsanları əsəbləşdirməkdən həzzmi alır? Və ya sadəcə əylənirmi? Bunları sosioloji, psixoloji və əxlaqi-tərbiyəvi kontekstdən təhlil edə bilirik lakin, unutmamalıyıq ki, Lümyerlər bu filmi çəkərkən heç də semiotik qatlara enərək bədii dəyər ortaya qoymağı hədəfləməyiblər. Məsələn, biz bağbana intizam, uşağa itaətsizlik, suya enerji və həyat, şlanqın taptalanmasına isə nəzarətin müvəqqəti itirilməsi kimi simvolik mənalara yükləyə bilirik. Həqiqətdə isə, bu sadəcə texniki bir yeniliyi nümayiş etdirmək idi və Lümyer qardaşları buna sənət əsəri deyil, elmi-texniki ixtira kimi yanaşırdı. Lakin, onlar özləri də fərqi nə varmadan kinoda slapstik komediyanın əsasını qoydular ki, bu artıq yeni bir çağın başlanğıcı demək idi.

Kinonun ilk illərində slapstik komediya səssiz mühitdə vizual və bədii maraq doğura biləcək ən effektiv üsul sayılırdı. Buz üzərindən sürüşüb yıxılmaq, vurub qaçmaq, yemək qazanını aşırmaq kimi fiziki hərəkətlər rahat anlaşılır və tamaşaçıyı güldürürdü. Maraqlısı budur ki, "slapstik" termini əslində musiqi və teatrda istifadə olunan clapper (və ya botaccio) adlı iki hissəli taxta alətdən gəlirdi. Bu alət bir-birinə vurulduqda həqiqi zərbə ilə ağrı yaratmadan güclü "şlap" səsi çıxarır. XVI əsrdə

İtaliyanın Commedia dell'arte teatrında aktyorlar bu alət vasitəsi ilə zorakılıq effekti yaratmış və tamaşaçını səs və hərəkətin sinxronluğu ilə güldürürlərmiş. (Backstage, 2024)

Slapstik komediya əsas dramatik effektini bədən hərəkətinin şişirdilmiş və ritmik ifadəsindən alan performativ komik model kimi xarakterizə olunduğu üçün onu fiziki komediya da adlandırı bilərik. Ümumiyyətlə, bu janrın əsas təməl elementlərindən biri “qaq” adlanan qısa, ani və vizual komik situasiyalardır. Bir sözlə, “qaq” slapstik komediyanın struktur vahididir və zarafatın atomunu təşkil edir.

### **“Pate” şirkətinin fəaliyyəti**

1896-cı ildə qurulan Pate şirkəti ilk illərdə sadəcə “kinematoqraf” aparatının satışı ilə məşğul olsa da, zaman-zaman Lümyerlərsayağı kadrlar çəkərək eksperimentlər də həyata keçirirdilər. Şirkətin müntəzəm şəkildə kino çəkilişlərinə başlaması isə 1901-ci ildə məşhur rejissor Ferniard Zekka ilə iş birliyi vasitəsi ilə başlayır ki, məhz bu ildən sonra şirkət kinopavliyonlar tikərək ciddi yatırımlar edir. Bu tanışlıq Pate üçün dönüm nöqtəsi olur və Zekka həm rejissor, həm ssenarist, həm də studiyanın texniki rəhbəri kimi fəaliyyət göstərir. “Bir cinayətin hekayəsi” (1901), “İçkinin qurbanları” (1902), “İsə Məsihin həyatı və ehtirası” (1903-1905) kimi filmlər ilə Lümyerlərin sadə müşahidə estetikasını buraxıb, hekayə quruluşlu bədii filmlər yaranmağa başladı. F. Zekka Patedə əl ilə rənglənmiş filmlər, çoxplanlı montaj, “Pathecolor” rəng texnologiyasının ilkin versiyaları və filmlərin seriyalı formada çəkilməsi kimi yeniliklərə imza atdı. Bununla da, Pate şirkəti kinonu Lümyerlərin sənədçiliyindən və Melyesin fantaziyalarından dramaturji kinoya yön almasına təkan göstərir.

XX əsrin əvvəllərində Pate şirkətinin Fransada “Qomon” (1895), “Le Film d'Art” (1907), “Eklayr” (1907) beynəlxalq bazarda isə ABŞ-də “Edison istehsal şirkəti” və “Bioqraf şirkəti” və İtaliyada isə “Cines” (1906) kimi rəqibləri vardı. Edisonun Pateyə qarşı açmış patent mübahisələrini həll edən şirkət öz laboratoriyalarını və kinoteatrlarını ABŞ-də açmaq hüququ aldı. Pate ilk vaxtlar onların texnologiyalarının Fransada müstəqil şəkildə icad olunmasını və ABŞ patentləri ilə eyni olmadığını bildirsə də, sonradan iqtisadi diplomatiya yolunu seçərək Edison sisteminə üzv olaraq müəyyən lisenziya haqqı ilə “Edison Trust”-a qoşuldu. Maraqlısı da bundadır ki, Pate ABŞ bazarında böyük uğur qazanır və Edisonun yaratdığı öz sistemində onun əsas rəqibinə çevrilir (Britannica, 2026). Bunun əsas səbəbi isə, Patenin ilk “kino ulduz” sistemini formalaşdırması və kommersiya və əyləncə istiqamətində irəlləməsi idi. Qomon şirkətinin Alis Gi Blaş tərəfindən çəkilən elmi-sənədli filmləri, Eklayrın texniki keyfiyyət və optika texnologiyası, Le Film d'Artın isə intellektual və teart əsaslı filmləri qarşısında əyləncənin gəlirli bir sektor olduğunu anlayan Pate qardaşları bu yöndə irəlləməyə qərar verdilər.

Kinonun ilk illərində filmlərdə çəkilən aktyorlar qeyri-peşəkar sıradan insanlar olsa da studiyaların formalaşması ilə aktyorlar dəyər qazandı və daimi aktyor heyətləri qurulmağa başlandı. Lakin, yenə də aktyorların adları gizli saxlanırdı. Bunun əsas səbəbi isə, şirkətlər, aktyorların məşhurlaşaraq daha çox məvacib tələb edəcəklərindən ehtiyat edirdilər (A History of Narrative Film, 2016, s. 28-29). 1907-ci ildə isə Pate şirkəti aktyorlarından birini ön plana çıxarmağa başladı. Bu məhz ilk kino ulduzu Maks Linder idi. Maks Linder kinosevərlərin rəğbətini qazanmaqla yanaşı, Çarli Çaplin, Baster Kiton və Harold Lloyd kimi sənətkarlara ilham qaynağı olaraq ulduz sisteminin formalaşmasında ilk addımı atdı.

### **Maks Linder yaradıcılığı**

1905-ci ildə Maks Linder hələ teatrda çalışan gənc və istedadlı aktyor olmasına baxmayaraq, hələ də özünü və potensialını tam mənası ilə ortaya qoya bilməmişdi. Çalxantılı keçən teart təhsilinin ardından bir də aşağı səviyyəli teatrda rol alması onu gələcəklə bağlı daha da narahatlığa sürükləyirdi. Maksın kinoya gəlişi 1905-ci ilin sonunda Lui Qanye ilə tanışlığı vasitəsi ilə başladı. Həmin vaxtlar Lui Qanye Pate şirkətində rejissorluq fəaliyyəti ilə məşğul olur və yeni istedadlar axtarışında idi. O, Maksın ilk dəfədən diqqətçəkici mimika və fiziki ifadə etmə qabiliyyətini sezdi və sınaq çəkilişlərinə dəvət etdi (Timenote, t.y).

1906-cı ildən Maks Linder mütəmadi olaraq bir neçə qısa epizodik rolda çıxış edir. Ümumiyyətlə, kinonun ilk illərində komediya janrı teatr köklərinə bağlı şəkildə irəlləyirdi. Hərçənd, XX əsrin

əvvəllərində yaşayan ilk kino nəzəriyyəçiləri kinonun özünəməxsus ifadə vasitələrini tapması və teatr təsirindən uzaqlaşması zəruriyyətini vurğulayırdılar (Manifeste des sept arts, 1923). Yəni, kinonun bədii dili formalaşmalı və teatrdan fərqli vizual vasitələr inkişaf etdirilməlidir. Maks Linder də bir aktyor kimi məhz bunu etdi: o, öz fərdi bacarıqları sayəsində keçmiş teatr təcrübəsini kinonun vizual dili ilə birləşdirdi. Onun ekrandakı oynu jestlərin və emosiyaların incə harmoniyasına əsaslanırdı. Bunun fərqləndirici Pate Maks Linder vasitəsi ilə eyni personajın bir çox filmdə davamlı iştirakına əsaslanan personaj əsaslı komediya konsepsiyasının əsasını qoyaraq “Maks” obrazı yaratdılar.

Maks obrazı, burjua zövqlərinə malik, zərif lakin, daim sosial ortamlarda gülünc situasiyalara düşən şəhərli kişi personajı idi. Gülüş də məhz bu ziddiyyətdən doğurdu. Onun geyimi ilə davranışı uyğun gəlmirdi, səfeh və yöndəmsiz hərəkətləri ilə hər zaman gülüş hədəfi olurdu. O, zərif geyimi, papağı, əlcəyindən asılmış çubuğu ilə qarşımıza çıxır və bədən dili vasitəsi ilə tamaşaçı ilə bağ qura bilirdi.

Maks obrazı əksər hallarda öz xarakterindən dolayı komik situasiyaya düşürdüsə, bəzi hallarda isə vəziyyət onu komik hallara düşürə bilirdi. Məsələn, “Maksın papağı” (1908) filmində, o, bir türlü papağını qoruya bilmir, hər dəfəsində bir tərslik baş verərək onu komik situasiyaya sala bilirdi. Ümumilikdə isə, Maks obrazı əsasən kinoda personaj əsaslı komediyanın və komik arxetipin ilk örnəyi sayılır. Hər hansı bir komik situasiyanın xarakter və ya vəziyyət əsaslı olmasını ayrıca analiz edəcəyik lakin, ilk öncə Maks Linderin bir neçə xarakter əsaslı filmlərinə nəzər salaq.

Maks Linderin çəkildiyi ən maraqlı filmlərdən hesab olunan “Gimnazistin ilk siqarı” (1908) aktyorun mimika və fiziki ifadə bacarığını bir daha gözlər önünə sərirdi. Ümumiyyətlə, Linderin Maks obrazı slapstik komediyada rəqibi hesab olunan Andre Didin “Çretinetti” obrazından kəskin fərqlənirdi. Çretinettinin hiperaktiv fiziki hərəkətləri ön planda idisə, Maksın daha çox mimika və jestləri önə çıxırdı. Yəni, biz Çretinettinin düşdüyü komik situasiyaya gülürüksə, Maksın isə düşdüyü komik situasiyadakı mimika və reaksiyasına gülürük. Məsələn, “Gimnazistin ilk siqarı” filmində baş qəhrəmanın ilk siqaretini yandırdıqdan sonra halının pisləşməsi ilə yaranan üz mimikaları, yıxılmasına baxmayaraq centlimen duruşunu qorumağa çalışması kimi detallar bizdə əsas gülüş doğuran ünsürlərdir. “Maks düş alır” (1906), “Xizəksürənin debütü” (1907) kimi filmlərdə də gülüş məhz belə ortaya çıxır. Yıxılma anı, reaksiya və gülüş. Həmçinin, “Gimnazistin ilk siqarı” filmində obrazın düşdüyü situasiyanın əxlaqi-tərbiyəvi yanı da var və biz həm gülürük, həm də dərs çıxarıq. Ümumiyyətlə, Maks Linderin filmlərinin bu cür ibratamız yönü də var ki, bu, o dövrün komediya filmlərində az rast gəlinən tendensiya idi və həmçinin, artıq kinonun ciddi bir sənət sahəsinə çevrilməsi yolunda önəmli addım idi.

### **Çarli Çaplin yaradıcılığı**

Maks Linderdən ilhamlanan bir çox sənətçi olmuşdur ki, onlardan ən böyüyü sözsüz ki, Çarli Çaplindir. Çaplin kinonun unikal dahisi olaraq aktyor, rejissor, ssenarist və pedaqoq kimi fəaliyyətləri ilə kinonun bir sənət sahəsi kimi dəyər qazanmasında kritik təsiri olmuşdur. Çaplin Linderin təqdim etdiyi zarafatyana jest dilini sadəcə davam etdirmədi; o, komediyanı emosional və sosial mənə daşıyan bir ifadə müstəvisinə çıxardı. Çaplinin “Tramp” obrazı məhz bu təkamülün qüsursuz simvoludur. O, həm gülüş doğuran, həm də müasir insanın yoxsulluq, yadlaşma və ləyaqət mübarizəsini özündə daşıyan universal və çoxqatlı insan fiqurudur. Çarli Çaplin kino tarixində komediyanın yalnız əyləncə vasitəsi deyil, həm də insanın mənəvi vəziyyətini poetik təzahürü ola biləcəyini sübuta yetirən sənətkar kimi çıxış edir.

20-ci illərdə “Çaplin arxetipi” deyərək bir anlayış yaranmışdı ki, artıq ona hər yerdə rast gəlmək olur və bir növ Çaplin “dünyanın ən məşhur” siması idi. “Kim daha çox ona bənzəyir” deyərək yarışmalar keçirilir və hər yer “saxta Çaplinlərlə” dolub daşırdı. Söyləntilərə görə, Çaplinin özü belə bu yarışmalardan birinə qatılıb və iyirminci yerə layiq görülüb lakin, bu iddia hələ də tam olaraq sübut olunmuş deyil (Yahoo Entertainment, 2024). Çaplini bu qədər məşhur edən onun universal dili idi ki, o, səssiz kinonun limitlərini aşaraq dil baryeri olmadan hər kəs ilə bağ qura bilirdi. O, hamının başa düşdüyü universal gülüş dili yaratmışdı. Onun yaratdığı Tramp obrazı modern şəhər insanının taleyi idi. Çaplin Tramp vasitəsi ilə yalnız güldürmürdü, eyni zamanda, sosial empatiya qururdu.

Tramp obrazı kiçik insan olaraq böyük idellar üçün savaşıyan ziddiyətli bir obraz idi ki, elə bu ziddiyət ilk baxışdan onun geyimində belə hiss edilirdi. Onun xarici görünüşündəki disharmoniya - böyük ayaqqabılar, geniş şalvar, kiçik papaq və nazik bığ - sosial olaraq kənarda qalan fərdin komik freqmentasiyasını əks etdirir, lakin obrazın davranış və jestləri aristokratik ləyaqət və humanist həssaslıq daşıyır. Biz Maks Linder timsalında gülüşün və komik situasiyanın əksər hallarda ziddiyyətlərdən ortaya çıxdığını demişdik. Personajın hərəkəti ilə xarakteri və ya şəxsi bacarığı ilə davranışı üst-üstə düşməyində qaçılmaz olaraq komik situasiya yaranır. Bütün komik obrazlar kimi, Tramp obrazında da bunun şahidi oluruq: məsələn, “Polis” (1916) filmində personajımız bir quldura qoşularaq xarakterinə və fərdi bacarıqlarına zidd olan işlərə qoşulması və ev soymağa çalışması bunun ən mükəmməl örnəklərindən biri ola bilər. Trampın bu davranışı işsizlik və yoxsulluq kimi sosioloji səbəblərdən qaynaqlansa da, burada çox dərin psixoloji qatlar da özünü göstərir. İlk öncə Tramp daim “kiçik”, “görünməz” və “ciddiyə alınmayan” biridir. Onun burada quldura qoşulması “mən də bacarıram” deməyin kompensasiya aktıdır ki, bunu da Alfred Adlerin aşağılıq kompleksi və kompensasiya nəzəriyyəsi ilə əlaqələndirə bilərik (Simply Psychology, 2024). Filmin əvvəlində din adamının onu aldatması, onun çevrəyə qarşı aqresivliyini daha da artırır və bu kompleks daha da şiddətlənərək onu çətin situasiyalara salır. Ümumiyyətlə, ziddiyyət hər zaman dərin psixoloji və semiotik qatları olan kompleks bir anlayışdır və Mixail Baxtinə görə obraz öz daxilində bir neçə münaqişəli mənə və mövqe daşıya bilər (Problems of Dostoevsky’s Poetics, 1984, s. 18).

Çarli Çaplinin kinoya gəlişi Mek Sennettin vasitəsi ilə Keyston studiyasında başladı. Bir neçə uğursuz roldan sonra təsadüf nəticəsində Tramp obrazı yaradıldı ki, bu hadisə onun da, kino tarixinin də taleyini köklü şəkildə dəyişəcəkdi. Bu obraz tənqidçilər tərəfindən uğurlu qarşılandı, tamaşaçılar tərəfindən isə adətən bir ikon halına gələcək qədər sevilirdi. Ümumiyyətlə, Tramp obrazı tamaşaçının ekran qarşısında rastlaşa biləcəyi ən qeyri-adi obraz ola bilərdi. Onun adı yoxdur, faktiki bir ünvanı və ailəsi də bilinmir. Zamanda və məkanda bəlli bir yerdə deyil və biz onu tam mənası ilə tanımlaya bilmirik. Papaq, əsa, ayaqqabı və bığ - bəzən isə sadəcə bığ dəyişilməz olaraq qalır. Ona kiçik adam, kiçik dost və avara deyirdilər. O, həm bizim içimizdən birisi, həm də bizdən çox fərqli olan polifonik bir xarakterdir.

Tramp obrazı ilk dəfə 1914-cü ildə çəkilmiş “Kid Auto Races at Venice” (Venesiya uşaq avtomobil yarışları) filmində qarşımıza çıxır. Bu, Çaplinin obrazının tamaşaçı ilə birbaşa üz-üzə gəldiyi ilk an olması ilə kino tarixində xüsusi əhəmiyyət daşıyır. Səhnə gerçək həyatda keçirilən uşaq avtomobil yarışları zamanı çəkilib və obraz burada kadra girərək özünü göstərməyə çalışan fiqur kimi təqdim olunur. O, burada heç bir dramatik situasiyanın içində deyil; sadəcə “mən burdayam” deyərək öz varlığını göstərməyə çalışır. Onun buradakı hərəkətləri də, sosial görünməzliyin kompensasiya edilməsi kimi dəyərləndirilə bilər. Tramp obrazının ilk tam şəkildə görüldüyü güründüyü film isə 1915-ci ildə çəkilmiş və Edna Pörvians ilə ilk iş birliyi olan “The Tramp” filmidir.

Çarli Çaplin yaradıcılığının başlarında artan populyarlığı və maddi gücü ilə bütün yaradıcı prosesi öz əlinə alaraq müstəqil bir sənətçi profili cızmışdı. Filmlərinin ssenarisini yazır, özü rejissorluq edir, aktyor kimi çıxış edir, hətta musiqilərini belə özü bəstələyirdi. Onun “İmmiqrant” (1917), “Uşaq” (1921), “Qızıl hərslisi” (1925), “Sirk” (1928), “Böyük şəhərin işıqları” (1931), “Modern zamanlar” (1936) kimi filmlər səssiz dövr kino tarixinin qızıl klassikləri olaraq qəbul edilir. Ümumiyyətlə, Çaplin səsli mərhələyə keçid dövründə bir az daha təmkinli yanaşmış və filmlərinin böyük qismini səssiz formada davam etdirmişdi. Çaplin özü bunu belə açıqlamışdı: “Danışmaq süni bir şeydir. Hansı ki, hərəkət təbiiliyə uyan bir quş kimi yaxındır. Səs çox gözəl bir şeydir amma, sadəcə baxan birinin səssizliyi qədər mükəmməl deyil”. “Modern zamanlar” filmində qismən danışq və səs olsa da biz hələ də Çaplinin səsini eşitməmişdik. Yalnız filmin sonunda Çaplinin mahnı oxuması səhnəsində tamaşaçı ilk dəfə onun səsini eşidir və bu Çaplin yaradıcılığında səssiz dövrün bitdiyini və yeni dövrün başladığına işarə idi. Onun ilk tam səsli filmi isə 1940-cı ildə çəkdiyi “Böyük diktator” filmi oldu. Burada Tramp obrazı ilk dəfə danışır və filmin mövzusunun dolayısı obrazı qarşı münasibət fərqli kütlələr tərəfindən müxtəlif cür qarşılanır. Bu dövrdən sonra onun filmləri və xarakteri birmənalı qarşılanmır və sanki tamaşaçı danışmayan Trampı daha çox sevir.



Hər nə qədər münaqişəli yönləri və filmləri olsa da Çarli Çaplin kinonun ən unikal dahisi sayılır və kinonun bir sənət sahəsi kimi inkişafında rolu əvəzədlənməzdir. Onun sənət anlayışı özünəməxsus estetikliyi və intellektuallığı ilə seçilir və o, reallıqda gördüklərimiz ilə zehnimizdə görmək istədiklərimiz arasında incə harmoniya yaradaraq bizə insan olduğumuzu xatırladır. O, yalnız böyük aktyor, rejissor və ssenarist deyil, həmçinin gələcəyə işıq saçıyan bir pedaqoq idi.

### **Baster Kiton və Harold Lloyd yaradıcılığı**

Komediyanın kino sənətindəki təkamülü sadəcə texniki yenilik deyil, həm də sosioloji və estetik bir proses idi. Lümyerlərin gündəlik həyatın təsadüfi anlarını çəkməsi ilə başlayan bu yol, "Pate" studiyalarında istehsalat sisteminə çevrilərək Maks Linderin simasında ilk komik fiquru formalaşdırdı. Çarli Çaplin bu modeli bir addım da irəli apararaq, komediyanı insanın daxili ziddiyyətləri və ləyaqət mübarizəsi kimi daha dərin mövzularla birləşdirdi. Baster Kiton və Harold Lloyd isə bu xətti fiziki ustalığı və texniki eksperimentlərlə zənginləşdirərək, səssiz komediyanın hərəkət və ritm imkanlarını ən yüksək həddə çatdırdılar.

Baster Kiton komediyanı vərmiş etdiyimiz "sadəcə güldürmək" funksiyasından çıxarır, insanın məşinləşən və sürətlə inkişaf edən şəhər dünyası ilə qarşıdurmasını göstərən bir sənətə çevirdi. Onun məşhur "daş sifət" (The Great Stone Face) ləqəbi əslində emosiyasızlıqdan çox, modern həyatın xaos ritmi qarşısında fərdin göstərdiyi bir növ soyuqqanlı reaksiya ilə birlikdə olan sükut dolu etiraz idi. (Britannica, 2026). Məsələn, "General" (1926) filminə Kitonun qəhrəmanı həm texnoloji inkişafın simvolu olan parovozla mübarizə aparır, həm də onun mexanizminə uyğunlaşmağa məcbur olur. Bu vəziyyət fərdin məşinləşmiş sistem içində hərəkət azadlığının necə daraldığını göstərən bir metaforadır. "Kiçik Şerlok" (1924) filminə isə o, kino illüziyası ilə gerçəklik arasındakı sərhədləri dağıdaraq tamaşaçını maraqlı bir dünyaya dəvət edir. Burada insan öz həyatını kənardan izləyən bir müşahidəçiyə çevrilir. "Kiçik Gəmiçi Bill" (1928) filminəki nəhəng dağıntı səhnələri isə insanın həm təbiət, həm də texnologiya qarşısındakı acizliyini komik-dramatik dillə ifadə edir. Kitonun komikası təsadüflərdən daha çox, dəqiqliklə hesablanmış hərəkətlərə əsaslanırdı. Bu yanaşma onun sənətini həm ironik, həm də faciəvi bir araşdırmağa çevirir.

Amerikan komediyasının digər mühüm siması Harold Lloyd isə "adi insanın qəhrəmanlığı" obrazını yaradan əsas sənətkardır. Onun eynəkli gənc obrazı nə Çaplinin cəmiyyətdən uzaq romantik "Tramp"-ı, nə də Kitonun soyuqqanlı personajı ilə eyniləşdirilə bilməz. Lloydun qəhrəmanı orta təbəqənin dəyərlərini daşıyan, cəmiyyətdə yer tutmağa və uğur qazanmağa çalışan biridir. O, bu məqsədinə çatmaq üçün bəzən gülünc, bəzən də həddindən artıq riskli yollara əl atır. Məsələn, "Təhlükə Son Dərəcə" (1923) filminəki məşhur göydələndə dırmaşma səhnəsi təkə fiziki cəsarət deyil, həm də 1920-ci illərin Amerikan cəmiyyətindəki "özünü yüksəltmə" (self-made man) ideyasının simvoludur (Britannica, 2026). Buradakı komik vəziyyət sosial yüksəliş arzusunun bir növ şişirdilmiş formasıdır. "Tələbə" (1925) filminə isə Lloyd cəmiyyət tərəfindən qəbul olunmaq və uğur qazanmaq məsələlərini araşdırır. Lloydun yumoru sosial normaların yaratdığı gərginliyi boşaltma mexanizmi kimi çıxış edir. Onun qəhrəmanı büdrəsə də, hər dəfə ayağa qalxmaq əzmi göstərir ki, bu dözümlülük də onu dövrün tamaşaçısı üçün ən real və doğma komik obrazlardan birinə çevirmişdir.

### **Nəticə**

Kino sənətinin erkən mərhələləri təkə gülüşün inkişafını deyil, həm də kino dilinin özünün kəşf edildiyi və kodlaşdırıldığı fundamental dövrü təmsil edir. Bu ilkin illərdə komediya, kadr quruluşu, montaj ritmi və bədən hərəkətinin kinematoqrafik təsviri kimi texniki məsələlər üçün mühüm bir eksperimental laboratoriya rolunu oynayaraq, vizual ifadənin əsas imkanlarını təyin etmişdir. Səssiz kinoda formalaşan bu vizual komediya poetikası səsli kinoya keçidlə yeni tematik və funksional qatlar əldə etdi. Dialoq, musiqi elementləri və ritmik dinamika komediyanın dramaturgiyasını daha geniş sosial və psixoloji kontekstlərlə zənginləşdirdi. XX əsrin ortalarından etibarən, komediya sadə gündəlik həyatın müşahidə sərhədlərini aşaraq, ideologiya, identiklik, vətəndaşlıq və sinif münasibətləri kimi mürəkkəb mövzuların zərif tənqidinə imkan verən bir ifadə platformasına çevrildi.

Müasir dövrdə komediya janrı satira, qara yumor, absurdist yanaşma, postmodern parodiya və meta-komediya kimi müxtəlif alt janrlarda təkamülünü davam etdirir. Bu inkişaf təkə kino

sənayesində deyil, həm də televiziya və rəqəmsal media formatlarında müşahidə olunur. Rəqəmsal montaj imkanları, sürətli vizual dil, internet mədəniyyətinin (memlər) və sosial şəbəkələrin təsiri komediyanın həm istehsal, həm də qəbul mexanizmlərini köklü şəkildə dəyişdirmişdir.

Bununla belə, komediyanın əsas epistemoloji funksiyası — fərdin özünü və ətrafındakı dünyanı gülüş prizmasından dərk etməsi — dəyişməz olaraq qalır. Göstərilən tarixi mərhələlər sübut edir ki, komediya sadə bir əyləncə forması deyil, insan təcrübəsini şərh edən və sosial reallığı anlamağa imkan verən mürəkkəb və çoxşaxəli bir bədii strukturdur.

### Ədəbiyyat

1. Adler, A. (n.d.). *Alfred Adler*. Simply Psychology. <https://www.simplypsychology.org/alfred-adler.html>
2. Aristotel. (2019). *Poetika*. Bakı: Qanun nəşriyyatı.
3. Bakhtin, M. (1984). *Problems of Dostoevsky's poetics* (C. Emerson, Trans. & Ed.). University of Minnesota Press.
4. Backstage. (2023). *Slapstick comedy: Definition and examples*. <https://www.backstage.com/magazine/article/slapstick-comedy-definition-examples-76449/>
5. Beekes, R. S. P. (2010). *Etymological dictionary of Greek*. Brill.
6. Britannica. (n.d.-a). *Buster Keaton: American actor and director*. <https://www.britannica.com/biography/Buster-Keaton>
7. Britannica. (n.d.-b). *Harold Lloyd: American actor*. <https://www.britannica.com/biography/Harold-Lloyd>
8. Britannica. (n.d.-c). *History of film: Edison and the Lumière brothers*. <https://www.britannica.com/art/history-of-film/Edison-and-the-Lumiere-brothers>
9. Canudo, R. (1923). *Manifeste des sept arts*. Gazettes des Sept Arts.
10. Cook, D. A. (2016). *A history of narrative film* (5th ed.). W. W. Norton.
11. Keaton and Deleuze. (2004). *Keaton and Deleuze*. Senses of Cinema. [https://www.sensesofcinema.com/2004/comedy-and-perception/keaton\\_deleuze/](https://www.sensesofcinema.com/2004/comedy-and-perception/keaton_deleuze/)
12. Linder, M. (n.d.). *Max Linder*. Timenote. <https://timenote.info/en/Max-Linder>
13. Sidwell, K. (2009). *Aristophanes the democrat*. Cambridge University Press.
14. Yahoo Entertainment. (n.d.). *Fact check: Hollywood tale claims*. <https://www.yahoo.com/entertainment/fact-check-hollywood-tale-claims-020000073.html>

Daxil oldu: 11.10.2025

Qəbul edildi: 21.02.2026

## TƏBİƏT ELMLƏRİ NATURAL SCIENCES

DOI: <https://doi.org/10.36719/2663-4619/127/230-241>

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### Ampelographic Characteristics of New Grape Varieties

#### Abstract

This article is devoted to the ampelographic evaluation of newly developed grape varieties, namely *Nakhchivan Muscat*, *Nargizi*, and *Alinja*. The study investigates their ecological, phenological, agrobiological, and biomorphological characteristics, examines their genetic structure, and provides a comprehensive description based on standard ampelographic descriptors.

The *Nakhchivan Muscat* variety was selected from plants obtained in 1985 through the treatment of germinating seeds of the Uzbek Muscat variety with a 0.3% colchicine solution for 24 hours. The plants selected from the resulting seedlings were chosen for further cultivation. The newly developed variety was granted a patent and copyright certificate in 2020 (No. 00288; author: Professor V.M. Guliyev). The average yield per vine is 11–13 kg.

The *Nargizi* variety was developed in 1980 via open pollination of seeds of the Uzbek Muscat variety. Seed germination was stimulated using a 0.3% colchicine solution for 48 hours, followed by the selection of promising genotypes from the resulting seedlings. The variety was granted a patent and copyright certificate in 2020 (No. 00291; author: Professor V.M. Guliyev). The average yield per vine is 15–17 kg.

The *Alinja* grape variety was developed through open pollination of the Meleyi variety. Prior to germination, the seeds were treated with a 0.5% colchicine solution for 48 hours. For cultivation subsequent selection was carried out among seedlings. The *Alinja* variety was granted a patent and copyright certificate (No. 00284; author: Professor V.M. Guliyev). The average yield per vine is 10–12 kg.

The article presents a concise ampelographic characterization of these newly developed varieties.

**Keywords:** *grape breeding, grapevine varieties, biomorphology, agrobiological traits, ampelography, chromosome structure*

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## Yeni üzüm sortlarının ampeloqrafik xüsusiyyətləri

### Xülasə

Məqalə Naxçıvan Muskadı, Nərgizi və Alincə adlı yeni üzüm sortlarının ampeloloqrafik qiymətləndirilməsinə həsr olunmuşdur. Tədqiqat dövrü yeni üzüm sortlarının ekoloji, fenoloji, aqrobioloji, biomorfoloji xüsusiyyətləri araşdırılmış, onların genetik strukturu tədqiq edilmiş, ampelo-deskriptor xüsusiyyətləri təsvir olunmuşdur.

Naxçıvan muskadı sortu 1985-ci ildə Özbəkistan muskadı üzüm sortunun cücərən toxumlarına 0.3% kolxisin məhlulu ilə 24 saat ərzində təsir edilməsi nəticəsində əldə olunmuş bitkilər içərisindən seçilmişdir. Yeni sort 2020-ci ildə patent və müəlliflik şəhadətnamə almışdır (№ 00288, müəllif: prof. V.M. Quliyev). Hər bir kol 11-13 kq məhsul verir.

Nərgizi sortu 1980-ci ildə Özbəkistan muskadı sortunun sərbəst tozlanma yolu ilə əldə edilmiş toxumlarına cücərmə dövrü 48 saat ərzində 0.3% kolxisin məhlulu ilə təsir edilmişdir. Sonra cücərən bitkilər içərisindən seçilmişdir. Nərgizi 2020-ci ildə patent və müəlliflik şəhadətnaməsi almışdır (№ 00291, müəllif: prof. V.M. Quliyev). Hər bir kol 15-17 kq məhsul verir.

Alincə üzüm sortu Mələyi sortunun sərbəst tozlanma yolu ilə alınmış. toxumlarına cücərmədən əvvəl 48 saat ərzində 0.5% kolxisin məhlulu ilə təsir edilmişdir. Nəticədə alınan bitkilər işərisindən seçilmişdir. Alincə patent və müəlliflik şəhadətnaməsi almışdır (№ 00284, müəllif: prof. V.M. Quliyev). Hər bir kol 10-12 kq məhsul verir.

Məqalədə yeni sortların qısa ampeloqrafik təsviri verilmişdir.

**Açar sözlər:** *seleksiya, üzüm sortu, biomorfologiya, aqrobiologiya, ampeloqrafiya, xromosom*

### Introduction

**Relevance of the Research Topic:** In the context of modern viticulture, the introduction of highly productive and economically valuable grapevine cultivars with diverse end-use applications into cropping systems represents a strategically important and actual issue both globally and within the Republic of Azerbaijan.

The grapevine gene pool of the Republic of Azerbaijan comprises approximately 600 cultivars, of which around 400 are indigenous and 200 are introduced varieties. Within the Nakhchivan Autonomous Republic, the grapevine genetic resources include 92 indigenous cultivars, categorized as follows: 9 raisin varieties, 29 table varieties, 19 dual-purpose (universal) varieties, and 35 technical (wine) varieties. In addition, 23 introduced cultivars are cultivated in the region. Furthermore, the regional gene pool encompasses a wide range of newly developed clones, mutants, and experimentally derived hybrid and polyploid grape forms ( $2n = 76$ ), characterized by diverse genetic, and economically valuable traits (Kuliyev, 2011).

**Brief literature review.** The species and cultivar diversity, as well as the global distribution of the genus *Vitis* L., have been extensively investigated in contemporary scientific research (Yang Dong et al., 2023). Considerable attention has also been devoted to the theoretical and practical foundations underlying the development of new grapevine cultivars (Kazakhmedov, 2024).

At present, breeders in leading viticulture-producing countries employ a range of genetic and breeding approaches, including clonal selection, classical hybridization, induced mutagenesis, and polyploidization, for the development of new cultivars (Musayev et al., 2015). Clonal selection has proven particularly effective, resulting in the identification and propagation of high-yielding and economically valuable genotypes.

A substantial body of literature addresses the evaluation of agrobiological and chemical-technological characteristics of newly developed cultivars and forms, as well as their introduction into viticultural production systems (Lnitskaya et al., 2022). The incorporation of improved cultivars into vineyard plantings contributes significantly to increased productivity and enhanced fruit quality.

It should also be emphasized that standardized criteria exist for grape cultivars intended for commercial cultivation. These traits are codified and described using internationally recognized ampelographic descriptors in accordance with the methodology of the International Organisation of Vine and Wine (OIV) (OIV Codes, 2020). The application of this descriptor system facilitates accurate cultivar identification, supports selection processes for vineyard establishment, and enhances the economic efficiency of viticultural production (Troshin et al., 2021).

In recent years, genome and DNA analyses in grapevine have played a significant role in elucidating evolutionary development, origin, and genetic relationships among grape cultivars (L'nitskaya et al., 2016; Il'nitskaya et al., 2016).

**The main objective of the work.** The primary objective of grapevine breeding is the development of new cultivars characterized by different ripening periods (reaching technological maturity at various times), high market appeal, stable productivity, resistance to major diseases and pests, elevated sugar content, and suitability for transportation and storage. The present study is aimed at addressing these breeding priorities.

The research was conducted using high-yielding grapevines of the varieties "Nakhchivan Muscat," "Nargizi," and "Alinja," developed through selective breeding. The study encompassed the evaluation of phenological, agrobiological, cytological, and biomorphological characteristics of the newly developed cultivars, as well as their productivity, yield quality parameters, and resistance to diseases and pests.

Ampelographic characterization was carried out in accordance with the standardized methodologies of the International Organisation of Vine and Wine (OIV). Phenological observations were systematically performed throughout the growing season, and resistance to diseases and pests was assessed under field conditions. Cytological analyses were conducted using MBI-6 and Palom microscopes (Agayev, 2001). In addition, the ampelographic descriptor profiles of the cultivars were established, and production costs were calculated based on the relevant methodological framework (Orudzhov, 2007).

## Results and discussion

**On the Ecology of the Studied Grape Varieties.** Large-scale environmental assessments of agricultural crops, including grapevine, have been conducted in several countries worldwide (Sundyreva et al., 2023; Sudnikova et al., 2025). The present study was carried out in the Nakhchivan Autonomous Republic of the Republic of Azerbaijan, which represents one of the key agro-industrial regions of the country. Within the regional agricultural sector, viticulture constitutes one of the most economically profitable branches, and its importance has been steadily increasing in recent years. Areas suitable for grape cultivation are predominantly located in plains and foothill zones. Viticulture-suitable lands account for approximately 60–65% of the total territory, corresponding to about 3.0–3.5 thousand km<sup>2</sup>. The soils of grape-growing areas are highly diverse, comprising more than 15 types and subtypes. The region is characterized by high thermal resources, with the sum of active temperatures exceeding 3500–4000°C. Under such conditions, the sugar content in the juice of

more than 75% of cultivated grape varieties reaches 19.0-25.0 g/100 cm<sup>3</sup>. Seasonal temperature dynamics significantly influence grapevine phenology. In spring, sap flow begins when soil temperature reaches +8–10°C, while active vegetative growth starts at temperatures above +10.8°C. Optimal vine development occurs at +25–30°C, whereas temperatures exceeding +30–35°C during summer lead to a slowdown in growth processes. In autumn, as air temperatures decrease below +30°C (late September-early October), a secondary phase of physiological activity is observed. Subsequently, when temperatures fall below +18°C, vegetative activity gradually ceases, and the vines enter a dormancy period. The onset of relative dormancy is associated with soil temperatures of +8–10°C. Climatic conditions are further characterized by an average relative air humidity of 66.0–70.0%. During the growing season, soil moisture in the arable layer ranges from 17.6% to 32.6%, which plays a crucial role in regulating vine growth and productivity.

**Progress of the main phenological phases.** During the research period from 2022 to 2025, the progression of the main phenological stages of the newly studied grape varieties was investigated. The results obtained are presented below (Table 1).

**Table 1.**  
 The course of the main phenological phases.

| Sorts r           | Opening of buds |                  | Blossoming |                  | Fruit ripening |                  | Vegetation period, days |                      | Autumn (or Fall) |
|-------------------|-----------------|------------------|------------|------------------|----------------|------------------|-------------------------|----------------------|------------------|
|                   | mass            | duration in days | mass       | duration in days | mass           | duration in days | until flowering         | until fruit ripening |                  |
| Alinja            | 08-13.04        | 7                | 12.06      | 8                | 22.09          | 37               | 60                      | 165                  | 12.11            |
| Nakhchivanmuscati | 05-11.04        | 8                | 10.06      | 9                | 24.09          | 39               | 65                      | 155                  | 17.11            |
| Nargizi           | 06-12.40        | 8                | 12.06      | 8                | 05.10          | 44               | 63                      | 473                  | 12.11            |

The yield of grapevines depends more on the fertility of pollen cells than on other factors. This is explained by the fact that during the flowering period, the higher the percentage of fertile pollen cells involved in the pollination process, the higher the berry set on the clusters, and therefore, the yield. During the study, the fertility of pollen grains in grapevine varieties was examined. The results of the study showed that the germination percentage of pollen cells in grapevine varieties is as follows: 93.8% for Alinja, 97.5% for Nakhchivan Muscati, and 94.0% for Nargizi.

**Cytological analysis results.** Grapevine yield is largely influenced by pollen viability, which plays a critical role in successful fertilization. During the flowering period, a higher proportion of viable pollen grains participating in pollination leads to improved fruit set within clusters and, consequently, increased yield. In the present study, the viability of pollen grains in the examined grapevine cultivars was assessed. The results indicated high germination rates across all studied varieties: *Alinja* - 93.8%, *Nakhchivan Muscat* - 97.5%, and *Nargizi* - 94.0%. It is well established that most cultivated grapevine varieties possess a diploid chromosome set ( $2n = 38$ ). In this study, the chromosomal constitution of the somatic cells of the newly developed cultivars was investigated. Cytological analysis was performed using root meristem cells. The results confirmed that the somatic cells of the *Alinja*, *Nakhchivan Muscat*, and *Nargizi* cultivars are diploid, with a chromosome number of  $2n = 38$  (Figure 1).

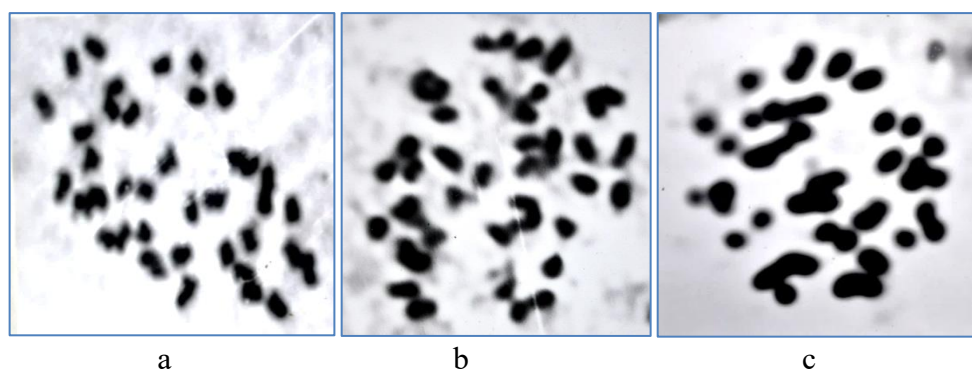


**Figure 1.** a) Gahvayi kishmishi ( $2n=38$ ) b) Sufra bayanshira ( $2n=38$ ) c) Oguz ( $2n=38$ )

**Agronomic Characteristics.** The investigation of agrobiological, biomorphological, and principal productivity traits of grape cultivars provides farmers with broad opportunities for informed varietal selection in the production process (Antonenko et al., 2019, Beybulatov et al., 2018, Beybulatov et al., 2019).

During the period 2022–2025, the main agrobiological and productivity indicators of grape cultivars developed through breeding were studied. The research encompassed the evaluation of the vegetation period, the timing of onset and completion of phenological stages, shoot growth intensity, cluster and berry characteristics, yield level, and quality parameters.

The observations and measurements conducted revealed differences among the cultivars in terms of vegetation duration, yield potential, and resistance to environmental factors. The results obtained are presented in Table 2.

**Table 2.**  
Main productivity indicators of new grapevine varieties.

| Sorts r            | The average mass of a cluster, g | The number of berries in the cluster, number | The mass of 100 berries, g | In the press, % |      | Total juice yield % | In the juice                         |                               | Yield coefficient |                      | Yield per stem, kg |
|--------------------|----------------------------------|----------------------------------------------|----------------------------|-----------------|------|---------------------|--------------------------------------|-------------------------------|-------------------|----------------------|--------------------|
|                    |                                  |                                              |                            | Pee             | seed |                     | sugar content, g/100 cm <sup>3</sup> | acidity, g/dm <sup>3</sup> ." | in the grapevine  | in productive shoots |                    |
| Alinja             | 420,01±2,62                      | 140,4                                        | 2600,0±8,1                 | 10,5            | 4,5  | 88,0                | 20,2                                 | 5,4                           | 0,67              | 1,1                  | 10,0               |
| Nakhchivan Muscati | 354,0±10,36                      | 59,4                                         | 360,0±12,0                 | 14,3            | 4,0  | 77,0                | 20,1                                 | 6,7                           | 0,76              | 1,4                  | 13,0               |
| Nargizi            | 750,6±10,12                      | 20,4                                         | 340,0±16,0                 | 12,2            | 3,6  | 82,0                | 18,0                                 | 6,1                           | 0,75              | 1,60                 | 15,0               |

**Productivity variance analysis.** The results of the variance analysis of the productivity of the grapevine varieties Alinja, Nargizi, and Nakhchivan Muscati for the years 2022-2025 have been calculated. The results obtained are presented below (table 3).

**Table 3.**  
Results of variance analysis of productivity.

| Varieties         | Yield per vine, kg |      |      | ΣV       | X     |
|-------------------|--------------------|------|------|----------|-------|
|                   | I                  | II   | III  |          |       |
| <b>Alinja</b>     | 10, 2              | 9,6  | 10,5 | 30,3     | 9,8   |
| <b>Nargizi</b>    | 13,5               | 15,1 | 16,2 | 44,8     | 10,6  |
| Nakhchivan Muscat | 13,2               | 12,7 | 11,2 | 37,1     | 8,9   |
| Σ P               | 36,9               | 37,4 | 37,9 | Σx=112,2 | X=9.8 |

**Economic efficiency of the variety.** During the course of the study, key economic indicators were analyzed, including production costs per hectare, yield per hectare (centners), selling price per centner, total sales revenue, net income (in manats), and profitability (%). The corresponding results are presented below. The analysis demonstrated that the highest profitability levels were observed in the following grapevine cultivars: *Alinja* — 319.28%, *Nakhchivan Muscat* — 230.00%, and *Nargizi* — 360.88% (Table 4).

**Table 4.**  
Economic efficiency of grape varieties.

| Grape varieties   | Production costs per hectare (manat) | Yield per hectare (centners) | Selling price per centner (manat) | Total revenue from sales (manat) | Net income (manat) | Profitability (%) |
|-------------------|--------------------------------------|------------------------------|-----------------------------------|----------------------------------|--------------------|-------------------|
| <b>Alinja</b>     | 5364,31                              | 321,60                       | 70,0                              | 22491,70                         | 17127,39           | 319,28            |
| Nakhchivan Muscat | 5400,45                              | 254,60                       | 70,0                              | 17822,00                         | 12421,55           | 230,00            |
| <b>Nargizi</b>    | 5490,45                              | 321,60                       | 80,0                              | 25744,00                         | 20253,55           | 360,88            |

**Note:** 1 US dollar = 1.70 manat (AZN)

**Ampelo-descriptor characteristics.** The ampelo-descriptive description of grape varieties was carried out according to the appropriate method of the International Organization of Vine and Wine (OIV) (table 5).

**Table 5.**  
A brief ampelographic description of new grape varieties.

| The morphological signs |                                                            | Appearance of the heritable signs |                    |         |                      |        |                      |
|-------------------------|------------------------------------------------------------|-----------------------------------|--------------------|---------|----------------------|--------|----------------------|
|                         |                                                            | Nakhchivan Muscati                |                    | Nargizi |                      | Alinja |                      |
| Chiper                  | Th enames                                                  | Code                              | Form               | Code    | Form                 | Code   | Form                 |
| 001                     | Form (openness) tops of young shoots                       | 1                                 | Closed             | 1       | Closed               | 1      | Closed               |
| 003                     | Intensity of anthocyanin coloring tops                     | 1                                 | missingr very weak | 1       | missing or very weak | 1      | missing or very weak |
| 004                     | Young shoot: intensity of white prostrate hairs of the tip | 1                                 | none or very low   | 1       | none or very low     | 1      | none or very low     |
| 010                     | Color of ventral side of nodes of shoot                    | 1                                 | green              | 1       | green                | 1      | green                |
| 012                     | Density of erect hairs on internodes of shoot              | 1                                 | none or very low   | 1       | none or very low     | 3      | low                  |
| 017                     | Tendrill length                                            | 1                                 | very short         | 7       | very short           | 7      | long about           |



|     |                                                                                                     |   |                                                       |   |                                                       |   |                                                       |
|-----|-----------------------------------------------------------------------------------------------------|---|-------------------------------------------------------|---|-------------------------------------------------------|---|-------------------------------------------------------|
|     |                                                                                                     |   |                                                       |   |                                                       |   | 25 sm                                                 |
| 053 | Density of prostrate hairs between main veins on lower side of blade (4th leaf) of young leaf       | 1 | none or very low                                      | 1 | none or very low                                      | 3 | low                                                   |
| 065 | Size of blade of mature leaf                                                                        | 5 | medium                                                | 5 | medium                                                | 7 | large                                                 |
| 067 | Shape of blade of mature leaf                                                                       | 7 | circular                                              | 7 | circular                                              | 7 | circular                                              |
| 068 | Number of lobes of mature leaf                                                                      | 3 | seven                                                 | 5 | five                                                  | 5 | circular                                              |
| 069 | Color of the upper side of the blade of a mature leaf                                               | 5 | medium green                                          | 5 | medium green                                          | 7 | dark green                                            |
| 074 | Profile of blade in cross section of nature leaf                                                    | 3 | Furrowed                                              | 3 | only at the petiolar point                            | 3 | furrowed                                              |
| 075 | Blistering of the upper side of the blade of a mature leaf                                          | 3 | weak                                                  | 3 | Weak                                                  | 3 | weak                                                  |
| 076 | Shape of teeth of mature leaf                                                                       | 3 | both sides straight                                   | 3 | both sides straight                                   | 3 | both sides straight                                   |
| 079 | Degree of opening overlapping of petiole sinus of mature lea                                        | 3 | open                                                  | 3 | open                                                  | 3 | open                                                  |
| 082 | Degree of opening overlapping of upper lateral sinus of mature leaf                                 | 3 | closed                                                | 3 | closed                                                | 3 | closed                                                |
| 084 | Density of prostrate hairs between the main veins on the lower side of the blade of the mature leaf | 1 | none or very low                                      | 1 | none or very low                                      | 1 | none or very low                                      |
| 085 | Density of erect hairs on the main veins on the lower side of the blade of a mature leaf            | 1 | none or very low                                      | 1 | none or very low                                      | 1 | none or very low                                      |
| 087 | The density of bristly omission between the main veins on the lower surface of the leaf             | 1 | missing or very weak (very rare)                      | 1 | missing or very weak (very rare)                      | 1 | missing or very weak (very rare)                      |
| 093 | Length of petiole compared to length of middle vein of mature leaf                                  | 5 | equal                                                 | 5 | equal                                                 | 5 | equal                                                 |
| 094 | Depth of upper lateral sinuses of mature leaf                                                       | 5 | medium                                                | 5 | medium                                                | 1 | absent or very shallow                                |
| 103 | Depth of upper lateral sinuses of mature leaf                                                       | 2 | brownish                                              | 2 | brownish                                              | 3 | reddish-violet                                        |
| 151 | Sexual organs of Flower                                                                             | 3 | fully developed stamens and fully developed gynoecium | 3 | fully developed stamens and fully developed gynoecium | 3 | fully developed stamens and fully developed gynoecium |
| 153 | Number of Inflorescences per shoot                                                                  | 2 | 1.1 to 2 inflorescence                                | 2 | 1.1 to 2 inflorescence                                | 2 | 1.1 to 2 inflorescence                                |
| 202 | Length of bunch (peduncle excluded)                                                                 | 7 | long                                                  | 9 | very long                                             | 9 | very long                                             |
| 204 | Density of Bunch                                                                                    | 5 | Medium                                                | 9 | very dense                                            | 9 | very dense                                            |
| 206 | Bunch leg length (length of primary bunch stem)                                                     | 5 | medium, about 7 sm                                    | 7 | long, about 9 sm                                      | 5 | medium, about 7 sm                                    |
| 207 | Wooding of the cluster petiole                                                                      | 5 | medium (up to half of the cluster                     | 7 | strong (most of the cluster petiole)                  | 7 | strong (most of the cluster petiole)                  |

|     |                                                                                 |   | petiole)                                    |   |                                             |   |                                             |
|-----|---------------------------------------------------------------------------------|---|---------------------------------------------|---|---------------------------------------------|---|---------------------------------------------|
| 220 | Length of berry                                                                 | 7 | long (about 19-23 mm)                       | 7 | long (about 19-23 mm)                       | 5 | medium (about 14-18 mm)                     |
| 223 | Shape of berry                                                                  | 8 | obovoid                                     | 2 | globose                                     | 2 | globose                                     |
| 225 | Color of berry skin                                                             | 1 | green yellow                                | 1 | green yellow                                | 5 | dark red violet                             |
| 228 | Thickness of berry skin                                                         | 5 | medium                                      | 5 | medium                                      | 7 | thick                                       |
| 231 | Intensity of the anthocyanin coloration of berry flesh                          | 1 | none or very low                            | 1 | none or very low                            | 7 | high                                        |
| 232 | Juiciness of berry flesh                                                        | 2 | medium juicy                                | 1 | slightly juicy                              | 2 | medium juicy                                |
| 235 | Firmness of berry flesh                                                         | 3 | small, up to 65%                            | 2 | slightly                                    | 2 | slightly firm                               |
| 236 | Particularity of flavor of berry                                                | 2 | muckat                                      | 1 | none                                        | 1 | none                                        |
| 238 | Length of pedicel of berry                                                      | 9 | very long (about 16 mm and more)            | 5 | medium (about 8-12 mm)                      | 3 | short (about 4-8 mm)                        |
| 240 | Ease of detachment of berry from pedicel                                        | 3 | Difficult                                   | 3 | very easy                                   | 3 | difficult                                   |
| 241 | Formation of seeds of berry                                                     | 3 | Complete                                    | 3 | Complete                                    | 3 | Complete                                    |
| 243 | Weight of seeds of berry                                                        | 3 | low (about 10-25 mg)                        | 3 | low (about 10-25 mg)                        | 3 | low (about 10-25 mg)                        |
| 301 | Time of blooming of kidneys                                                     | 3 | early chardonnay                            | 3 | early chardonnay                            | 3 | early chardonnay                            |
| 303 | The beginning of the maturing of berries                                        | 5 | Average                                     | 7 | late                                        | 7 | late                                        |
| 304 | Physiological maturity of berries                                               | 5 | Average                                     | 9 | very late                                   | 7 | late                                        |
| 351 | Vigor of shoot growth                                                           | 5 | medium (about 1,3-2,0 m)                    | 5 | medium (about 1.3-2.0 m)                    | 7 | strong (about 2.1-3.0 m)                    |
| 452 | Degree of leaf's resistance to ( <i>Plasmopara viticola</i> Berl.) plasmop      | 7 | High                                        | 5 | average                                     | 7 | high                                        |
| 453 | Degree of cluster's resistance to ( <i>Plasmopara viticola</i> Berl) plasmopara | 7 | High                                        | 5 | average                                     | 7 | high                                        |
| 455 | Steadiness degree to an ( <i>Ucinula necator</i> Burill.) oidium of leaves      | 7 | High                                        | 5 | average                                     | 7 | high                                        |
| 456 | Steadiness degree to an ( <i>Ucinula necator</i> Burill.) oidium of bunch       | 7 | High                                        | 5 | average                                     | 7 | high                                        |
| 458 | Steadiness degree to grey rot ( <i>Botrytis cinerea</i> Pers.) of leaves        | 5 | Average                                     | 3 | low                                         | 7 | high                                        |
| 459 | Degree of cluster's resistance to <i>Botrytis cinerea</i> Pers.) botrytis       | 5 | Average                                     | 3 | low                                         | 7 | High                                        |
| 504 | Productivity, t/ha                                                              | 9 | very high (about 17 s/ha and more)          | 9 | very high (about 17 s/ha and more)          | 7 | high (about 13-16 t/ha)                     |
| 505 | Sugar content of must, g/100 sm <sup>3</sup>                                    | 5 | Medium (about 18-20 g/100 sm <sup>3</sup> ) | 5 | Medium (about 18-20 g/100 sm <sup>3</sup> ) | 5 | Medium (about 18-20 g/100 sm <sup>3</sup> ) |
| 506 | Acid content of must, g/dm <sup>3</sup>                                         | 3 | low (about 4-6 g/dm <sup>3</sup> )          | 3 | low (about 4-6 g/dm <sup>3</sup> )          | 3 | low (about 4-6 g/dm <sup>3</sup> )          |

|     |                                           |   |                              |   |                                             |   |                                             |
|-----|-------------------------------------------|---|------------------------------|---|---------------------------------------------|---|---------------------------------------------|
| 604 | Degree of maturity of shoots, %           | 9 | very high (more than 96.0%)  | 9 | very high (more than 96.0%).                | 9 | very high (more than 96.0%)                 |
| 629 | Vegetation period                         | 6 | late ripening (161-170 days) | 7 | Very late ripening (v.p. 171 days and more) | 7 | very late ripening (v.p. 171 days and more) |
| 630 | Oculus germination level (%)              | 9 | very high                    | 7 | high                                        | 9 | very high                                   |
| 631 | Frost steadiness of a grade               | 5 | Average                      | 5 | average                                     | 7 | high                                        |
| 632 | Steadiness of a grade at high temperature | 5 | Average                      | 5 | average                                     | 7 | high                                        |

Below is a brief ampelographic description of the new grape varieties.

**NEW GRAPE VARIETY NAKHCHIVAN MUSCATI.** The Nakhchivan Muscat grape variety was selected in 1985 from the germinating seeds of the Uzbek Muscat variety, which were kept in a 0.3% colchicine solution for 24 hours. The new grape variety received a patent and author certificate in 2020 (No. 00288, author: Prof. V.M. Kuliyeu).

**Ampelographic Characteristics:** The grapevines exhibit vigorous growth, with approximately 75% of new shoots being productive. The leaf blade is large, measuring 17.0 cm in length and 17.0 cm in width, and is broadly oval in shape. The leaf area is 180.82 cm<sup>2</sup>, with a leaf index of 0.98. The leaf surface is smooth and light green, with margins oriented upwards. The flowers are hermaphroditic. Grape clusters vary in weight from 240 to 560 g, with lengths of 18.0–22.0 cm and widths of 11.0–14.5 cm. The berries are light yellowish-white or blue-white, large in size (23.0–25.0 mm in length and 2.0–2.5 mm in width), and contain 3–4 seeds per berry. The weight of 100 seeds is 5.2 g.



**Agrobiological and Technological Characteristics:** The annual growing period of the cultivar is 150–160 days, with a cumulative active temperature requirement of 3350–3400°C to reach full physiological maturity. This variety is highly productive, yielding 12–15 kg per vine. The average cluster weight is 354.0 g.

The berries are juicy and sweet, with a juice content of 75.0–78.0%. Sugar concentration ranges from 18.0 to 21.0 g/100 cm<sup>3</sup>, while acidity ranges between 5.0 and 7.5 g/dm<sup>3</sup>. The yield coefficient per vine is 0.76, whereas the coefficient for productive shoots is 1.4.

The cultivar demonstrates strong resistance to fungal pathogens, including downy mildew (*Plasmopara viticola*), rated 1–2 points, and powdery mildew (*Uncinula necator*), rated 0–1 point. Fully developed shoots are capable of withstanding temperatures as low as –20°C. In autumn, the wax coating on one-year-old shoots reaches 90–93%, providing additional protection against environmental stress.

This grape variety is intended to be consumed fresh.

**NEW GRAPE VARIETY—NARGIZI.** The new grape variety was developed in 1980 from the Uzbek Muscat (*Nimranq* × *Alexander Muscat*) cultivar, with plants selected from seeds treated for 48 hours in a 0.3% colchicine solution. The grape clusters are notably large, with weights ranging from 800 to 1200 g. The vines exhibit vigorous growth. Based on botanical features and morphological characteristics, the variety is classified within the ecological-geographical subgroup of Eastern grape cultivars (*Convar. orientalis* subconvar. *caspica* Negr.). In 2020, this cultivar was



officially granted a patent and copyright certificate (No. 00291; author: Prof. V.M. Kuliyeve, 2020).

**Ampelographic Characteristics.** The grapevine develops vigorously. 42-60% of the growing shoots are productive. The length of one-year-old shoots is 1.5 to 2.0 meters. The leaves are medium-sized (diameter 14.5–16.5 cm) and are oval. The surface is light green, with edges directed upward, and they are five-lobed. The flowers are hermaphroditic. The fertility of the anthers is 96.0–98.0%.

**Agrobiological characteristics.** The grape clusters measure 16.0–21.0 cm in length and 10.0–12.0 cm in width, with berries densely arranged within the clusters. The berries are large, spherical, and light blue in color, with diameters ranging from 22.0 to 24.0 mm and medium-thick skins. Each berry contains 3–4 seeds, which are oval, light brown, and measure 5.4 mm in length and 3.2 mm in width. The mass of 100 seeds is 7.65–7.72 g.

This is a late-ripening cultivar, with a vegetative period of 170–175 days and a cumulative positive temperature requirement of 4380–4400°C for full physiological maturity. The variety is highly productive, with a yield coefficient of 0.65 per vine and 1.4 per bearing shoot. The grape juice contains 17.0–18.5 g/100 cm<sup>3</sup> of sugar and 6.0–7.0 g/dm<sup>3</sup> of acidity. Each vine produces 13.0–15.0 kg of fruit, corresponding to an average yield of 400.0–450.0 centners per hectare.

The cultivar exhibits strong resistance to fungal pathogens, with downy mildew (*Plasmopara viticola*) rated 1–2 points and powdery mildew (*Uncinula necator*) rated 0–1 point. Fully developed shoots tolerate temperatures as low as –20°C. In autumn, the wax coating on one-year-old shoots reaches 89.1–90%, providing additional protection against environmental stress.

The product is consumed both fresh and used for wine production.

**NEW GRAPE VARIETY – ALİNJA.** This is a technical grape variety obtained through selection. The seeds of the parent grape variety were germinated and kept in a 0.5% aqueous solution of colchicine for 48 hours. Afterward, the new plants obtained were selected from them.

In terms of morphological features and biological characteristics, it belongs to the ecological-geographical group of Eastern wine grape varieties (Convar orientalis subconvar caspica Negr.). A patent and an author's certificate were granted to the new variety in 2020 (No. 00284, author Prof. V.M. Guliyeve, 2020). It is widespread in the territory of the Republic of Azerbaijan.



**Ampelographic Description.** The grapevine shoots are strong and bushy, with 60.8% of shoots being productive. One-year-old shoots exhibit vigorous growth, with branch lengths exceeding 160.5 cm. The leaves are predominantly round, occasionally slightly oval, measuring 17.0–19.0 cm in diameter, with an area of 174.51 cm<sup>2</sup>. The leaf surface is smooth, relatively dark green, and five-lobed, with margins oriented upward. The flowers are hermaphroditic, and pollen viability is high at 96.0%. Grape clusters are long and cylindrical, with tightly packed berries. Cluster length reaches 28.0 cm, and width is 14.0 cm, with cluster weights ranging from 400–520 g, and in some cases reaching 650–800 g. The berries have diameters of 1.8–2.0 cm, with dark red to black coloration and a light powdery wax coating. The berries are juicy, with thick skins and colorless flesh. Each berry contains 2–3 seeds.

**Agrobiological Characteristics.** This cultivar is a medium-late ripening grape variety, with clusters reaching full maturity at the end of September to early October. The vegetative period lasts 155–165 days, requiring a cumulative active temperature of 3650–3660°C for complete physiological maturity. The productivity coefficient is 0.67 per vine and 1.1 per fruitful shoot. Each vine yields 10.0–12.0 kg of grapes, indicating high productivity. At technical maturity, the grape juice contains 18.0–20.0 g/100 cm<sup>3</sup> of sugar and 5.0–6.0 g/dm<sup>3</sup> of acidity.

The variety exhibits strong winter hardiness, with shoot survival reaching 89.0% (rated 4 points), and demonstrates high resistance to fungal diseases. Downy mildew (*Plasmopara viticola*) is rated 1–2 points, powdery mildew (*Uncinula necator*) is rated 0–1 point, and gray rot incidence is 2.5%

with an infection intensity of 5.7%. Fully developed shoots can tolerate frost down to  $-20^{\circ}\text{C}$ . In autumn, the wax coating on one-year-old shoots reaches 89.1–90%, providing additional protection against environmental stress.

This grape variety is primarily used in winemaking and is well-suited for long-distance transportation due to its structural integrity and durability.

### Conclusion

The following results were obtained from the study:

- The ecological characteristics of the regions where the new grape varieties are cultivated were investigated;
- Key phenological stages, biomorphological traits, and agrobiological characteristics of the newly developed grape cultivars were assessed;
- The genomic structure of the new cultivars was analyzed, confirming that the somatic cells possess a diploid chromosome number ( $2n = 38$ );
- Comprehensive ampelographic descriptions of the new grape cultivars were conducted in accordance with OIV standards;
- The economic efficiency of the newly developed grape varieties was evaluated;
- The new grape cultivars, *Nakhchivan Muscat*, *Nargizi*, and *Alinja*, developed through selective breeding, have been patented, registered in the State Register of the Republic of Azerbaijan, and are being introduced into cultivation in the grape-growing regions of the Republic of Azerbaijan.

### References

1. Agayev, Y. M. (2000). *Sposob okrashivaniya khromosom rasteniy* (Avt. svid. No. 812240). *Byulleten' izobreteniy*, 10, 1.
2. Antonenko, M. V., Guguchkina, T. I., Prah, A. V., Kolesnov, A. Y., & Zenina, M. A. (2019). Research of physical and chemical characteristics of grapes from different regions of Krasnodar territory for their use as standards of authenticity of wine production. *Fruit Growing and Viticulture of South Russia*, 55(1), 95–106. <https://doi.org/10.30679/2219-5335-2019-1-55-95-106>
3. Beybulatov, M. R., Buyval, R. A., Tikhomirova, N. A., & Urdenko, N. A. (2018). Otsenka agrobiologicheskikh i khozyaystvennykh priznakov klona sorta vinograda Muskat belyy VCR-3 v usloviyakh Yuzhnogo berega Kryma. *Plodovodstvo i vinogradarstvo Yuga Rossii*, 51(3), 88–97. <https://doi.org/10.30679/2219-5335-2018-3-51-88-97>
4. Beybulatov, M. R., Urdenko, N. A., Tikhomirova, N. A., & Buyval, R. A. (2019). Otsenka potentsiala aborigennykh i mestnykh sortov vinograda dlya upravleniya protsessom formirovaniya urozhaya. *Plodovodstvo i vinogradarstvo Yuga Rossii*, 57(3), 60–71. <https://doi.org/10.30679/2219-5335-2019-3-57-60-71>
5. International Organisation of Vine and Wine (OIV). (2001). *Codes of character descriptors for varieties and species of Vitis*. <http://www.oiv.int>
6. Ilnitskaya, E. T., Sheludko, O. N., & Makarkina, M. V. (2022). Molecular genetics and chemical-technological characteristics of the Dmitry grape variety. *Magarach. Viticulture and Winemaking*, 24(3), 235–241. <https://doi.org/10.34919/IM.2022.24.3.006>
7. Il'nitskaya, E. T., Tokmakov, S. V., Suprun, I. I., Naumova, L. G., & Ganich, V. A. (2016). Izucheniye geneticheskogo skhodstva donskikh aborigennykh sortov vinograda s primeneniym SSR-analiza i po osnovnym ampelograficheskim priznakam lista. *Sel'skokhozyaystvennaya biologiya*, 51(1), 60–67. <https://doi.org/10.15389/agrobiology.2016.1.60>
8. Kazakhmedov, R. E. (2024). Osnovnyye itogi nauchno-issledovatel'skoy raboty Dagestanskoy selektsionnoy opytnoy stantsii vinogradarstva i ovoshchevodstva za 2023 god. *Plodovodstvo i*

- vinogradarstvo Yuga Rossii*, 85(1), 74–91. <https://doi.org/10.30679/2219-5335-2024-1-85-74-91>
9. Kuliyeu, V. M. (2011). Indutsirovannye autotetraploidnyye mutanty vinograda. *Tsitologiya i genetika*, 45(3), 35–42. <https://doi.org/10.3103/S0095452711030054>
  10. Musayev, M. K., Akparov, Z. I., & Kuliyeu, V. M. (2015). Results of the study of genetic resources of grapes in Azerbaijan. *Acta Horticulturae*, 1074, 15–22. <https://doi.org/10.17660/ActaHortic.1074.1>
  11. Orudzhov, T. A., Mustafayev, R. I., Veliyeu, S. Y., & Alekperov, A. O. (2007). *Rekomendatsii po uchotu i kal'kulyatsii proizvodstvennykh zatrat na sel'skokhozyaystvennuyu produkciiyu*. Baku.
  12. Sudnikova, V. P., Zeleneva, Y. V., Gusev, I. V., Kon'kova, E. A., & Kovalenko, N. M. (2025). Novyye istochniki i donory pshenitsy s vysokim potentsialom kompleksnoy ustoychivosti k osobo opasnym boleznyam. *Sel'skokhozyaystvennaya biologiya*, 60(1), 3–20. <https://doi.org/10.15389/agrobiology.1.3>
  13. Sundryeva, M. A., Mishko, A. E., & Seget, O. L. (2023). Scion-rootstock combinations of grapes for increasing adaptation potential in the summer period in the North-Western Ciscaucasia. *Fruit Growing and Viticulture of South Russia*, 80(2), 170–179. <https://doi.org/10.30679/2219-5335-2023-2-80-170-179>
  14. Troshin, L. P., Kravchenko, R. V., Matuzok, N. V., & Kufanova, R. N. (2021). Sovershenstvovaniye sortimenta dlya optimizatsii tekhnologii proizvodstva vinograda v Anapo-Tamanskoy zone. *Magarach. Vinogradarstvo i vinodeliye*, 23(2), 120–124. <https://doi.org/10.35547/IM.2021.23.2.003>
  15. Yang, D., Duan, S., Xia, Q., & Kuliyeu, V. (2023). Dual domestications and origin of traits in grapevine evolution. *Science*, 379(6635), 892–947.

Received: 15.11.2025

Accepted: 09.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/242-250>

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## **Residivləşən respirator infeksiyalar keçirən uşaqlarda respirator xəstəliklərin neyroimmun mexanizmləri**

### **Xülasə**

Residivləşən respirator infeksiyalar (RRİ) keçirən uşaqlarda neyropeptid-P substansiyasının həm immun sistemlə əlaqəsini, həm də iltihabi prosesdə əhəmiyyətini öyrənməyi qarşımıza məqsəd qoyduq. Bu məqsədlə 340 RRİ keçirən uşaq müayinə etdik. Müqayisə qrupu kimi 125 nadir xəstələnən uşaq (NXU) və analogi yaşda olan 120 praktik sağlam uşaq da müayinəyə cəlb olunmuşdur. Neyropeptid-P substansiyası ABŞ-da yerləşən PENINSULA LABORATORİES INC. firmasından əldə edilən reaktivlərlə «Stat Fax» analizatorlarla, immunferment metodu ilə təyin edilmişdir. İmmunoloji göstəricilər – CD3, CD4, CD8, CD19 hüceyrələrinin miqdarı axarlı sitometriya metodu, zərdab immunqlobulinləri A, G, M-in konsentrasiyası - G. Manchininin radial immundiffuziya metodu, qan zərdabında IgE-nin səviyyəsi immunferment analiz (İFA) metodu ilə təyin edilmişdir. IL-1β, IL-2, IL-6, IL-8 və ŞNF-α sitokinlərin səviyyəsi «İMMULİTE» avtomatik analizatoru vasitəsilə immunhemilüminissent metodu (ABŞ), IFN-γ-nın səviyyəsi isə immunferment analiz metodu ilə yoxlanılmışdır.



Apardığımız tədqiqat nəticəsində aşkar edildi ki, RRI keçirən uşaqlarda respirator xəstəliklərin patogenezinə immun sistemlə yanaşı neuropeptid P substansiyası da mühüm əhəmiyyət kəsb edir. Araşdırmamız nəticəsində məlum olmuşdur ki, bu sistemlər arasında sıx korrelyasion əlaqə mövcuddur. RRI qrupunda respirator xəstəliklərin klinik remissiya dövründə immun sistemin, o cümlədən sitokin statusun və P substansiyasının göstəricilərinin normallaşmaması bu uşaqlarda infeksiya agentin persistə etməsini, iltihab prosesinin xəstəliyin klinik remissiya dövründə də davam etməsini göstərir.

**Açar sözlər:** *residivləşən respirator infeksiyalar, uşaqlar, neuropeptid- P substansiyası, immun sistem, sitokin, iltihab*

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## Neuroimmune Mechanisms of Respiratory Diseases in Children With Recurrent Respiratory Infections

### Abstract

We aimed to study both the relationship of neuropeptide-P substance with the immune system and its importance in the inflammatory process in children with recurrent respiratory infections (RRI). For this purpose, we examined 340 children with RRI. As a comparison group, 125 children with rare diseases and 120 practically healthy children of similar age were included in the examination. The levels of CD3, CD4, CD8, CD19 cells was determined by the flow cytometry method, the concentration of serum immunoglobulins A, G, M - by G. Mancini's radial immunodiffusion method, the level of IgE was determined by the enzyme immunoassay (IFA) method. The level of IL-1 $\beta$ , IL-2, IL-6, IL-8 and SNF- $\alpha$  cytokines was checked using the "IMMULITE" automatic analyzer using



the immunochemiluminescent method (USA), and the level of IFN- $\gamma$  was checked using the enzyme immunoassay method.

As a result of the conducted research, it was found that neuropeptide substance P, along with the immune system, plays an important role in the pathogenesis of respiratory diseases in children with RRI. As a result of the research, it was found that there is a close correlation between these systems. The non-normalization of the immune system, including cytokine status, substance P indicators during the clinical remission of respiratory diseases in the RRI group indicates the persistence of the infectious agent in these children, and the continuation of the inflammatory process during the clinical remission of the disease.

**Keywords:** recurrent respiratory infections, children, neuropeptide-P substance, immune system, cytokine, inflammation

## Giriş

Tibbin infeksiyon xəstəliklərin müalicə və profilaktikası sahəsində əldə etdiyi nailiyyətlərə baxmayaraq, adaptasiya səviyyəsinin gərginliyi və zəifliyi olan uşaqların sayı durmadan artır. Bu uşaqlar əsasən tənəffüs sistemi xəstəlikləri ilə tez-tez xəstələnirlər. Respirator xəstəliklərlə təkrar xəstələnmə bir çox sistemlərin fəaliyyətinin pozulmasına, fon xəstəliklərinin inkişafına, fiziki və sinir-psixi inkişafın ləngiməsinə, sosial adaptasiyanın pozulmasına səbəb olur. Belə uşaqlar “Tez-tez xəstələnən uşaqlar” və ya “Residivləşən respirator infeksiyalar” (RRİ) keçirən uşaqlar adlanırlar. Bu uşaqlarda xəstəliklər ağırlaşmağa, uzun sürmə və xronikləşməyə meyilli olur və onlar «risk» qrupunu təşkil etməklə, nəinki yalnız tibbi, həm də sosial-iqtisadi problem kimi diqqəti cəlb edirlər. Onu da qeyd etmək istərdik ki, respirator xəstəliklərlə tez-tez xəstələnmədə immun sistemlə yanaşı digər sistemlərin də rol oynadığı güman edilir. Belə ki, immun sistemin digər sistemlərlə qarşılıqlı əlaqəsinə dair ədəbiyyat mənbələrində məlumatlar öz əksini tapır (França, Lotti, 2017).

Bu sistemlər içərisində sinir sistemi mühüm yer tutur. İmmun sistemin sinir sistemi ilə əlaqəsindən bəhs edərkən, ilk növbədə onun neyropeptidlərlə əlaqəsinə toxunmaq lazımdır (Duffy LK, Huber E, Thomas S, et al. 2022). Bu bioloji aktiv maddələr sinir uclarından hasil olaraq bir çox fizioloji və patoloji proseslərdə, o cümlədən immun sistemin fəaliyyətində əhəmiyyətli rol oynayır (Hwang, Lee, Kim, et al., 2021). Tənəffüs sistemi xəstəliklərində də neyroimmun mexanizmlərin rol oynadığı danılmazdır (Azzoni, Perdijk, Harris, Marsland, 2023). Ümumi sayı 60-dan çox olan neyropeptidlər arasında taxikininlər qrupuna daxil olan P substansiyasının residivləşən respirator infeksiyalar (RRİ) keçirən uşaqlarda həm immun sistemlə əlaqəsini, həm də iltihabi prosesdə əhəmiyyətini öyrənməyi qarşımıza məqsəd qoyduq.

**Tədqiqatın material və metodları.** Qarşıya qoyduğumuz məqsədə çatmaq üçün 340 RRİ keçirən uşaq müayinə etdik. Müqayisə qrupu kimi 125 nadir xəstələnən uşaq (NXU) və analoji yaşda olan 120 praktik sağlam uşaq da müayinəyə cəlb olunmuşdur. Həm RRİ, həm də NXU qrupundakı uşaqlarda xronik və irsi xəstəliklər, kobud anadangəlmə qüsurlar, endokrinopatiyalar, mübadilə xəstəlikləri inkar edilmişdir. Eləcə də, bu qruplardakı uşaqlar son 6 ay ərzində heç bir immunkorrektor qəbul etməmişlər. Müayinə olunan uşaqların boyu və çəkisi  $\pm 1\sigma$  aralığında olmuşdur. Neyropeptid – P substansiyası ABŞ-da yerləşən PENİNSULA LABORATORİES INC. firmasından əldə edilən reaktivlərlə «Stat Fax» analizatorlarla, immunferment metodu ilə təyin edilmişdir. İmmunoloji göstəricilər – CD3, CD4, CD8, CD19 hüceyrələrinin miqdarı axarlı sitometriya metodu, zərdab immunqlobulinləri A, G, M-in konsentrasiyası - G. Manchininin radial immundiffuziya metodu, qan zərdabında IgE-nin səviyyəsi immunferment analiz (IFA) metodu ilə təyin edilmişdir. IL-1 $\beta$ , IL-2, IL-6, IL-8 və ŞNF- $\alpha$  sitokinlərin səviyyəsi «İMMULİTE» avtomatik analizatoru vasitəsilə immunhemilüminiscent metodu (ABŞ), IFN- $\gamma$ -nın səviyyəsi isə immunferment analiz metodu ilə yoxlanılmışdır. Nəticələr Statistica 16 proqram təminatından (StatSoft, ABŞ) istifadə edilməklə təhlil edilmişdir. Nəticələrin statistik təhlilinə orta dəyərlərin, standart kənarlaşmanın, minimum və maksimum dəyərlərin hesablanması daxildir. Məlumatlar mütləq rəqəmlər və faizlər şəklində təqdim edilmişdir. Qruplar arasında məlumatları müqayisə etmək üçün

Yates korreksiyası ilə  $\chi^2$  testindən və t-testindən istifadə edilmişdir.  $p \leq 0,05$  olduqda müqayisə edilən göstəricilər arasındakı fərqlər statistik baxımdan etibarlı hesab edilmişdir.

P substansiyasının səviyyəsi həm RRI, həm də NXU qrupuna daxil olan uşaqlarda xəstəliyin kəskin və klinik remissiya dövrlərində yoxlanılmışdır. İmmun və sitokin statusda olduğu kimi, P substansiyasının yoxlanması zamanı da xəstəliklərin nozoloji formaları nəzərə alınmışdır.

**Tədqiqatın nəticələri və onların müzakirəsi.** Aparılan tədqiqatlar göstərmişdir ki, RRI qrupunda xəstəliyin kəskin dövründə P substansiyasının səviyyəsi yüksəlir. Lakin onun səviyyəsi xəstəliyin nozoloji formasından asılı olaraq fərqli olmuşdur (cədvəl 1 və şəkil 1).

Belə ki, fəsadlaşmayan kəskin respirator virus infeksiyaları (KRVİ) zamanı fəsad müşahidə edilməsə də, intoksikasiyanın ağırlığı P substansiyasının səviyyəsinə təsir etmişdir (Cədvəl 1 və şəkil 1).

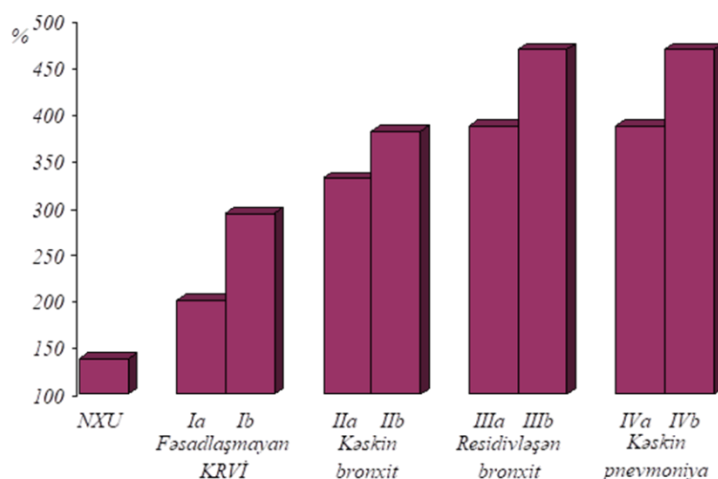
**Cədvəl 1.**  
Müayinə olunan uşaqlarda P substansiyasının səviyyəsi.  
(kəskin dövr)

| Müayinə qrupları     |                             | Substansiya P, pq/ml | P       |
|----------------------|-----------------------------|----------------------|---------|
| Sağlam (n=120)       |                             | 1,61±0,05            |         |
| NXU (n=125)          |                             | 2,21±0,20            | < 0,01  |
| KRVİ                 | Orta ağır (n=20)            | 3,19±0,21            | < 0,001 |
|                      | Ağır (n=35)                 | 4,67±0,32            | < 0,001 |
| Kəskin bronxit       | I qrup (n=30)               | 5,31±0,31            | < 0,001 |
|                      | II qrup (n=44) (obstruktiv) | 6,39±0,28            | < 0,001 |
| Residivləşən bronxit | I qrup (n=78)               | 6,22±0,24            | < 0,001 |
|                      | II qrup (n=97) (obstruktiv) | 7,5±0,19             | < 0,001 |
| Kəskin pnevmoniya    | Fəsadsız (n=12)             | 6,22±0,21            | < 0,001 |
|                      | Fəsadlı (n=24)              | 7,51±0,57            | < 0,001 |

Qeyd: P - nəzarət qrupunun göstəriciləri ilə fərqin statistik dürüstlüyü

Şəkil 1. Müayinə qruplarında xəstəliyin kəskin dövründə

P substansiyasının səviyyəsi (sağlam – 100%).



Əsasən ağır gedişli fəsadlaşmayan KRVİ zamanı P substansiyasının səviyyəsi orta ağır gedişli fəsadlaşmayan KRVİ-dən daha yüksək olmuşdur. Göründüyü kimi, xəstəliyin kəskin dövründə orta ağır gedişli fəsadlaşmayan KRVİ zamanı P substansiyasının səviyyəsi  $3,19 \pm 0,21$  pq/ml olduğu halda, ağır gedişli fəsadlaşmayan KRVİ zamanı  $4,67 \pm 0,32$  pq/ml olmuşdur ( $p < 0,001$ ).

Klinik remissiya zamanı kompleks müalicə fonunda hər iki halda P substansiyasının artmış səviyyəsində müəyyən qədər azalma müşahidə edilsə də, heç bir qrupda tam normallaşma müşahidə edilməmişdir (cədvəl 2 və şəkil 2).

**Cədvəl 2.**

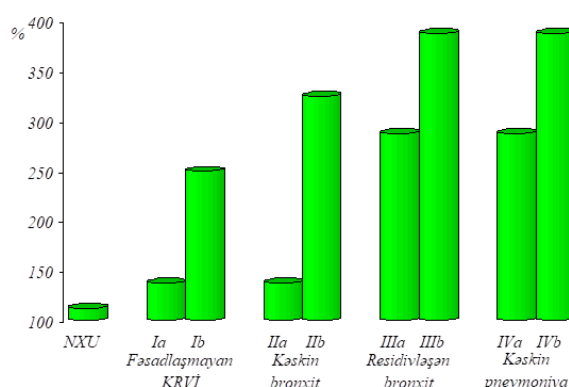
Müayinə olunan uşaqlarda P substansiyasının səviyyəsi.  
(klinik remissiya dövrü)

| Müayinə qrupları     | P substansiyası, pq/ml         | P               |
|----------------------|--------------------------------|-----------------|
| Sağlam (n=120)       | $1,61 \pm 0,05$                |                 |
| NXU (n=125)          | $2,21 \pm 0,20$                | $< 0,01$        |
| KRVİ                 | Orta ağır(n=20)                | $2,22 \pm 0,19$ |
|                      | Ağır (n=35)                    | $4,18 \pm 0,17$ |
| Kəskin bronxit       | I qrup (n=30)                  | $2,23 \pm 0,22$ |
|                      | II qrup (n=44)<br>(obstruktiv) | $5,78 \pm 0,23$ |
| Residivləşən bronxit | I qrup (n=78)                  | $4,61 \pm 0,21$ |
|                      | II qrup (n=97)<br>(obstruktiv) | $6,22 \pm 0,14$ |
| Kəskin pnevmoniya    | Fəsadsız (n=12)                | $4,56 \pm 0,28$ |
|                      | Fəsadlı (n=24)                 | $6,21 \pm 0,31$ |

Qeyd: P - nəzarət qrupunun göstəriciləri ilə fərqi statistik dürüstlüyü

Lakin orta ağır gedişli fəsadlaşmayan KRVİ-də klinik remissiya zamanı P substansiyasının səviyyəsi NXU-ya yaxınlaşsa da ( $2,22 \pm 0,19$  pq/ml,  $p < 0,01$ ), ağır gedişli fəsadlaşmayan KRVİ-də adı çəkilən neuropeptidin səviyyəsi bir qədər yüksək olmuşdur ( $4,18 \pm 0,17$  pq/ml;  $p < 0,001$ ). Görünür ki, hər halda xəstəliyin gedişi, intoksikasiyanın ağırlığı P substansiyasının səviyyəsinə təsir etmişdir.

**Şəkil. 2.** Müayinə qruplarında xəstəliyin remissiya dövründə Substansiya P-nin səviyyəsi (sağlam – 100%).



Kəskin bronxitli TXU zamanı da müxtəlif nəticələr alınmışdır. Göründüyü kimi, həm sadə, həm də obstruktiv bronxitli RRİ zamanı xəstəliyin kəskin dövründə P substansiyasının səviyyəsi artmış olur (kəskin sadə bronxit və kəskin obstruktiv bronxitdə müvafiq olaraq  $5,31 \pm 0,31$  pq/ml və  $6,39 \pm 0,28$  pq/ml olmuşdur ( $p < 0,001$ ). Xəstəliyin klinik remissiya dövründə hər iki halda P substansiyasının səviyyəsində azalma nəzərə çarpmışdır, lakin bu azalma kəskin sadə bronxitdə daha çox müşahidə edilmişdir, demək olar ki, NXU-ya yaxın olmuşdur ( $2,23 \pm 0,22$  pq/ml;  $p < 0,01$ ). Obstruksiya ilə müşayiət olunan kəskin bronxit zamanı klinik remissiya zamanı da müşahidə etdiyimiz uşaqların P substansiyasının səviyyəsində əhəmiyyətli azalma nəzərə çarpmamışdır.

Residivləşən bronxitli RRİ zamanı da eyni mənzərə alınmışdır. Göründüyü kimi, qeyri-obstruktiv residivləşən bronxit zamanı xəstəliyin kəskin dövründə P substansiyasının səviyyəsi  $6,22 \pm 0,24$  pq/ml, klinik remissiya zamanı  $4,61 \pm 0,21$  pq/ml olduğu halda; ( $p < 0,001$ ), obstruktiv residivləşən bronxit zamanı xəstəliyin kəskin və klinik remissiya zamanı P substansiyasını səviyyəsi müvafiq olaraq  $7,5 \pm 0,19$  pq/ml və  $6,22 \pm 0,14$  pq/ml ( $p < 0,001$ ) olmuşdur.

Göründüyü kimi, residivləşən bronxit zamanı P substansiyasının səviyyəsi kəskin bronxitdən yüksək olmuşdur. Amma residivləşən bronxitin də obstruktiv forması zamanı artım daha çox müşahidə edilmiş və klinik remissiya zamanı o qədər də azalma qeyd olunmamışdır.

RRİ qrupuna daxil olan kəskin pnevmoniyalı uşaqların qan zərdabında P substansiyasının səviyyəsi göstərilmişdir. Xəstəliyin kəskin dövründə P substansiyasının səviyyəsi fəsadsız gediş zamanı  $6,22 \pm 0,21$  pq/ml, klinik remissiya zamanı  $4,56 \pm 0,28$  pq/ml olduğu halda ( $p < 0,001$ ), kəskin pnevmoniyanın fəsadlı gedişi zamanı xəstəliyin kəskin və klinik remissiya zamanı P substansiyasını səviyyəsi müvafiq olaraq  $7,51 \pm 0,57$  pq/ml və  $6,21 \pm 0,31$  pq/ml ( $p < 0,001$ ) olmuşdur.

Göründüyü kimi, xəstəliyin fəsadlı gedişi zamanı P substansiyasının artımı fəsadsız gedişdən daha qabarıq olmuş, klinik remissiya zamanı da əhəmiyyətli azalma qeyd olunmamışdır.

Bütün bunlardan belə nəticə çıxarmaq olar ki, RRİ zamanı tənəffüs sisteminin xəstəlikləri iltihabi proses olduğu üçün onların hamısında iltihabda mühüm əhəmiyyət kəsb edən mediator P substansiyasının səviyyəsi yüksəlmiş olur. Lakin bu yüksəlmə xəstəliyin ağırlığından, fəsadların olub-olmamasından, residivləşmədən və s. amillərdən bilavasitə asılı olmuşdur.

Onu da qeyd etmək lazımdır ki, aldığımız nəticələr bir daha sübut edir ki, xəstəliyin klinik remissiya zamanı da P substansiyasının yüksək səviyyəsinin saxlanması RRİ zamanı iltihabın davam etməsini, infeksiya amilin persistə etməsini göstərir.

RRİ qrupunda respirator xəstəliklər zamanı xəstəliyin kəskin dövründə immun sistemdə, o cümlədən sitokin statusda da dəyişikliklər baş verir. Bu dəyişikliklər obstruksiya ilə müşayiət olunan bronxitlər, xüsusilə residivləşən obstruktiv bronxit və kəskin pnevmoniyanın fəsadlaşmış gedişi zamanı daha qabarıq nəzərə çarpmışdır. Bu zaman IL-1 $\beta$ , ŞNF- $\alpha$ , IL-6 və IL-8 kimi iltihab sitokinlərinin artması, hüceyrə immunitetinin əsas göstəricilərindən olan IL-2 və IFN- $\gamma$ -nın kəskin azalması müşahidə edilir. Bu göstəricilər içərisində IL-1 $\beta$  və IFN- $\gamma$  xüsusilə fərqlənmişdir (Cədvəl 3). Respirator xəstəliklər zamanı xəstəliyin kəskin dövründə RRİ qrupunda hüceyrə immuniteti göstəricilərinin 50%-ədək azalması (əsasən CD3, CD4-hüceyrələrin, immunrequlyator əmsalin), humoral immunitet göstəricilərinin disbalansı müşahidə edilmişdir.

### Cədvəl 3.

Müayinə olunan uşaqların immun göstəriciləri  $M \pm m$  ( $P \leq 0,005$ ).

| Göstəricilər          | RRİ<br>Kəskin dövr<br>(n=340) | RRİ<br>Klinik remissiya<br>dövrü<br>(n=340) | NXU<br>Kəskin<br>dövr (n=125) | NXU<br>Klinik remissiya<br>dövrü<br>(n=125) | Praktik sağlam<br>uşaqlar<br>(n=120) |
|-----------------------|-------------------------------|---------------------------------------------|-------------------------------|---------------------------------------------|--------------------------------------|
| IL-1 $\beta$ , pq/ml  | 178,3 $\pm$ 11,8              | 119,2 $\pm$ 10,4                            | 80,2 $\pm$ 7,3                | 52,5 $\pm$ 9,8                              | 41,5 $\pm$ 7,4                       |
| IFN- $\gamma$ , pq/ml | 45,5 $\pm$ 10,2               | 47,2 $\pm$ 9,8                              | 69,2 $\pm$ 6,8                | 79,7 $\pm$ 7,2                              | 84,5 $\pm$ 11,4                      |
| CD3 %                 | 38,1 $\pm$ 10,8               | 39,8 $\pm$ 12,5                             | 44,0 $\pm$ 6,8                | 48,0 $\pm$ 9,2                              | 51,5 $\pm$ 10,0                      |
| CD4 %                 | 18,0 $\pm$ 11,2               | 19,8 $\pm$ 9,4                              | 24,0 $\pm$ 8,7                | 29,0 $\pm$ 7,4                              | 30,2 $\pm$ 9,5                       |
| CD8 %                 | 19,8 $\pm$ 12,8               | 20,0 $\pm$ 7,6                              | 20,0 $\pm$ 10,2               | 19,0 $\pm$ 11,8                             | 20,8 $\pm$ 11,2                      |
| CD4/ CD8              | 0,9                           | 0,9                                         | 1,2                           | 1,5                                         | 1,4                                  |

Biz tədqiq etdiyimiz xəstələrdə P substansiyasının səviyyəsi ilə immun sistemin göstəriciləri arasında korrelyasion əlaqəni də araşdırdıq. Ən yüksək korrelyasion əlaqə IL-1 $\beta$ -nin səviyyəsi ilə P substansiyasının səviyyəsi arasında aşkar edilmişdir ( $r = +0,64$ ). Bu da fikrimizcə, təbiidir. Çünki makrofaqlardan ifraz olunan IL-1 $\beta$  iltihab sitokini kimi yerli və ümumi iltihab reaksiyalarında rol oynayır (Li, Zhang, Li, et al., 2021). P substansiyası neyrogen iltihabda, immun modulyasiyada və orqanizmin infeksiyalara qarşı reaksiyasında əsas rol oynayan neuropeptiddir (Aldini, Yamasaki, Tobe, 2020). Onun iltihab proseslərinə təsirini eləcə də Wang Y. və həmmüəllifləri də apardıqları tədqiqatlarda sübut edirlər (Wang, Tan, Yang, et al., 2021). P substansiyası leykositlər üçün güclü kemotraktantdır və infeksiyalar zamanı iltihab reaksiyasını gücləndirən mast hüceyrələrinin deqranulyasiyasını sürətləndirir. NK1 reseptorları vasitəsilə hərəkət edərək, leykositləri aktivləşdirir, damar keçiriciliyini artırır və iltihab vasitəçilərinin sərbəst buraxılmasına kömək edir ki, bu da onu iltihab və yoluxucu proseslərin patogenezinə mühüm iştirakçıya çevirir (Okyem, Tan, Romanova, Sweedler, 2025). Çox vaxt müxtəlif iltihabi proseslərdə histaminlə birlikdə P substansiyasının yüksək miqdarda aşkar edilir, bu da onun patoloji prosesin formalaşmasında iştirakını göstərir. Neuropeptidlər hematoensefalik baryer vasitəsilə selektiv keçiriciliyə malikdir, buna görə də peptid kompleksi patoloji proseslərin göstəricisi kimi xidmət edə bilər və xəstəliyin erkən mərhələlərinin markerləri və ya patoloji proseslərin vasitəçiləri kimi istifadə edilə bilər (Dhall, Kadian, Sharma, Hooda, Kumar, Mudgal, Singh, Arya, Rani, 2023). Hematoensefalik baryeri keçə bildiyindən IL-1 $\beta$ , hipotalamus və hipofizar mərkəzlərə təsir göstərərək, qızdırma, halsızlıq, yuxunun pozulması və ya əksinə yuxululuq, iştahanın azalması kimi ümumi iltihab reaksiyalarını əmələ gətirməklə yanaşı, beyin mərkəzində olan nüvələrə təsir edərək sinir uclarından P substansiyasının sintezini sürətləndirir. P substansiyasının artmış səviyyəsi isə öz növbəsində, makrofaqlara təsir edərək onlardan IL-1 $\beta$ -nin hasil olmasını gücləndirir (Lauritano, Mastrangelo, D'Ovidio, Ronconi, Caraffa, Gallenga, Frydas, Kritas, Trimarchi, Carinci, et al., 2023). P substansiyası mədə-bağırsaq traktının və ağciyərlərin sinir pleksuslarında (neyroepitelial cisimlərdə) aktivdir və damar keçiriciliyinin tənzimlənməsində iştirak edir, yoluxucu prosesin lokalizasiyasına təsir göstərir (Huang, Wang, Liao, et al., 2021; Martínez, Guzmán, Rodríguez, et al., 2021). P substansiyası sinir və immun sistemlərini birləşdirir, yoluxucu agentlərə qarşı iltihabi reaksiyanı gücləndirir. Beləliklə, IL-1 $\beta$  və P substansiyası, iltihabın bu iki mediatoru bir-biri ilə sıx qarşılıqlı əlaqədə fəaliyyət göstərir (Sampson, Hamilton, Sutherland, et al., 2020).

Apardığımız tədqiqatlar nəticəsində o da aşkar edilmişdir ki, P substansiyası ilə CD4-hüceyrələr, IL-2 və IFN- $\gamma$  arasında sıx mənfi korrelyasion əlaqə müəyyən edilir ( $P - CD4$  arasında  $r = -0,48$ ,  $P - IL-2$  arasında  $r = -0,45$  və  $P - IFN - \gamma$  arasında  $r = -0,4$ ). Fikrimizcə, bu da təbiidir. Çünki, P substansiyasının iltihabda rolundan qeyd edərkən, onun damar keçiriciliyini artırdığını göstərmişdik.

Damar keçiriciliyi artarkən iltihab toxumasına immunkompetent hüceyrələrin (T-limfositlər və onların subpopulyasiyaları) miqrasiyası sürətlənir (Schwartz, Czermak, Downey, et al., 2018), sonda onların miqdarı azalır (Xie, Liu, Zhang, et al., 2022).

Neyropeptidlərin immunrequlyasiyada rolu haqda əldə olunan ədəbiyyatlarda da məlumat verilir (Briand, Lalloo, Jordan, 2019). Bunların içərisində P substansiyasının T-hüceyrələrlə də sıx əlaqədə olduğu da sübut olunmuşdur (Cai, Chen, Zhang, et al., 2016). Hüceyrə immunitetinin əsas göstəricisi olan T-hüceyrələrin P substansiyası ilə sıx əlaqədə olduğunu Mashaghi A və həmmüəlliflər də göstərmişdir (Mashaghi, Marmalidou, Tehrani, Grace, Pothoulakis, Dana, 2016). IL-2 və IFN- $\gamma$ -nın məhz immunkompetent hüceyrələrdən, daha dəqiq desək, Th1-hüceyrələrdən hasil olduğunu nəzərə alsaq onda aydın olur ki, P substansiyasının yüksək səviyyəsi hüceyrə immunitetinin əsas göstəricilərindən olan və virus infeksiyası ilə mübarizədə mühüm əhəmiyyət kəsb edən IL-2 və IFN- $\gamma$ -nın azalmasına səbəb olur (Jang, Lee, Chang, et al., 2018).

Onu da qeyd etmək yerinə düşərdi ki, P substansiyasının yüksək səviyyəsinin xəstəliyin klinik remissiya zamanı da müşahidə edilməsi iltihabın davam etməsinə, uzun sürməsinə və ən başlıcası xronikləşməsinə zəmin yaradır (Mello, Costa, Alencar, et al., 2020). Çünki P substansiyasının yüksək səviyyəsi eyni zamanda IL-12-nin artmasına səbəb olur (Park, Kim, Lee, et al., 2020). IL-12 isə iltihabın xronikləşməsində mühüm əhəmiyyət kəsb edir (Briand, Lalloo, Jordan, 2019).

Beləliklə, məlum olur ki, respirator xəstəliklərinin patogenezinə mühüm rol oynayan immun sistem ayrılıqda deyil, digər vacib sistemlərlə, o cümlədən sinir sistemi ilə qarşılıqlı əlaqədə fəaliyyət göstərir. Residivləşən respirator infeksiyalar keçirən uşaqlarda respirator xəstəliklərin ağırlığı, fəsadlaşması, uzun sürməsi, residivləşməsi və xronik hala keçməsində immun sistemlə yanaşı sinir sisteminin, o cümlədən neyropeptid – P substansiyasının da böyük rolu vardır.

### Ədəbiyyat

1. Aldini, G., Yamasaki, K., & Tobe, T. (2020). The role of substance P in the regulation of inflammation in autoimmune diseases. *Journal of Autoimmunity*, 113, 102470.
2. Azzoni, R., Perdijk, O., Harris, N. L., & Marsland, B. J. (2023). Neuroimmune interactions in the lung. *Annual Review of Immunology*, 42, 57–81.
3. Briand, J., Lalloo, K., & Jordan, J. (2019). Neurotransmitter peptides and their role in immune regulation. *Journal of Experimental Medicine*, 216(2), 213–223.
4. Cai, Y., Chen, Z., Zhang, Q., et al. (2016). Substance P enhances the Th1 immune response by activating human T cells. *Journal of Neuroimmunology*, 302, 1–9.
5. Dhall, M., Kadian, R., Sharma, P., Hooda, A., Kumar, P., Mudgal, P., Singh, K., Arya, A., & Rani, N. (2023). Unravelling the neurochemical maze: Neurotransmitters, neuropeptides and novel drug modes of action based on epilepsy pathophysiology. *Epilepsy and Paroxysmal Conditions*, 15(3), 282–293. <https://doi.org/10.17749/2077-8333/epi.par.con.2023.15>
6. Duffy, L. K., Huber, E., Thomas, S., et al. (2022). Neuropeptides in the regulation of immune system activity. *Brain, Behavior, and Immunity*, 92, 64–78.
7. França, K., & Lotti, T. M. (2017). Psycho-neuro-endocrine-immunology: A psychobiological concept. In *Advances in Experimental Medicine and Biology* (Vol. 996, pp. 123–134). [https://doi.org/10.1007/978-3-319-56017-5\\_11](https://doi.org/10.1007/978-3-319-56017-5_11)
8. Huang, Z., Wang, Y., Liao, Z., et al. (2021). Substance P and its role in enhancing immune responses in the central nervous system. *Journal of Neuroimmunology*, 355, 577–585.
9. Hwang, H., Lee, J., Kim, Y., et al. (2021). The role of neuropeptides in modulating the immune system in response to injury. *Journal of Neurosurgery*, 134(3), 973–984.
10. Jang, J., Lee, T., Chang, H., et al. (2018). Substance P and its role in cytokine release in chronic inflammation. *Journal of Immunology*, 200(4), 1467–1475.
11. Lauritano, D., Mastrangelo, F., D'Ovidio, C., Ronconi, G., Caraffa, A., Gallenga, C. E., Frydas, I., Kritas, S. K., Trimarchi, M., Carinci, F., et al. (2023). Activation of mast cells by neuropeptides: The role of pro-inflammatory and anti-inflammatory cytokines. *International Journal of Molecular Sciences*, 24, 4811.

12. Li, Z., Zhang, L., Li, M., et al. (2021). Substance P influences astrocyte activation and inflammatory cytokine release in experimental autoimmune encephalomyelitis. *Neurochemical Research*, 46(9), 2174–2183.
13. Martínez, A., Guzmán, I., Rodríguez, E., et al. (2021). Neuropeptides and their role in the regulation of neuroinflammation. *Brain Research*, 1749, 147084.
14. Mashaghi, A., Marmalidou, A., Tehrani, M., Grace, P. M., Pothoulakis, C., & Dana, R. (2016). Neuropeptide substance P and the immune response. *Cellular and Molecular Life Sciences*, 73, 4249–4264.
15. Mello, C. F., Costa, A. R., Alencar, D., et al. (2020). Substance P and its interaction with immune cells in the pathogenesis of autoimmune diseases. *Autoimmunity Reviews*, 19(6), 102519.
16. Neubauer, H., Ewald, M., & Biedenkapp, J. (2018). Substance P, its receptors, and the immune response. *Frontiers in Immunology*, 9, 987.
17. Okyem, S., Tan, Y., Romanova, E., & Sweedler, J. V. (2025). Neuropeptide characterization workflow from sampling to data-independent acquisition mass spectrometry. *Journal of Visualized Experiments*, 222, e68741. <https://doi.org/10.3791/68741>
18. Park, H. S., Kim, K. H., Lee, J. Y., et al. (2020). Substance P in the modulation of immune responses during infection. *Cellular Immunology*, 349, 104050.
19. Sampson, R., Hamilton, L., Sutherland, P., et al. (2020). Neuropeptide modulation of immune cells in inflammation. *Journal of Neuroimmunology*, 344, 577–585.
20. Schwartz, L., Czermak, J., Downey, W., et al. (2018). Effects of neuropeptides on immune cell responses: A focus on substance P. *Immunologic Research*, 66(5), 632–644.
21. Wang, Y., Tan, W., Yang, X., et al. (2021). The regulation of neuroinflammation by substance P: Pathophysiological insights and therapeutic potential. *Cellular and Molecular Neurobiology*, 41(6), 1079–1091.
22. Xie, Y., Liu, B., Zhang, S., et al. (2022). Substance P and its impact on the immune response in neurodegenerative diseases. *Journal of Neuroinflammation*, 19(1), 72.

Daxil oldu: 30.10.2025

Qəbul edildi: 22.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/251-257>

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## Experimental Evaluation of an Alternative Treatment Method for Necrobacteriosis in Lambs

### Abstract

Necrobacteriosis remains an important infectious disease in livestock, leading to significant economic losses and severe systemic complications, particularly in young animals. The search for effective therapeutic approaches aimed at improving local antimicrobial activity and host immune response remains relevant.

The aim of this study was to evaluate the therapeutic efficacy of combined administration of naftalan oil, oxytetracycline, and the immunomodulatory preparation mixoferon in animals affected by necrobacteriosis.

The therapeutic effect of topical application of a naftalan oil–oxytetracycline mixture on lesions of the oral mucosa was investigated under experimental conditions. Clinical recovery dynamics and general condition of animals receiving combined therapy were assessed and compared with conventional treatment approaches.

Application of the naftalan oil–oxytetracycline combination was associated with improvement of local tissue condition and reduction of inflammatory manifestations, which contributed to accelerated clinical recovery. Additional administration of mixoferon was accompanied by improvement of nonspecific resistance indicators and a reduced tendency toward systemic spread of infection.

The obtained results indicate the potential effectiveness of complex therapy combining antimicrobial and immunomodulatory components in the treatment of necrobacteriosis. However, further studies using randomized controlled experimental designs, standardized outcome measures, and molecular diagnostic confirmation are required to validate these findings.

**Keywords:** *necrobacteriosis, Fusobacterium necrophorum, naftalan oil, oxytetracycline, immunomodulation, veterinary therapy*



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## Quzularda nekrobakteriozun alternativ müalicə üsulunun eksperimental qiymətləndirilməsi

### Xülasə

Nekrobakterioz heyvandarlıqda mühüm yoluxucu xəstəliklərdən biri olaraq qalır və xüsusilə cavan heyvanlarda ciddi sinir pozğunluqlarına və əhəmiyyətli iqtisadi itkilərə səbəb olur. Yerli antimikrob təsirin gücləndirilməsinə və orqanizmin immun cavabının yaxşılaşdırılmasına yönəlmiş effektiv kompleks müalicə yansımalarının axtarışı aktual olaraq qalmaqdadır.

Tədqiqatın məqsədi nekrobakteriozla xəstələnmiş heyvanlarda naftalan nefti, oksitetrasiklin və immunomodulyator preparat olan miksoferonun birgə tətbiqinin terapeutik effektivliyini qiymətləndirmək olmuşdur.

Eksperimental şəraitdə ağız boşluğunun selikli qişasında yaranmış zədələrə naftalan nefti–oksitetrasiklin qarışığının yerli tətbiqinin müalicəvi təsiri öyrənilmişdir. Kompleks terapiya alan heyvanlarda klinik sağalma dinamikası və ümumi vəziyyət qiymətləndirilmiş və ənənəvi müalicə üsulları ilə müqayisə edilmişdir.

Naftalan nefti–oksitetrasiklin kombinasiyasının tətbiqi yerli toxumaların vəziyyətinin yaxşılaşması və iltihabi əlamətlərin azalması ilə müşayiət olunmuş, bu da klinik sağlamanın sürətlənməsinə səbəb olmuşdur. Miksoferonun əlavə tətbiqi qeyri-spesifik rezistentlik göstəricilərinin yüksəlməsi və infeksiyanın sistem şəkildə yayılma meylinin azalması ilə müşahidə edilmişdir.

Əldə olunan nəticələr göstərir ki, antimikrob və immunomodulyator komponentləri birləşdirən kompleks terapiya nekrobakteriozun müalicəsində perspektivli hesab oluna bilər. Lakin, bu nəticələrin təsdiqlənməsi üçün randomizə olunmuş nəzarətli eksperimental dizayn, standartlaşdırılmış qiymətləndirmə meyarları və molekulyar diaqnostik təsdiqlə aparılan əlavə tədqiqatlara ehtiyac vardır.

**Açar sözlər:** nekrobakterioz, *Fusobacterium necrophorum*, naftalan nefti, oksitetrasiklin, immunomodulyasiya, baytarlıq terapiyası

## Introduction

Infectious diseases of livestock remain one of the major constraints affecting sustainable animal production worldwide despite substantial progress achieved in veterinary medicine. Diseases such as brucellosis, tuberculosis, leptospirosis, listeriosis and necrobacteriosis continue to cause considerable economic losses associated with decreased productivity, treatment costs and increased mortality of young animals (Shevchenko, 2018, Terekhov, 2025).

Necrobacteriosis is considered one of the most widespread bacterial infections affecting small ruminants and represents a significant veterinary and economic concern in sheep breeding systems. (Sato, 2021, Rizgar, 2024). The disease is characterized by purulent-necrotic lesions of soft tissues and mucous membranes, impaired growth performance and, in severe cases, systemic complications leading to organ damage and mortality. The etiological agent, *Fusobacterium necrophorum*, is widely distributed in the environment and may constitute part of the normal gastrointestinal microbiota of animals. However, under predisposing conditions such as tissue injury, stress, poor hygienic management and decreased immune resistance, the microorganism acquires pronounced pathogenic potential (Nagaraja, 2005, Manuel 2003, Aliyev, 2025).

Despite advances in understanding the epidemiology and pathogenesis of necrobacteriosis, effective therapeutic management remains challenging. Conventional antimicrobial therapy does not always provide satisfactory clinical outcomes due to tissue necrosis, impaired local circulation and reduced penetration of antibacterial agents into affected areas. Therefore, the development of complex therapeutic approaches aimed at improving local drug delivery while simultaneously enhancing host immune responsiveness represents an important direction of contemporary veterinary research (Bennett, 2001, Carvalho, 2020).

Naftalan oil possesses biologically active properties potentially capable of improving local microcirculation and inflammatory response modulation, which may enhance antimicrobial treatment efficacy. In addition, immunomodulatory agents may contribute to improved resistance of the host organism and prevention of systemic dissemination of infection, particularly in young animals characterized by immature immune responses. However, scientific evidence supporting the combined therapeutic use of these agents in necrobacteriosis remains limited (Juan, 2019, Kolychev, 2025, Kislenko, 2012).

**The aim of the present study** was to evaluate the clinical effectiveness of combined therapy including naftalan oil, oxytetracycline and the immunomodulatory preparation mixoferon in the treatment of oral mucosal necrobacteriosis in young farm animals under field conditions.

To achieve this aim, the following objectives were established: to characterize clinical manifestations of necrobacteriosis in lambs; to assess the therapeutic effect of topical application of naftalan oil in combination with oxytetracycline; to compare the effectiveness of the proposed treatment protocol with conventional therapeutic approaches; to evaluate the potential immunomodulatory contribution of mixoferon in preventing disease complications; to develop practical recommendations for veterinary application based on obtained results.

## Materials and Methods

The study was conducted at a private sheep farm located in the Kara-Ark settlement of the Samukh district (Azerbaijan) and at the regional veterinary diagnostic laboratory.

During routine clinical examination (dispensary survey), 24 lambs aged 2 months showing clinical signs consistent with necrobacteriosis were identified and included in the study. Affected animals demonstrated excessive salivation characterized by foamy viscous discharge with a putrid odor, reduced feed intake, depression, and predominantly recumbent behavior.

Clinical examination of the oral cavity revealed deep purulent-necrotic ulcerative lesions localized on the lips, gums, cheeks, and tongue, frequently covered with grayish diphtheritic plaques. In several cases, lesions extended to the mucous membranes of the larynx and nasal cavity. Gingival involvement was occasionally associated with signs of periodontitis.

Animals were selected based on clinical manifestation of oral necrobacteriosis and comparable age characteristics.

Biological samples were collected from ulcerative-necrotic lesions after mechanical removal of necrotic tissue at the border between affected and healthy areas under aseptic conditions.

Smear imprints were prepared from pathological material and stained using Gram staining for preliminary microscopic evaluation. Samples were subsequently cultured under anaerobic conditions on Kitt–Tarozzi medium for isolation of suspected *Fusobacterium necrophorum*.

For biological confirmation of pathogen virulence, laboratory animals (white mice and rabbits) were experimentally inoculated. All procedures involving laboratory animals were performed in accordance with the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes (ETS No. 123, 1986).

Molecular confirmation of the pathogen was carried out using polymerase chain reaction (PCR) performed on a “Tertsik” thermal cycler (Russia).

Genomic DNA extraction from biological samples included proteinase K digestion (10 mg/mL), phenol–chloroform extraction (1:1), and ethanol precipitation.

A deposited reference strain of *Fusobacterium necrophorum* (№ 8TS630501) was used as a positive control. PCR products were separated by electrophoresis in 0.8% agarose gel at 35–40 mA for 30–40 minutes using pUC18 DNA digested with AluI restriction enzyme as a molecular size marker.

Amplified DNA fragments were documented digitally, and selected amplicons were sequenced according to standard molecular biology protocols.

Indirect fluorescent antibody testing (IFAT) was used for serological confirmation of necrobacteriosis.

Hyperimmune serum was obtained from clinically healthy rabbits immunized with formalin-inactivated epizootic strains of *F. necrophorum*. Bacterial suspensions were prepared in isotonic sodium chloride solution and administered in increasing doses (0.5–1.2 mL) at 4-day intervals over a 1.5-month immunization period.

Smears prepared from clinical material were ethanol-fixed and incubated with hyperimmune serum followed by fluorescein-labeled anti-rabbit globulin conjugate. Preparations were examined using a fluorescence microscope at  $\times 400$  and  $\times 1000$  magnification.

Positive controls consisted of known *F. necrophorum* cultures, whereas negative controls included preparations treated with normal rabbit serum or without primary antiserum.

To evaluate nonspecific resistance in lambs, blood serum samples were analyzed for: bactericidal activity; lysozyme activity.

Serum bactericidal activity was determined using flow cytometry-based assessment of bacterial viability after exposure to serum samples. Lysozyme activity was evaluated using immunochemical analytical methods based on antigen–antibody interaction.

Therapeutic evaluation included combined administration of:

naftalan oil (topical application), oxytetracycline (antibacterial therapy), mixoferon (immunomodulatory preparation).

Following mechanical cleaning of necrotic lesions, a mixture of naftalan oil and oxytetracycline was applied locally to affected oral mucosa.

Oxytetracycline was additionally administered according to recommended veterinary therapeutic dosages. Mixoferon was used as adjunct immunomodulatory therapy aimed at supporting host immune response and reducing the risk of systemic infection development.

Naftalan oil was used as a topical biologically active agent possessing anti-inflammatory and regenerative properties facilitating local tissue recovery.

Oxytetracycline, a broad-spectrum tetracycline antibiotic, was applied as the primary antimicrobial component of therapy.

Mixoferon, an interferon-based immunomodulatory preparation, was administered to stimulate cellular immune mechanisms and enhance nonspecific resistance of the organism.

All procedures involving animals complied with international standards for animal welfare and were performed under veterinary supervision with measures taken to minimize animal stress and suffering.

## Results

Microscopic analysis of smears revealed Gram-negative bacteria morphologically consistent with *Fusobacterium necrophorum*, the causative agent of necrobacillosis. Bacteria were thin, filamentous, and varied in length, with a granular structure and pale staining.

Pathological material was inoculated onto Kitt–Tarozzi anaerobic nutrient medium. Within 18–24 hours of incubation, intense turbidity developed initially in the lower layers, gradually spreading upwards, accompanied by slight gas formation. Pure cultures of *F. necrophorum* were successfully isolated from the lesions.

In vivo pathogenicity tests were conducted on white mice. Subcutaneous injection of 0.3 mL of the isolated culture into the tail root resulted in animal death within 14 days. Post-mortem examination revealed muscle tissue necrosis and purulent foci in the liver, lungs, and heart.

In rabbits, subcutaneous administration of 1 mL culture into the outer ear surface induced necrotic lesions within 24 hours, followed by death and extensive necrotic changes in the head, liver, and heart.

Molecular diagnostics were performed using PCR targeting the leukotoxin gene of *F. necrophorum* with the diagnostic PCR system produced by “NIVI of Siberia and the Far East,” following the manufacturer’s instructions. PCR was conducted in two stages using external and nested primers. Amplicon analysis showed the characteristic pattern, confirming the presence of *F. necrophorum* DNA in the tested samples.

The IFA reaction was considered positive upon detection of bright green fluorescence of bacterial cells against a dark background, consistent with *F. necrophorum* morphology. Absence of specific fluorescence or weak diffuse background was interpreted as negative.

Ten strains of *F. necrophorum* were identified from diseased lambs.

## Nonspecific Serum Reactivity

Bactericidal activity in the serum of diseased lambs was significantly lower than in the control group ( $26.1 \pm 0.63\%$  vs.  $52.9 \pm 0.49\%$ ,  $p < 0.05$ ). Lysozyme activity was also reduced,  $26.8 \pm 1.26\%$  vs.  $48.0 \pm 0.51\%$  in controls ( $p < 0.001$ ).

Twenty diseased lambs were divided into two groups ( $n = 10$  each):

**Group 1 (experimental)** – topical application of a mixture of naftalan oil and oxytetracycline to affected mucous membranes with subsequent intramuscular injection of Mixoferon (0.1 mL/kg once daily).

**Group 2 (control)** – identical topical treatment without Mixoferon.

In Group 1, improvement was observed by Day 3, with reduced salivation and normalization of body temperature. By Day 5, appetite and general condition were restored.

In Group 2, recovery was slower and less pronounced.

## Bactericidal Activity of Serum (%)

| Day | Group 1         | Group 2         |
|-----|-----------------|-----------------|
| 3   | $51.0 \pm 0.83$ | $45.8 \pm 0.20$ |
| 5   | $52.4 \pm 0.50$ | $47.3 \pm 0.35$ |
| 7   | $52.5 \pm 0.52$ | $48.2 \pm 0.22$ |

( $p < 0.05$  between groups and relative to baseline)

### Lysozyme Activity of Serum (%)

| Day | Group 1     | Group 2     |
|-----|-------------|-------------|
| 3   | 44.6 ± 0.28 | 40.9 ± 0.82 |
| 5   | 46.8 ± 0.28 | 41.0 ± 0.44 |
| 7   | 47.9 ± 0.64 | 41.3 ± 0.46 |

( $p < 0.05$  between groups and relative to baseline)

### Conclusion

The obtained results confirm that necrobacillosis in lambs is accompanied by pronounced local purulent-necrotic lesions of the mucous membranes as well as a significant decrease in indicators of nonspecific resistance of the organism. The detected reduction in serum bactericidal and lysozyme activities indicates the development of secondary immunodeficiency, which is consistent with current concepts of the pathogenesis of infections caused by *Fusobacterium necrophorum*.

It is well known that the effectiveness of antibacterial therapy in necrobacillosis is often limited by the presence of necrotic tissues, impaired microcirculation, and insufficient penetration of antibiotics into inflammatory lesions. Consequently, the use of systemic antimicrobial agents alone frequently results in prolonged disease progression and an increased risk of infection generalization.

The results of the present study demonstrated that topical application of a mixture of naftalan oil and oxytetracycline provides a more pronounced therapeutic effect compared with conventional treatment approaches. This effect is likely associated with the ability of naftalan oil to improve local blood circulation, stimulate physiological hyperemia, and enhance penetration of antibacterial agents into affected tissues. In addition, the anti-inflammatory and reparative properties of naftalan oil promote faster cleansing of ulcerative-necrotic lesions and activation of tissue regeneration processes.

Particular importance should be attributed to the use of the immunomodulatory preparation mixoferon. The obtained data indicate a significant increase in serum bactericidal and lysozyme activities in animals of the experimental group, suggesting restoration of innate immune mechanisms. Enhancement of nonspecific resistance likely contributed to limitation of infection spread and accelerated clinical recovery of the animals.

The more rapid disappearance of clinical symptoms observed in lambs receiving combined therapy confirms the effectiveness of an integrated therapeutic approach combining local antimicrobial treatment with immune correction. These findings are consistent with contemporary concepts of veterinary infectious disease therapy, according to which maximum treatment efficacy is achieved through simultaneous action on both the pathogen and the host immune system.

It should be noted that the study was conducted under field production conditions, which increases the practical relevance of the obtained results. However, the limited number of animals and the absence of randomized experimental design indicate the need for further studies involving larger sample sizes and standardized experimental models.

### References

1. Aliyev, A. S., Danko, Y. Y., Eshchenko, I. D., (2025). *Epizootiology with Fundamentals of Microbiology: Textbook*— Saint Petersburg: Lan, 432.
2. Bennett, P. M., & McEwen, S. A. (2001). Necrobacillosis in domestic animals. *Veterinary Record*, 149(22), 683–686.
3. Carvallo, F. R., Uzal, F. A., Flores, K., Diab, S. S., Giannitti, F., Crossley, B., Wünschmann, A. (2020). *Journal of Veterinary Diagnostic Investigation*, 32(2), 339–343. doi:10.1177/1040638720906409
4. Dmitriev, A. F. (2014). *Sheep Diseases*: Stavropol: — 168 ISBN 978-5-9596-1010-4.

5. Juan, M. R., Ignacio, G. B., Rafael, Z. L., Pilar, M. R., Alba, G. R. (2019). *Manuales clínicos de Veterinaria*, Elsevier 152. ISBN: 9788491135951
6. Kolychev, N. M. (2025). *Veterinary Microbiology and Mycology*. Lan.
7. Kislenko, V. N. (2012). *Veterinary Microbiology and Immunology*. GEOTAR-Media.
8. Kumar, A., Anderson, D., Amachawadi, R. G., Nagaraja, T. G., Narayanan, S. K. (2013). Alimentary necrobacillosis in alpacas. *Journal of Veterinary Diagnostic Investigation*, 25(4), 502–507. doi:10.1177/1040638713491407
9. Chirino-Trejo, M., Woodbury, M. R., & Huang, F. (2003). Antibiotic sensitivity and biochemical characterization of *Fusobacterium* spp. and *Arcanobacterium pyogenes* isolated from farmed white-tailed deer (*Odocoileus virginianus*) with necrobacillosis. *Journal of Zoo and Wildlife Medicine*, 34(3), 262–268. <https://doi.org/10.1638/02-019>
10. Nagaraja, T. G., Narayanan, S. K., Stewart, G. C., Chengappa, M. M. (2005). *Fusobacterium necrophorum* infections in animals. *Vet Res Commun* 29 (1), 55–70.
11. Petryankin, F. P., Petrova, O. Yu. (2014). *Diseases of Young Farm Animals: Study Guide*. Saint Petersburg: Lan Publishing House, 352.
12. Sulaiman, R. R., Marif, H. F., Ali, B. A., Ali, K. N., & Baba Shekh, M. O. (2024). Genetic variability and antibacterial sensitivity of *Fusobacterium necrophorum* in sheep. *Iraqi Journal of Veterinary Medicine*, 48(1), 93–100. <https://doi.org/10.30539/xxn4db22>
13. Sato, K., Matsubara, T., Imai, S., Hatada, K., Mitsuma, W., Kawasaki, S., Hama, I., Kamura, T. (2021). *Fusobacterium necrophorum* Endocarditis with Liver Abscesses: A Case Report and Review of the Literature. *Intern Med* 60 (15):2445-2449 doi: 10.2169 /internalmedicine. 6348-20. PMID: PMC8381182
14. Shevchenko, A. A., et al (2018). *Diagnosis of Infectious Diseases of Farm Animals: Bacterial Diseases: Monograph*. Kuban State Agrarian University, 701.
15. Skorodumov, D. I., Rodionova, V. B., Kostenko, T. S. (2023). *Practical Course in Veterinary Microbiology and Immunology*: Lan, 336. ISBN 978-5-507-47839-2.
16. Terekhov, V. I. (2025). *Infectious Diseases of Animals: Clostridial and Other Anaerobic Infections*: Lan, 220.

Received: 11.11.2025

Accepted: 14.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/258-268>

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## Construction of the Regression Equation of the Electrochemical Chlorination Process of Alkylation Products with Methanol, Ethanol, and Propanol of Methyl and Dimethyl Homologues of Phenol

### Abstract

The aim of the presented work is to investigate the common and different characteristics of the regularities of obtaining aromatic compounds, including C<sub>1</sub>-C<sub>3</sub> alkyl derivatives of phenols, anilines and naphthols by an effective catalytic alkylation process, and to develop the chlorination of hydrogen chloride in an electrochemical system.

Experiments in the laboratory were carried out in a five-factorial design. A mathematical model of the electrolysis process of obtaining aromatic amines, phenols and naphthols by the process of heterogeneous catalytic alkylation of low molecular weight alkyl (C<sub>1</sub>-C<sub>3</sub>) derivatives and comparative halogenation of individual homologues in an electrochemical system has been established. The "black box" principle was used here.

Taking into account what has been said, active experimental methods were used to create the optimal mode of the electrolysis process of alkylphenols, alkyl aromatic amines, HCl. A regression equation was formulated to build a mathematical model of the process.

To assess the homogeneity of parallel experiments, the average value of variances was found, and Fisher's criterion was used to check the adequacy of the obtained results.

$U_a(X_1, X_2, X_3, X_4, X_5)$  min,  $U_v(X_1, X_2, X_3, X_4, X_5)$  max and  $U_b(X_1, X_2, X_3, X_4, X_5)$  max was taken for alkylamines, alkyl naphthols, alkylphenols and HCl as an optimization objective function.

A quick extraction method was used to optimize the process. For this, change steps were calculated according to all three objective functions.  $X_2$  was taken as base factor and step was accepted as  $\Delta x_{2a}^x = 0.5$  was taken. Then the steps corresponding to the other four factors were calculated. According to the report, the optimal level of chlorination products of alkyl aromatic compounds is 82.05% by current, 72.69% by substance, and 13.01% of HCl concentration.

According to the obtained results, when  $X_1 = 0.482 \text{ A/cm}^2$ ,  $X_2 = 4.5 \text{ A/l}$ ,  $X_3 = 38.8 ^\circ\text{C}$ ,  $X_4 = 19.8 \%$ ,  $X_5 = 6 \text{ V}$ , the output of the chlorination product of alkyl aromatic compounds according to the current is 82.05 %.

**Keywords:** *hydrogen chloride, electrochemical chlorination, phenols, alkylphenol, catalytic alkylation, alkyl-aniline, alkyl aromatic*

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## **Metanol, etanol və propanol ilə fenolun metil və dimetil homoloqlarının alkilləşmə məhsullarının elektrokimyəvi xlorlaşdırma prosesinin reqressiya tənliyinin qurulması**

### **Xülasə**

Təqdim olunan işin məqsədi aromatik birləşmələrin, o cümlədən fenolların, anilinlərin və naftolların C1–C3 alkil törəmələrinin effektiv katalitik alkilləşmə prosesi ilə alınmasının ümumi və fərqli qanunauyğunluqlarını tədqiq etmək və hidrogen xloridin elektrokimyəvi sistemdə xlorlaşdırılmasını inkişaf etdirməkdir.

Laboratoriya təcrübələri beş faktorlu dizayn əsasında aparılmışdır. Aşağı molekullu alkil (C1–C3) fenol törəmələrinin və onların homoloqlarının heterogen katalitik alkilləşməsi və ayrı-ayrı homoloqların elektrokimyəvi sistemdə müqayisəli halogenləşməsi prosesi ilə aromatik aminlərin, fenolların və naftolların elektroliz prosesinin riyazi modeli qurulmuşdur. Burada “qara qutu” prinsipi tətbiq edilmişdir.

Qeyd olunanları nəzərə alaraq, alkilfenolların, alkilaromatik aminlərin və HCl-in elektroliz prosesinin optimal rejimini yaratmaq üçün aktiv eksperimental metodlardan istifadə olunmuşdur. Prosesin riyazi modelini qurmaq üçün reqressiya tənliyi tərtib edilmişdir.

Parallel təcrübələrin homogenliyini qiymətləndirmək üçün dispersiyaların orta qiyməti tapılmış və alınmış nəticələrin adekvatlığını yoxlamaq üçün Fişer kriteriyasından istifadə edilmişdir.

Alkilaminlər, alkilnaftollar, alkilfenollar və HCl üçün optimallaşdırma məqsəd funksiyası kimi aşağıdakılar qəbul edilmişdir:

$U_a(X_1, X_2, X_3, X_4, X_5) \text{ min}$ ,  $U_v(X_1, X_2, X_3, X_4, X_5) \text{ max}$  və  $U_b(X_1, X_2, X_3, X_4, X_5) \text{ max}$ .



Prosesin optimallaşdırılması üçün sürətli çıxarış metodu tətbiq edilmişdir. Bunun üçün bütün üç məqsəd funksiyası üzrə dəyişmə addımları hesablanmışdır. X2 baza faktor kimi götürülmüş və addım  $\delta = 0.5$  qəbul edilmişdir. Daha sonra digər dörd faktor üçün uyğun addımlar hesablanmışdır.

Hesabat üzrə alkil aromatik birləşmələrin xlorlaşdırma məhsullarının optimal səviyyəsi cərəyan üzrə 82.05%, maddə üzrə 72.69% və HCl konsentrasiyası üzrə 13.01% təşkil etmişdir.

Alınan nəticələrə görə,  $X_1 = 0.482 \text{ A/sm}^2$ ,  $X_2 = 4.5 \text{ A/l}$ ,  $X_3 = 38.8^\circ\text{C}$ ,  $X_4 = 19.8\%$ ,  $X_5 = 6 \text{ V}$  olduqda, alkil aromatik birləşmələrin xlorlaşdırma məhsulunun çıxımı cərəyan üzrə 82.05% təşkil edir.

**Açar sözlər:** *hidrogen xlorid, elektrokimyəvi xlorlaşdırma, fenollar, alkilfenol, katalitik alkiləşmə, alkilanilin, alkilaromatik birləşmələr*

## Introduction

Among the researches in the field of petrochemicals, one of the interesting things is the production of aromatic amines and phenols by the process of heterogeneous catalytic alkylation of low molecular weight alkyl ( $C_1$ - $C_3$ ) derivatives and their comparative halogenation of individual homologues in an electrochemical system. There are no joint studies in the presented field in the literature. However, there is a large literature on the alkylation of phenols as well as anilines separately. It should also be noted that there are significant differences in the composition and structure of the catalytic systems used in the alkylation of phenols with  $C_1$ - $C_3$  alcohols and the catalysts used in the interaction of aromatic amines with alcohols (Agaev, 2022, pp. 11-13). In this regard, the development of catalytic systems with optimal and universal acid-basic properties in the interaction of acidic phenols and basic anilines with  $C_1$ - $C_3$  alcohols is not easy and requires a special approach (Muradov, 2020, pp. 25-27). A similar issue is considered important in the electrochemical chlorination of alkyl phenols and alkylanilines in the presence of HCl solution.

The aim of the presented work is to investigate the common and different characteristics of the regularities of obtaining aromatic compounds, including  $C_1$ - $C_3$  alkyl derivatives of phenols and anilines by the effective catalytic alkylation process, and the development of chlorination with hydrogen chloride in an electrochemical system.

## Methodology

Experiments in laboratory conditions were performed in a five-factor model. First, we need to build a mathematical model of the electrolysis process of obtaining low molecular mass alkyl ( $C_1$ - $C_3$ ) derivatives of aromatic amines and phenols by heterogeneous catalytic alkylation and comparative halogenation of individual homologs in an electrochemical system. The "black box" principle was used here. The mathematical model (mathematical description) of the process is sought in the following form:

$$U_i = f(X_1, X_2, \dots, X_n), \quad i = 1, 2, \dots, n \quad (1)$$

In the model (1), active and passive experimental methods are used to determine the values of the coefficients of the variables. It is known that getting a more accurate mathematical model with active experimental methods is possible. One of these methods is the multifactorial experiment method (Sautin, 1975, p. 115; Muradov, 2004, pp. 69-73).

Taking into account the above, active experimental methods were used to create the optimal mode of the electrolysis process of HCl for the halogenation of alkyl phenols and alkyl aromatic amines. To build a mathematical model of the process (1), the regression equation is sought in the following form.

$$\begin{aligned} U = & v_0 + v_1X_1 + v_2X_2 + v_3X_3 + v_4X_4 + v_5X_5 + v_{12}X_1X_2 + v_{13}X_1X_3 + v_{14}X_1X_4 + v_{15}X_1X_5 + v_{23}X_2X_3 + \\ & + v_{24}X_2X_4 + v_{25}X_2X_5 + v_{34}X_3X_4 + v_{35}X_3X_5 + v_{45}X_4X_5 + v_{123}X_1X_2X_3 + v_{124}X_1X_2X_4 + v_{125}X_1X_2X_5 + \\ & + v_{134}X_1X_3X_4 + v_{135}X_1X_3X_5 + v_{145}X_1X_4X_5 + v_{234}X_2X_3X_4 + v_{235}X_2X_3X_5 + \\ & + v_{245}X_2X_4X_5 + v_{345}X_3X_4X_5 \end{aligned} \quad (2)$$

Here, according to the variables  $x_1, x_2, x_3, x_4, x_5$ , the anode current density  $X_1$ , the amount of current supplied to the process  $X_2$ , the temperature of the electrolyte  $X_3$ , the density of the background electrolyte  $X_4$ , and the process voltage  $X_5$  are determined by the following formulas:

$$X_1 = \frac{x_1 - x}{\Delta x_1}; \quad X_2 = \frac{x_2 - x}{\Delta x_2}; \quad X_3 = \frac{x_3 - x}{\Delta x_3}; \quad X_4 = \frac{x_4 - x}{\Delta x_4}; \quad X_5 = \frac{x_5 - x}{\Delta x_5} \quad (3)$$

The main characteristics of the five-factor experiment are given in table 1.

**Table 1.**  
 The main characteristics of the experiment.

| Characteristics          | $X_1$ ,<br>A/cm <sup>2</sup> | $X_2$ ,<br>A□hrs. | $X_3$ , °C | $X_4$ , % | $X_5$ , V | Concentration<br>of Chlorine,<br>% | Output<br>Regarding<br>Electrical<br>Current | Output<br>Regarding<br>Substances |
|--------------------------|------------------------------|-------------------|------------|-----------|-----------|------------------------------------|----------------------------------------------|-----------------------------------|
| 1. Main Level            | 0.35                         | 3.5               | 50         | 12.5      | 6         | 15                                 | 70                                           | 73                                |
| 2. Interval of<br>change | 0.25                         | 2.5               | 30         | 7.5       | 2         | 5                                  | 5                                            | 5                                 |
| 3. Upper level           | 0.6                          | 6                 | 80         | 20        | 8         | 20                                 | 85                                           | 90                                |
| 4. Lower level           | 0.1                          | 1                 | 20         | 5         | 4         | 10                                 | 62                                           | 65                                |

The variation of coded variables - factors, the results of parallel experiments conducted accordingly, and dispersions are given in table 2.

**Table 2.**  
 Results of the Experiment.

| №  | $X_1$ | $X_2$ | $x_3$ | $X_4$ | $X_5$ | Alkyl Phenol Output Regarding Electrical Current |                   |                  |            |              |               |                       |            |              |              |               |            |
|----|-------|-------|-------|-------|-------|--------------------------------------------------|-------------------|------------------|------------|--------------|---------------|-----------------------|------------|--------------|--------------|---------------|------------|
|    |       |       |       |       |       | $U_1$ , %                                        | $U_{2mid}$ ,<br>% | $C_{\phi}$ , mid | $S_{1j}^2$ | $U_{12}$ , % | $U_{1or}$ , % | $M_{output}$ ,<br>mid | $S_{2j}^2$ | $U_{21}$ , % | $U_{22}$ , % | $C_{HCl}$ , % | $S_{j3}^2$ |
| 1  | 2     | 3     | 4     | 5     | 6     | 7                                                | 8                 | 9                | 10         | 11           | 12            | 13                    | 14         | 15           | 16           | 17            | 18         |
| 1  | -     | -     | -     | -     | -     | 77.9                                             | 80.0              | 78.95            | 2.205      | 80.63        | 82.21         | 81.42                 | 1.2482     | 19.02        | 19.76        | 19.39         | 0.2738     |
| 2  | +     | -     | -     | -     | -     | 68.44                                            | 69.06             | 68.75            | 0.1922     | 70.9         | 71.7          | 71.3                  | 0.32       | 17.14        | 18.52        | 17.83         | 0.9522     |
| 3  | -     | +     | -     | -     | -     | 61.9                                             | 63.6              | 62.75            | 1.445      | 65.84        | 66.48         | 66.16                 | 0.2048     | 14.83        | 16.09        | 15.46         | 0.7938     |
| 4  | +     | +     | -     | -     | -     | 64.1                                             | 63.8              | 63.95            | 0.045      | 68.12        | 66.72         | 67.42                 | 0.98       | 11.18        | 9.9          | 10.54         | 0.8192     |
| 5  | -     | -     | +     | -     | -     | 77.26                                            | 75.64             | 76.45            | 1.3122     | 80.8         | 81.96         | 81.38                 | 0.6728     | 10.99        | 9.43         | 10.21         | 1.2168     |
| 6  | +     | -     | +     | -     | -     | 63.7                                             | 63.1              | 63.4             | 0.18       | 67.14        | 68.06         | 67.6                  | 0.4232     | 18.65        | 17.11        | 17.88         | 1.1858     |
| 7  | -     | +     | +     | -     | -     | 76.4                                             | 76.9              | 76.65            | 0.125      | 80.96        | 79.48         | 80.22                 | 1.0952     | 14.86        | 16.22        | 15.54         | 0.9248     |
| 8  | +     | +     | +     | -     | -     | 83.5                                             | 86.1              | 84.8             | 3.38       | 90.5         | 89.38         | 89.94                 | 0.6272     | 10.91        | 12.49        | 11.7          | 1.2482     |
| 9  | -     | -     | -     | +     | -     | 69.21                                            | 71.09             | 70.15            | 1.7672     | 74.1         | 72.58         | 73.34                 | 1.1552     | 10.5         | 9.88         | 10.19         | 0.1922     |
| 10 | +     | -     | -     | +     | -     | 65.7                                             | 66.5              | 66.1             | 0.32       | 70.34        | 69.1          | 69.72                 | 0.7688     | 18.22        | 17.28        | 17.75         | 0.4418     |
| 11 | -     | +     | -     | +     | -     | 64.53                                            | 64.97             | 64.75            | 0.0968     | 68.17        | 66.71         | 67.44                 | 1.0658     | 13.82        | 12.7         | 13.26         | 0.6272     |
| 12 | +     | +     | -     | +     | -     | 71.9                                             | 72.3              | 72.1             | 0.08       | 75.9         | 76.84         | 76.37                 | 0.4418     | 10.9         | 9.98         | 10.44         | 0.4232     |
| 13 | -     | -     | +     | +     | -     | 74.8                                             | 73.8              | 74.3             | 0.5        | 76.81        | 78.33         | 77.57                 | 1.1552     | 10.56        | 9.64         | 10.1          | 0.4232     |
| 14 | +     | -     | +     | +     | -     | 64.12                                            | 63.18             | 63.65            | 0.4418     | 65.09        | 66.37         | 65.73                 | 0.8192     | 17.8         | 16.08        | 16.94         | 1.4792     |
| 15 | -     | +     | +     | +     | -     | 63.58                                            | 61.82             | 62.7             | 1.5488     | 66.82        | 65.56         | 66.19                 | 0.7938     | 13.87        | 15.25        | 14.56         | 0.9522     |
| 16 | +     | +     | +     | +     | -     | 72.3                                             | 70.6              | 71.45            | 1.445      | 75.53        | 73.95         | 74.74                 | 1.2482     | 12.94        | 11.54        | 12.24         | 0.98       |
| 17 | -     | -     | -     | -     | +     | 83.6                                             | 83.34             | 83.47            | 0.0338     | 87.81        | 87.27         | 87.54                 | 0.1458     | 19.2         | 20.68        | 19.94         | 1.0952     |
| 18 | +     | -     | -     | -     | +     | 68.56                                            | 69.32             | 68.94            | 0.2888     | 71.98        | 73.34         | 72.66                 | 0.9248     | 17.56        | 18.68        | 18.12         | 0.6272     |
| 19 | -     | +     | -     | -     | +     | 68.4                                             | 69.84             | 69.12            | 1.0368     | 72.93        | 74.71         | 73.82                 | 1.5842     | 15.7         | 16.98        | 16.34         | 0.8192     |
| 20 | +     | +     | -     | -     | +     | 66.24                                            | 65.64             | 65.94            | 0.18       | 68.84        | 69.58         | 69.21                 | 0.2738     | 10.51        | 11.73        | 11.12         | 0.7442     |
| 21 | -     | -     | +     | -     | +     | 77.95                                            | 76.33             | 77.14            | 1.3122     | 79.88        | 80.78         | 80.33                 | 0.405      | 10.23        | 11.63        | 10.93         | 0.98       |
| 22 | +     | -     | +     | -     | +     | 73.12                                            | 74.6              | 73.86            | 1.0952     | 76.55        | 75.75         | 76.15                 | 0.32       | 19.2         | 18.64        | 18.92         | 0.1568     |

|    |   |   |   |   |   |       |       |       |        |       |       |       |        |       |       |       |        |
|----|---|---|---|---|---|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|--------|
| 23 | - | + | + | - | + | 66.7  | 67.86 | 67.28 | 0.6728 | 72.49 | 70.27 | 71.38 | 2.4642 | 17.22 | 15.24 | 16.23 | 1.9602 |
| 24 | + | + | + | - | + | 68.81 | 69.93 | 69.37 | 0.6272 | 72.93 | 72.21 | 72.57 | 0.2592 | 13.1  | 11.42 | 12.26 | 1.4112 |
| 25 | - | - | - | + | + | 66.18 | 64.98 | 65.58 | 0.72   | 69.12 | 67.96 | 6.54  | 0.6728 | 10.16 | 10.92 | 10.54 | 0.2888 |
| 26 | + | - | - | + | + | 62.7  | 62.18 | 62.44 | 0.1352 | 66.41 | 65.05 | 65.73 | 0.9248 | 17.87 | 18.69 | 18.28 | 0.3362 |
| 27 | - | + | - | + | + | 69.45 | 68.63 | 69.04 | 0.3362 | 72.82 | 71.78 | 72.3  | 0.5408 | 13.85 | 14.89 | 14.37 | 0.5408 |
| 28 | + | + | - | + | + | 65.92 | 67.36 | 66.64 | 1.0368 | 70.16 | 71.08 | 70.62 | 0.4232 | 10.89 | 11.81 | 11.35 | 0.4232 |
| 29 | - | - | + | + | + | 68.24 | 69.48 | 68.86 | 0.7688 | 71.1  | 72.66 | 71.88 | 1.2168 | 10.2  | 11.78 | 10.99 | 1.2482 |
| 30 | + | - | + | + | + | 79.62 | 78.14 | 78.88 | 1.0952 | 82.03 | 83.85 | 82.94 | 1.6562 | 17.82 | 17.32 | 17.57 | 0.125  |
| 31 | - | + | + | + | + | 75.23 | 76.73 | 75.98 | 1.125  | 80.25 | 79.07 | 79.66 | 0.6962 | 12.67 | 14.09 | 13.38 | 1.0082 |
| 32 | + | + | + | + | + | 83.66 | 85.42 | 84.54 | 1.5488 | 90.59 | 88.85 | 89.77 | 1.5138 | 19.34 | 20.64 | 19.99 | 0.845  |

The accuracy of the experiment is checked regarding Cochran's criterion:

$$G_p = \frac{\max S_j^2}{\sum_{j=1}^N S_j^2} \quad (4)$$

For Alkyl Phenol:

$$G_{p1} = \frac{2.05}{27.0968} = 0.0813 \quad (5)$$

For HCl:

$$G_{p2} = \frac{2.4642}{27.041} = 0.0911 \quad (6)$$

$$G_{p3} = \frac{1.9602}{25.543} = 0.07674 \quad (7)$$

$$N = 32$$

$$f = K - 1 = 2 - 1 = 1 \quad (8)$$

$$G_{ced} = 0.389$$

$$G_{p1} = 0.0813 < G_{ced} = 0.389$$

$$G_{p2} = 0.0911 < G_{ced} = 0.389 \quad (9)$$

$$G_{p3} = 0.07674 < G_{ced} = 0.389$$

$G_{ced}$  is equal to 0.389 (Kurzin, 2022, p. 78; Zakgeim, 2014, p. 304; Isgandarov, 2007, p. 226; Ostrovsky, 2008, p. 424; Kurzin, 2022, p. 78) according to the number of experiments ( $N = 32$ ) and degree of freedom ( $f = k - 1 = 2 - 1 = 1$ ). In both cases,  $G_p < G_{ced}$  is being met; therefore, the experiment can be considered satisfactory.

To assess the homogeneity of parallel experiments, the average value of dispersions is calculated:

$$S_{ya}^2 = \frac{1}{N} \sum_{j=1}^N S_j^2 = \frac{1}{32} \cdot 27.0968 = 0.8468 \quad (10)$$

$$S_{y\theta}^2 = \frac{\sum S_i^2}{N} = \frac{1}{32} \cdot 27.041 = 0.8450 \quad (11)$$

$$S_{yc}^2 = \frac{1}{N} \sum_{j=1}^N S_j^2 = \frac{1}{32} \cdot 25.543 = 0.7982 \quad (12)$$

The dispersion of average values of the parallel experiments is calculated as follows:

$$f = N \cdot (k - 1) = 32 \cdot (2 - 1) = 32 \quad (13)$$

$$S_{ya}^2 = \frac{S_{ya}^2}{k} = \frac{0.8468}{2} = 0.4234 \quad (14)$$

$$S_{yg}^2 = \frac{S_{yg}^2}{k} = \frac{0.845}{2} = 0.4225 \quad (15)$$

$$S_{yc}^2 = \frac{S_{yc}^2}{k} = \frac{0.7982}{2} = 0.3991 \quad (16)$$

The error in determining the regression coefficients is calculated by the following formula:

$$S_a = \sqrt{\frac{S_{ya}^2}{N}} = \sqrt{\frac{0.4234}{32}} = 0.113 \quad (18)$$

$$S_g = \sqrt{\frac{S_{yg}^2}{N}} = \sqrt{\frac{0.4225}{32}} = 0.1149 \quad (19)$$

$$S_c = \sqrt{\frac{S_{yc}^2}{N}} = \sqrt{\frac{0.3991}{32}} = 0.1120 \quad (20)$$

The value of Student's criterion is  $t = 2.09$  (Radchenko, 2014, pp. 232-234; Salman, 2017, pp. 1-19; Ostrovsky, 2012, p. 432; Ostrovsky, 2005, p. 394; Radchenko, 2011, p. 376), where the confidence coefficient is  $R = 0.95$  and the degree of freedom is  $f = N - (k - 1) = 32 - (2 - 1) = 32$ . Then:

$$\begin{aligned} S_a \cdot t &= 0.115 \cdot 2.09 = 0.2404 \\ S_g \cdot t &= 0.01147 \cdot 2.09 = 0.2401 \\ S_c \cdot t &= 0.1120 \cdot 2.09 = 0.2341 \end{aligned} \quad (21)$$

Since the yield of chlorination products of alkyl aromatic compounds according to the current, as well as the HCl residue are influenced by the same factors in the experiment, the mathematical expression of both can be sought in the form of the polynomial shown in (2). The regression coefficients included in the polynomial are calculated as follows (Agaev, 2022, pp. 11-13; Belozerova, 2015, pp. 23-29; Belozerova, 2014, pp. 6-23; Malysheva, 2021, pp. 68-76; Aung, 2020, pp. 62-71).

$$\begin{aligned}
 \theta_0 &= \frac{1}{N} \sum_{j=1}^N Y_j \\
 \theta_i &= \frac{1}{N} \sum_{j=1}^N x_{ji} Y_j \\
 \theta_{im} &= \frac{1}{N} \sum_{j=1}^N x_{ji} x_{jm} Y_j; \quad (i \neq m) \\
 \theta_{imk} &= \frac{1}{N} \sum_{j=1}^N x_{ji} x_{jm} x_{jk} Y_j; \quad (i \neq m \neq k) \\
 \theta_{imkc} &= \frac{1}{N} \sum_{j=1}^N x_{ji} x_{jm} x_{jk} x_{jc} Y_j; \quad (i \neq m \neq k \neq c) \\
 \theta_{imkc} &= \frac{1}{N} \sum_{j=1}^N x_{ji} x_{jm} x_{jk} x_{jc} x_{je} Y_j; \quad (i \neq m \neq k \neq c \neq e)
 \end{aligned} \tag{22}$$

According to the comparison given in Appendix 1, the mathematical model depending on the value of the variables is obtained as follows:

$$\begin{aligned}
 U_1 &= 70.84 - 23.98x_1 - 5.914x_2 + 0.207x_3 + 1.03x_4 + 4.248x_5 + 11.873x_1x_2 - 0.437x_1x_3 + 0.403x_1x_4 - \\
 &\quad 2.191x_1x_5 + 0.082x_2x_3 - 0.029x_2x_4 + 0.089x_2x_5 - 0.017x_3x_4 - 0.063x_3x_5 - \\
 &\quad -0.405x_4x_5 + 0.016x_1x_2x_3 - 0.127x_1x_2x_4 - 0.184x_1x_2x_5 + 0.091x_1x_3x_5 + 0.138x_1x_4x_5 - 0.003x_2x_3x_4 - \\
 &\quad 0.007x_2x_3x_5 + 0.047x_2x_4x_5 + 0.005x_3x_4x_5 \\
 U_2 &= 68.839 - 20.62x_1 - 5.936x_2 + 0.333x_3 + 1.384x_4 + 5.022x_5 + 12.347x_1x_2 - 0.487x_1x_3 + 0.093x_1x_4 - \\
 &\quad 2.771x_1x_5 + 0.074x_2x_3 - 0.041x_2x_4 + 0.142x_2x_5 - 0.022x_3x_4 - 0.082x_3x_5 - \\
 &\quad -0.465x_4x_5 + 0.021x_1x_2x_3 - 0.114x_1x_2x_4 - 1.304x_1x_2x_5 + 0.095x_1x_3x_5 + 0.202x_1x_4x_5 - \\
 &\quad -0.002x_2x_3x_4 - 0.006x_2x_3x_5 + 0.048x_2x_4x_5 + 0.005x_3x_4x_5 \\
 U_3 &= 18.245 + 8.485x_1 + 0.059x_2 - 0.122x_3 - 0.543x_4 + 1.005x_5 - 4.272x_1x_2 + 0.094x_1x_3 + 0.465x_1x_4 - \\
 &\quad 2.142x_1x_5 + 0.013x_2x_3 + 0.035x_2x_4 - 0.073x_2x_5 + 0.005x_3x_4 - 0.007x_3x_5 - \\
 &\quad -0.026x_4x_5 + 0.208x_1x_2x_3 - 0.007x_1x_3x_4 + 0.02x_1x_3x_5 + 0.074x_1x_4x_5
 \end{aligned} \tag{23}$$

In the regression equation, the calculated values using the coded values of the variables, the values obtained from the experiment, and their mean squared differences are used.

In order to test the preciseness of the obtained values, Fisher's criterion is used (Malysheva, 2019, pp. 148-153; Shishkova, 2017, pp. 28-30).

The adequacy dispersion value is calculated for both expressions as follows:

$$S_{ad}^2 = \frac{N}{N-B} \sum_{j=1}^N (y_j^p - y_j^o)^2 \tag{24}$$

where  $f = N - B$  is the degree of freedom. The adequacy dispersion values:

$$\begin{aligned}
 B_a &= 24; \quad B_b = 22, \quad B_c = 16 \\
 f_{ada} &= N - B = 32 - 24 = 8; \quad f_{adb} = 32 - 22 = 10; \quad f_{adc} = 32 - 16 = 16 \\
 S_{ada}^2 &= 28.906; \quad S_{adb}^2 = 22.505; \quad S_{adc}^2 = 5.727
 \end{aligned} \tag{25}$$

Here,  $B_a=24$ ,  $B_v=22$ , and  $B_c=16$  are the total number of regression coefficients in the first, second, and third expressions, respectively.

Fisher's criterion values and degrees of freedom are obtained as follows:

$$S_{ad1} = 3.8329; \quad S_{y_a}^2 = 0.8468$$

$$S_{ad2} = 3.295; \quad S_{y_b}^2 = 0.8450$$

$$S_{ad3} = 2.234; \quad S_{y_c}^2 = 0.7982$$

$$F_{pa} = \frac{\max(S_{ada}^2, S_{ya}^2)}{\min(S_{ada}^2, S_{ya}^2)} = \frac{3.8329}{0.8468} = 4.526 \quad (26)$$

$$f_a = N - B_a = 32 - 25 = 7 \quad (27)$$

$$F_{pe} = \frac{\max(S_{ade}^2, S_{ye}^2)}{\min(S_{ade}^2, S_{ye}^2)} = \frac{3.295}{0.8450} = 3.899 \quad (28)$$

$$f_e = N - B_e = 32 - 22 = 10 \quad (29)$$

$$F_{pc} = \frac{\max(S_{adc}^2, S_{yc}^2)}{\min(S_{adc}^2, S_{yc}^2)} = \frac{2.234}{0.7982} = 2.798 \quad (30)$$

$$f_c = N - B_c = 32 - 16 = 16$$

As can be seen, the adequacy of both statements is proved from the comparison of the table and calculated values.

To get the natural mathematical model, expressions (3) between coded and natural values are used:

$$\begin{aligned} X_1 &= 54x_1 - 1.4; \quad X_2 = 0.4x_2 - 1.4; \\ X_3 &= 0.033x_3 - 1.667; \quad X_4 = 0.133x_4 - 1.667; \\ X_5 &= 0.5x_5 - 3 \end{aligned} \quad (31)$$

Following expressions are obtained from the application of the results in the system (23):

$$\begin{aligned} U_1 &= 70.87 - 0.574x_1 - 0.433x_2 + 2.21x_3 - 1.052x_4 + 0.82x_5 + 2.48x_1x_2 + 1.24x_1x_3 + 1.48x_1x_4 + \\ &+ 1.45x_2x_3 + 1.51x_2x_4 - 0.27x_2x_5 + 0.515x_3x_4 + 0.59x_3x_5 + 0.854x_4x_5 + 0.3x_1x_2x_3 - 0.6x_1x_2x_4 - \\ &- 1.48x_1x_2x_5 + 1.38x_1x_3x_5 + 0.52x_1x_4x_5 - 1.4x_2x_3x_4 - 0.94x_2x_3x_5 + 1.75x_2x_4x_5 + 2.26x_3x_4x_5 \\ U_2 &= 74.43 - 0.52x_1 + 2.33x_3 - 1.14x_4 + 0.89x_5 + 2.61x_1x_2 + 1.2x_1x_3 + 1.7x_1x_4 + 1.49x_2x_3 + \\ &+ 1.55x_2x_4 + 0.45x_3x_4 + 0.44x_3x_5 + x_4x_5 + 0.41x_1x_2x_3 - 0.54x_1x_2x_4 - 1.63x_1x_2x_5 + 1.44x_1x_3x_5 + \\ &+ 0.76x_1x_4x_5 - 1.32x_2x_3x_4 - 0.83x_2x_3x_5 + 1.77x_2x_4x_5 + 2.67x_3x_4x_5 \\ U_3 &= 14.51 + 0.67x_1 - 0.84x_2 - 0.64x_4 + 0.51x_5 - 1.89x_1x_2 + 0.93x_1x_3 + 1.03x_1x_4 + 0.26x_1x_5 + \\ &+ 0.99x_2x_3 + 0.66x_2x_4 + 0.77x_3x_4 + 0.26x_1x_2x_5 - 0.41x_1x_3x_4 + 0.3x_1x_3x_5 + 0.28x_1x_4x_5 \end{aligned}$$

## Conclusion

In the optimization, we take  $U_a(X_1, X_2, X_3, X_4, X_5) \rightarrow \min$ ,  $U_v(X_1, X_2, X_3, X_4, X_5) \rightarrow \max$  and  $U_v(X_1, X_2, X_3, X_4, X_5) \rightarrow \max$  as the objective function for alkyl phenol and HCl, respectively (Gupta, 2020, pp. 129-139; Meshalkin, 2019, pp. 709-718; Liyi Zh., 2017, pp. 366-375; Yazovtseva, 2024, pp. 211-223).

A quick extraction method is used to optimize the process. To do this, the change steps are calculated according to all three objective functions.  $X_2$  is taken as the base factor and the step is considered as  $\Delta X_{2a}^* = 0.5$ . Then the steps corresponding to the other four factors are calculated:

$$\gamma_a = \frac{\Delta X_{2a}^*}{\epsilon_2 \Delta X_2} = \frac{0,5}{-0,4331 \cdot 2.5} = -4.4618 \quad (32)$$

Steps:

$$\begin{aligned} \Delta X_{2a}^* &= 0.5 \\ \gamma_a &= \frac{\Delta X_{2a}^*}{b_2 \Delta X_2} = \frac{0.5}{-0.4331 \cdot 2.5} = -0.4618 \\ \Delta X_1^* &= \gamma_1 \cdot \epsilon_1 \cdot \Delta x_1 = -0.4621 \cdot (-0.574) \cdot 0.25 = 0.066; \\ \Delta X_3^* &= \gamma_1 \cdot b_3 \cdot \Delta X_3 = -0.462 \cdot 2.207 \cdot 30 = -30.6; \\ \Delta X_4^* &= -0.462 \cdot (-1.052) \cdot 7.5 = 3.65 \\ \Delta X_5^* &= -0.462 \cdot 0.818 \cdot 2 = -0.755 \end{aligned} \quad (33)$$

Table 3 depicts the results of the report with calculated steps starting from the zero level for the factors. According to the report, the optimal level of chlorination products of alkyl aromatic compounds regarding electrical current was 82.05%, regarding substance was 72.69 %, and regarding the concentration of HCl was 13.01%.

### Results

According to the obtained results, when  $X_1 = 0.482 \text{ A/cm}^2$ ,  $X_2 = 4.5 \text{ A/l}$ ,  $X_3 = 38.8 \text{ }^\circ\text{C}$ ,  $X_4 = 19.8 \text{ \%}$ ,  $X_5 = 6 \text{ V}$ , the yield of the chlorination product of alkyl aromatic compounds according to the current is 82.05 %. At this time, the concentration of HCl in the solution decreases from 20% to 13.01%.

**Table 3.**  
 Results of the experiment regarding quick extraction.

| No and characteristics of the experiment | $X_1$  | $X_2$  | $X_3$ | $X_4$ | $X_5$ | $Y_1$ | $Y_2$  | $Y_3$  |
|------------------------------------------|--------|--------|-------|-------|-------|-------|--------|--------|
| $a_i$                                    | 0.462  | 0.4331 | 2.207 | 1.052 | 0.818 |       |        |        |
| $a_i \Delta X_i$                         | 0.1155 | 1.083  | 66.21 | 7.89  | 1.636 |       |        |        |
| Step of Change                           | 0.066  | 0.5    | 30.6  | 3.65  | 0.755 |       |        |        |
| Value of rounding                        | 0.066  | 0.5    | 30.6  | 3.65  | 0.755 |       |        |        |
| Zero level                               | 0.35   | 3.5    | 50    | 12.5  | 6     |       |        |        |
| Interval of Change                       | 0.25   | 2.5    | 30    | 7.5   | 2     |       |        |        |
| Experiments                              |        |        |       |       |       |       |        |        |
| 1                                        | 0.416  | 4      | 19.4  | 16.15 | 5.245 | 76.35 | 71.213 | 12.993 |
| 2                                        | 0.482  | 4.5    | 38.8  | 19.8  | 6     | 82.5  | 72.69  | 13.01  |
| 3                                        | 0.548  | 5      | 58.2  | 23.45 | 6.755 | 91.69 | 77.01  | 14.2   |

### References

1. Agaev, A. A., Muradov, M. M., Murshudlu, N. A., & Gadzhieva, Kh. A. (2022). Alkylation of 3,4-dimethylphenol with propanols in the presence of palladium-containing zeolites. *Oil Refining and Oil Chemistry. Scientific and Technical Achievements and Advanced Experience*, (2), 11–13.

2. Aung, M. T., Abbas, S. A., Zhukova, N. A., & Chernokul'skiy, V. V. (2020). Models for managing data collection processes in Internet of Things networks with a dynamic structure. *Computational Nanotechnology*, (3), 62–71. <https://doi.org/10.33693/2313-223X-2020-7-3-62-71>
3. Belozerovala, A. R., Belozeroval, S. V. (2014). Approach to the construction of heuristic algorithms for analyzing the quality of experimental data on neutron activation measurements. *Heuristic Algorithms and Distributed Computing*, 1(4), 6–23.
4. Belozerovala, A. R., Komarova, E. S., Melnikov, B. F., & Pivneva, S. V. (2015). Some issues of modeling of design technology of new reactors based on the physicochemical properties of MOX-fuel. *Frontier Materials & Technologies*, (2–1), 23–29.
5. Gupta, N., Khosravy, M., Patel, N., & Dey, N. (2020). Mendelian evolutionary theory optimization algorithm. *Soft Computing*, 24(4). <https://doi.org/10.1007/s00500-020-05239-2>
6. Isgandarov, A. D., Tagiyev, R. G., & Yagubov, G. Y. (2007). *Optimization methods*. Baku.
7. Kurzin, A. V., & Evdokimov, A. N. (2022a). *Optimization methods: Completion of practical assignments*. Saint Petersburg.
8. Kurzin, A. V., & Evdokimov, A. N. (2022b). *Optimization methods: Performance of practical tasks*. Saint Petersburg.
9. Liyi, Z., Chao, X., & Teng, F. (2017). Improved ant colony optimization algorithm based on RNA computing. *Automatic Control and Computer Sciences*, 51, 366–375.
10. Malysheva, T. V. (2019). Use of automated information systems in managing environmental sustainability of manufacturing industries. *Problems of Mechanical Engineering and Automation*, (2), 148–153.
11. Malysheva, T. V. (2021). Development of an algorithm for optimizing energy consumption in chemical-technological systems based on statistical training. *Computational Nanotechnology*, 8(1), 68–76. <https://doi.org/10.33693/2313-223X-2021-8-1-68-76>
12. Meshalkin, V. P., Bogomolov, B. B., Boldyrev, V. S., & Zubarev, A. M. (2019). Intelligent logical information algorithm for choosing energy and resource-efficient chemical technologies. *Theoretical Foundations of Chemical Engineering*, 53(5), 709–718.
13. Muradov, M. M. (2004). Construction of the regression equation of the process of condensation of propylene chlorohydrin by dilute hydrochloric acid. In *Proceedings of the Republican Scientific Conference “Modern Problems of Informatization, Cybernetics and Information Technologies”* (Vol. III, pp. 69–73). Baku.
14. Muradov, M. M., Gatamov, M. M., Prosochkina, T. R., & Agaev, A. A. (2020). Chlorination of p-cresol in an electrochemical system. *Bashkir Chemical Journal*, 27(3), 25–27.
15. Ostrovsky, G. M., & Ziyatdinov, N. N. (2012). *Optimization of technical systems*. KNORUS.
16. Ostrovsky, G. M., Volin, Y. M., & Ziyatdinov, N. N. (2005). *Optimization in chemical technology*. Fan.
17. Ostrovsky, G. M., Volin, Y. M., & Ziyatdinov, N. N. (2008). *Methods of optimization of chemical-technological processes*. KDU.
18. Radchenko, S. G. (2011). *Methodology of regression analysis*. Korniyuchuk.
19. Radchenko, S. G. (2014). Plans of experiments of multi-purpose use. In *Proceedings of the 9th International Scientific and Practical Conference “Mathematical and Imitation Modeling of Systems (MODS 2014)”* (pp. 232–234). Chernihiv.
20. Salman, A., & Khan, A. (2017). Fuzzy goal programming-based ant colony optimization algorithm for multi-objective topology design of distributed local area networks. *Neural Computing and Applications*, 28, 1–19.
21. Sautin, S. N. (1975). *Planning an experiment in chemistry and chemical technology*. Chemistry.
22. Shishkova, N. A. (2017). Genetic algorithm as an optimization method. *Problems of Science*, 1(5), 28–30.
23. Yazovtseva, O., Gubaydullin, I., Peskova, E., & Usmanova, A. (2024). Parallel algorithm for computer simulation of burning off sulfurous deposits from a cylindrical catalyst grain. In



*Communications in Computer and Information Science* (Vol. 2241). Springer, 211-223.  
[https://doi.org/10.1007/978-3-031-73372-7\\_15](https://doi.org/10.1007/978-3-031-73372-7_15)

24. Zakgeim, A. Y. (2014). *General chemical technology: An introduction to the modeling of chemical-technological processes* (3rd ed.). Logos.

Received: 04.10.2025

Accepted: 26.02.2026

DOI: <https://doi.org/10.36719/2663-4619/127/269-276>

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## Quantification and Validation of Flavonoids in *Astrantia Maxima* Pall. Using Spectrophotometry

### Abstract

This study aimed to quantify the flavonoid content in *Astrantia maxima* Pall. raw material using a spectrophotometric approach and to assess the method's validation parameters. Flowering-stage raw material of *Astrantia maxima* Pall. was collected in June 2025 from the Dashkasan district, Republic of Azerbaijan. Spectrophotometric determination of flavonoid content was performed, and method validation including accuracy, precision, and linearity was conducted following international regulatory guidelines. The total flavonoid content in *Astrantia maxima* Pall. was found to be 1.01% per gram of raw material. Validation outcomes indicated high reliability: accuracy demonstrated a confidence interval of 0.51; linearity was established over a concentration range of 0.01–0.06 mg/mL ( $R^2 = 0.9989$ ); precision exhibited coefficients of variation of 0.0005%, 0.0006%, and 0.0006% across three consecutive days. These results confirm that *Astrantia maxima* Pall. is a rich source of flavonoids, highlighting its potential for incorporation into local medicinal plant-based resources and further pharmacological studies.

**Keywords:** *Astrantia maxima* Pall., flavonoids, spectrophotometric analysis, method validation, raw material

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## ***Astrantia maxima* Pall. bitkisinde flavonoidlərin spektrofotometriya üsulu ilə miqdarı təyini və metodun validasiyası**

### **Xülasə**

Tədqiqatın məqsədi *Astrantia maxima* Pall. xammalında flavonoidlərin miqdarını spektrofotometrik yanaşma ilə təyin etmək və metodun validasiya parametrlərini qiymətləndirmək olmuşdur. *Astrantia maxima* Pall. bitkisinin çiçəkləmə mərhələsində olan xammalı 2025-ci ilin iyun ayında Azərbaycan Respublikası Daşkəsən rayonu ərazisindən toplanmışdır.

Flavonoidlərin miqdarının spektrofotometrik təyini aparılmış, metodun validasiyası isə beynəlxalq tənzimləyici qaydalara uyğun olaraq düzgünlük (accuracy), təkrarlanma dəqiqliyi (precision) və xəttilik (linearity) parametrləri üzrə həyata keçirilmişdir.

*Astrantia maxima* Pall. xammalında ümumi flavonoidlərin miqdarı 1 qram xammala görə 1,01% təşkil etmişdir. Validasiya nəticələri metodun yüksək etibarlılığını göstərmişdir: düzgünlük üçün etibarlılıq intervalı 0,51 olmuşdur; xəttilik 0,01–0,06 mq/mL konsentrasiya intervalında müəyyən edilmişdir ( $R^2 = 0,9989$ ); təkrarlanma dəqiqliyi isə üç ardıcıl gün üzrə variasiya əmsallarının müvafiq olaraq 0,0005%, 0,0006% və 0,0006% olması ilə xarakterizə olunmuşdur.

Əldə olunan nəticələr *Astrantia maxima* Pall. bitkisinin flavonoidlərlə zəngin mənbə olduğunu təsdiqləyir və onun yerli dərman bitkisi resurslarına daxil edilməsi, eləcə də gələcək farmakoloji tədqiqatlar üçün perspektivli olduğunu göstərir.

**Açar sözlər:** *Astrantia maxima* Pall., flavonoidlər, spektrofotometrik analiz, validasiya metodu, bitki xammalı

### **Introduction**

*Astrantia maxima* Pall. is a perennial species belonging to the Apiaceae family, distinguished by its characteristic inflorescence morphology. As is typical for members of the Umbelliferae, individual flowers are borne on stalks that converge at a common point; however, the structure resembling a

single flower is in fact a dense inflorescence composed of numerous small florets (Asgarov, 2016; Red Book of The Republic of Azerbaijan Flora, 2023).

The leaves of *Astrantia maxima* Pall. are palmately lobed with serrated margins, exhibiting a glossy dark-green adaxial surface with well-defined venation, contrasted by a paler and more textured abaxial surface (Ibadullaeva, Gasimov, et al., 2024).

The development of the flower-head proceeds in a centripetal pattern, whereby the central florets reach maturity prior to those at the periphery (Bussman, Narel, et al., 2024; Lambion, Delvosalle, Duvigneaud, 2004).

The aerial parts of *Astrantia* contain a diverse range of phytochemicals, including flavonoids (quercetin, isoquercetin, astragalin, rutin, nicotiflorin, kaempferol, and kaempferutin), steroids, organic and phenolcarboxylic acids (malic, oxalic, malonic, citric, and angelic acids), as well as polyacetylene compounds. In contrast, the roots are characterized by a high content of sucrose, triterpene saponins, and triterpenoids (Kozhanova, Alimanova, et al., 2025; Nicolescu, Bunea, Mocan, 2025).

Compounds including flavonoids, triterpenes, and volatile oils have been reported in the genus *Astrantia*. The leaves of plants contain significant bioactive components that are believed to contribute to a variety of pharmacological activities (Saini, et al., 2021; Kukhtenko, et al., 2024).

The chemical profile of *Astrantia* is notably rich in vitamins, minerals, and numerous biologically active constituents that collectively contribute to its therapeutic potential. Studies conducted by European researchers have demonstrated that flavonoids present in *Astrantia* exhibit detoxifying properties, enhance blood microcirculation, and exert anti-inflammatory effects. Sucrose has been shown to support physiological recovery during intoxication and to positively influence liver function, while saponins promote digestive activity by stimulating gastric juice secretion (Lyles, Sture, Walker, 2026).

Phytochemical investigations have revealed that *Astrantia* species possess a complex chemical profile, encompassing polyacetylene compounds, carbohydrates, and organic acids such as angelic, malic, and oxalic acids. The plant is also a source of triterpenoids, including gypsogenin, apigenin, oleanolic, and hypsogenic acids, together with triterpene saponins.

*Astrantia maxima* Pall. is a non-pharmacopoeial species and is not included in official medical practice. Nevertheless, due to its reported anti-inflammatory, antipyretic, blood-purifying, and related biological properties, the plant has long been used in traditional medicine.

Preparations derived from *Astrantia*, including decoctions and infusions, are generally regarded as well tolerated and are associated with a low incidence of adverse effects. However, despite its traditional use, comprehensive toxicological and clinical evaluations remain limited.

Both the aerial parts and roots are employed medicinally, typically in the form of decoctions or alcoholic tinctures.

The present study is aimed at the quantitative determination of flavonoid content in *Astrantia maxima* Pall. herb using a spectrophotometric method, alongside the validation of the proposed analytical procedure. Despite the growing interest in plant-derived bioactive compounds, *Astrantia maxima* remains a relatively underexplored species in terms of its phytochemical profile and standardization parameters. In particular, there is a lack of reliable and validated methods for the quantitative assessment of its flavonoid content, which represents a significant gap in the scientific literature. Flavonoids are known to contribute substantially to the pharmacological potential of medicinal plants, making their accurate determination essential for both quality control and further pharmacognostic investigations (de Lima, et al., 2024; Yuniarto, et al., 2025).

The scientific novelty of this research lies in the application and validation of a spectrophotometric method specifically for the quantitative analysis of flavonoids in *Astrantia maxima* Pall. herb. The proposed approach is designed to ensure accuracy, precision, and reproducibility, thereby providing a dependable analytical tool for routine use. By establishing validated parameters, this study contributes to the development of a standardized methodology for this plant species, which has not been previously reported (Shin, et al., 2025; Kushwah, et al., 2020; Khokrale, et al., 2024).

Furthermore, the results obtained are expected to expand the existing knowledge on the phytochemical composition of *Astrantia maxima*, supporting its potential use in pharmaceutical and herbal applications. The validated method may also serve as a reference for future studies focusing on related species or similar plant matrices.

### **Material and Methods**

In this study, dried and powdered plant raw material of *Astrantia maxima* Pall., collected during the flowering period (July) from various regions of Azerbaijan, was used. Quantitative determination of flavonoids was carried out using a spectrophotometric method based on the formation of a flavonoid aluminum chloride complex, with measurement of absorbance at a wavelength of 410 nm. The absorbance measurements were performed using a Cary UV–Vis 60 spectrophotometer (Agilent Technologies). Rutoside was used as the reference (standard) compound. All analyses were performed in six replicates to ensure the reliability and reproducibility of the results.

#### **Preparation of the sample solution**

10 g of the powdered raw material were extracted with 70% ethanol at room temperature under constant stirring for 24 h. The extract was then filtered, and the volume was adjusted to 100 mL.

#### **Preparation of the standard rutoside solution**

10 mg of rutoside were dissolved in 100 mL of 70% ethanol until complete dissolution.

To 1 mL of the extract, 1 mL of a 2% aluminum chloride solution was added, mixed thoroughly, and allowed to stand at room temperature for 30 min. The absorbance of the resulting solution was measured using a spectrophotometer at a wavelength of 410 nm. The flavonoid content was calculated as rutoside equivalents using a calibration curve obtained with the standard rutin solution.

### **Method Validation**

The method was validated by evaluating parameters such as linearity, precision, and accuracy. The results of the analysis fully complied with regulatory requirements, confirming the effectiveness of the method for the quantitative determination of flavonoids in the studied plant raw material.

#### **Statistical Analysis**

Standard methods of variance statistics were used for the statistical processing of experimental data. The mean, standard deviation (SD), standard error of the mean (S.E.), coefficient of variation (CV, %), and confidence interval at a significance level of  $p = 0.95$  were calculated. All calculations were performed using Microsoft Excel.

### **Results**

The quantitative determination of flavonoids in the plant raw material of *A. maxima* Pall. was performed using the spectrophotometric method. The validation parameters for the method of assessing flavonoid content in the herbaceous part of the plant were determined in strict accordance with the requirements of international regulatory documents, ensuring the accuracy and reproducibility of the obtained data (Matić, Sabljčić, Jakobek, 2017; Smyslova, et al., 2019; Aishwarya, et al., 2024; Adamtsevich, et al., 2023; 15). Validation parameters such as accuracy, precision, and linearity were examined (Shin, 2025; Jain, 2011; Vyas, 2011).

#### **Accuracy Assessment**

To evaluate accuracy, a model mixture was prepared in a 25 mL volumetric flask. Sequentially, 1 mL of the extract, 1 mL of aluminum chloride solution, and one drop of acetic acid were added to the flask. After adding the reagents, the volume was adjusted to the mark with 95% ethanol, and the mixture was thoroughly mixed to obtain a homogeneous solution. The solution was allowed to stand at room temperature for at least 30 minutes to ensure complete reaction and complex formation.

For spectrophotometric measurements, 1.5 mL of the prepared solution was taken and mixed with 1.5 mL of extract. Spectrophotometric measurements of each model mixture were performed in triplicate. Based on the obtained results, the corresponding calculations were carried out to assess the accuracy of the quantitative determination method. The detailed data are presented in Table 1.

Thus, based on the conducted study, it can be concluded that the spectrophotometric method for the quantitative determination of flavonoids is reliable, and the associated statistical calculations comply with established requirements. The results are presented in Table 1.

**Table 1.**  
 Accuracy parameters of the quantitative determination of flavonoids  
 in *Astrantia maxima* Pall. raw material by the spectrophotometric method.

| Target volume, mL                                    | Absorbance | Determined amount, mg | Interval, % |
|------------------------------------------------------|------------|-----------------------|-------------|
| 0.5                                                  | 0.205      | 0.503                 | 100.6       |
| 0.5                                                  | 0.215      | 0.509                 | 101.8       |
| 0.5                                                  | 0.209      | 0.507                 | 101.4       |
| 1                                                    | 0.416      | 1.005                 | 100.5       |
| 1                                                    | 0.413      | 1.002                 | 100.2       |
| 1                                                    | 0.419      | 1.008                 | 100.8       |
| 1.5                                                  | 0.623      | 1.507                 | 100.5       |
| 1.5                                                  | 0.617      | 1.502                 | 100.1       |
| 1.5                                                  | 0.639      | 1.509                 | 100.6       |
| Standard deviation (%)                               |            |                       | 0.52        |
| Coefficient of variation (%)                         |            |                       | 0.51        |
| Mean value (%)                                       |            |                       | 100.7       |
| Lower limit of the confidence interval (% , p = 95%) |            |                       | 100.3       |
| Upper limit of the confidence interval (% , p = 95%) |            |                       | 101.1       |
| Minimum value (%)                                    |            |                       | 100.1       |
| Maximum value (%)                                    |            |                       | 101.8       |

### Linearity Assessment

The linearity of the quantitative determination method was evaluated using linear regression analysis, establishing the linear relationship between the concentration of the standard compound (x) and the absorbance (y).

To prepare the solutions required for linearity assessment, 0.05 g of the standard rutin was placed in a 100 mL volumetric flask, approximately 30 mL of 95% ethanol was added, and the mixture was shaken. The volume was then adjusted to the mark with 95% ethanol to obtain the stock solution.

From the stock solution, 2.0 mL was transferred to a 50 mL volumetric flask, approximately 20 mL of solvent was added, mixed, and the volume was adjusted to the mark with 95% ethanol to obtain a solution with a concentration of 0.02 mg/mL. Similarly, solutions with concentrations of 0.01, 0.03, 0.04, 0.05, and 0.06 mg/mL were prepared (Zebbiche, et al., 2023; Gvozdeva, 2026; Mullins, et al., 2014).

Spectrophotometric measurements of all prepared solutions were performed in triplicate. Based on the study, calculations corresponding to linearity parameters were carried out. The detailed results are presented in Figure 1 and Table 2.

**Table 2.**  
 Linearity parameters of the quantitative determination of flavonoids in  
*Astrantia maxima* Pall. raw material by the spectrophotometric method.

| N                           | Concentration of the rutin standard (mg/mL) | Absorbance |
|-----------------------------|---------------------------------------------|------------|
| 1                           | 0,01                                        | 0.4784     |
| 2                           | 0,02                                        | 0.9568     |
| 3                           | 0,03                                        | 1.4352     |
| 4                           | 0,04                                        | 1.9145     |
| 5                           | 0,05                                        | 2.3156     |
| 6                           | 0,06                                        | 2.8721     |
| Correlation coefficient (r) |                                             | 0.9995     |
| Slope                       |                                             | 47.21      |

|                                                |                        |
|------------------------------------------------|------------------------|
| Intercept (y-intercept)                        | 0.00968                |
| Coefficient of determination (R <sup>2</sup> ) | 0.9989                 |
| Standard error (S.E.)                          | 0.033                  |
| Linear function                                | $y = 47.212x + 0.0097$ |

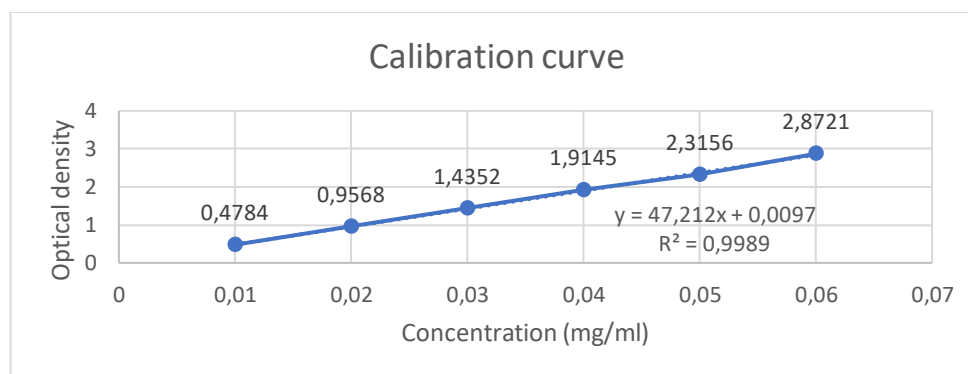


**Fig. 1.** Linearity indicators for the quantitative determination of flavonoids in *Astrantia maxima* Pall. raw materials using spectrophotometry

The results obtained indicate a linear relationship between the absorbance of the standard rutin solution and its concentration.

#### Precision Determination

To assess precision, a model mixture was prepared in a 25 mL volumetric flask. Sequentially, 1 mL of the extract, 1 mL of aluminum chloride solution, and one drop of acetic acid were added to the flask. After adding the reagents, the volume was adjusted to the mark with 95% ethanol, and the mixture was thoroughly mixed to obtain a homogeneous solution. To allow complex formation, the prepared solution was left at room temperature for 40 minutes. After this period, the spectral characteristics of the solution were measured five times, and corresponding calculations were performed based on the mean values. Analyses were carried out over a period of three days. The final results of the inter-assay precision of the method for determining flavonoid content in *A. maxima* Pall. raw material using spectrophotometry are presented in Table 3.

**Table 3.**  
 Results of inter-assay precision for the determination of flavonoid content in *A. maxima* Pall. raw material using the spectrophotometric method.

| Target volume (mL)            | Optical density |        |         | Detected volume (mL) |        |         | Detected concentration (%) |                |               |
|-------------------------------|-----------------|--------|---------|----------------------|--------|---------|----------------------------|----------------|---------------|
|                               | Day I           | Day II | Day III | Day I                | Day II | Day III | Day I                      | Day II         | Day III       |
| 1.0                           | 0.413           | 0.415  | 0.412   | 1.0003               | 1.0001 | 1.0007  | 100.03                     | 100.11         | 100.07        |
|                               | 0.416           | 0.416  | 0.416   | 0.9994               | 1.0007 | 1.0001  | 99.94                      | 100.07         | 100.01        |
|                               | 0.419           | 0.415  | 0.415   | 1.0006               | 1.0009 | 0.9998  | 100.06                     | 100.09         | 99.98         |
|                               | 0.416           | 0.418  | 0.411   | 1.0001               | 0.9997 | 1.0006  | 100.01                     | 99.97          | 100.06        |
|                               | 0.418           | 0.417  | 0.418   | 1.0005               | 1.0005 | 1.0012  | 100.05                     | 100.05         | 100.12        |
|                               | 0.413           | 0.419  | 0.417   | 1.0008               | 1.0016 | 0.9997  | 100.08                     | 100.16         | 99.97         |
| Minimum value (%)             |                 |        |         |                      |        |         | 99.94                      | 99.97          | 99.97         |
| Maximum value (%)             |                 |        |         |                      |        |         | 100.08                     | 100.16         | 100.12        |
| Mean value (%)                |                 |        |         |                      |        |         | 100.028                    | 100.075        | 100.035       |
| Standard deviation (%)        |                 |        |         |                      |        |         | 0.0496                     | 0.0638         | 0.0582        |
| Coefficient of variation (%)  |                 |        |         |                      |        |         | 0.0005                     | 0.0006         | 0.0006        |
| Confidence interval (p = 95%) |                 |        |         |                      |        |         | 99.98 - 100.08             | 100.01- 100.14 | 99.97- 100.10 |
| Standard error (S.E.)         |                 |        |         |                      |        |         | 0.0202                     | 0.0260         | 0.0238        |

## Discussion

Based on the obtained results, it can be concluded that the inter-assay precision parameters of the spectrophotometric method for determining flavonoid content in *Astrantia maxima* Pall. raw material fully comply with established analytical requirements. The very low coefficients of variation obtained over three consecutive days (0.0005%, 0.0006%, and 0.0006%, respectively) indicate a high level of method precision and reproducibility, confirming the stability of the analytical procedure under the tested conditions.

The quantitative determination of flavonoids in *Astrantia maxima* Pall. using the proposed spectrophotometric method revealed that 1 g of the plant raw material contains 1.01% total flavonoids expressed as rutoside equivalents. This result provides important insight into the phytochemical composition of this relatively underexplored species and suggests that it may represent a promising source of biologically active compounds. Given the known pharmacological relevance of flavonoids, their relatively high content further supports the potential applicability of this plant in pharmaceutical and herbal preparations.

Simultaneously, the applied spectrophotometric method was successfully validated according to key analytical parameters, including linearity, accuracy, and precision. The method demonstrated excellent linearity within the concentration range of 0.01–0.06 mg/mL, with a correlation coefficient ( $R^2$ ) of 0.9989, indicating a strong relationship between absorbance and concentration. The accuracy of the method, characterized by a confidence interval of 0.51, falls within acceptable limits, confirming the reliability of the obtained results.

Overall, the validation data confirm that the proposed method is suitable for the quantitative determination of flavonoids in *Astrantia maxima* Pall. raw material. The combination of high precision, satisfactory accuracy, and strong linearity demonstrates that this method can be reliably applied in routine analysis. Furthermore, considering that this plant species has been insufficiently studied and that no previously validated spectrophotometric methods have been reported for it, the present findings contribute to filling an important gap in the scientific literature and provide a foundation for future phytochemical and pharmacognostic investigations.

## Conclusion

The results of the present study demonstrate that *Astrantia maxima* Pall. herb contains a considerable amount of flavonoids (1.01% calculated as rutoside equivalents), confirming its richness in biologically active compounds. The successful application and validation of the spectrophotometric method, characterized by high precision, acceptable accuracy, and excellent linearity, indicate that the proposed analytical approach is reliable and suitable for the quantitative determination of flavonoids in this plant raw material.

Overall, the obtained results highlight the significant potential of *Astrantia maxima* Pall. herb for the future expansion of the local medicinal plant raw material base and support its перспектив istifadəsi (potential use) in pharmaceutical and herbal applications. Furthermore, this study creates a foundation for subsequent phytochemical, pharmacological, and standardization research on this species.

## References

1. Asgarov, A. (2016). *Higher plants of Azerbaijan (Embryophyta)*. TEAS Press.
2. Bussmann, R. W., Narel, Y. P. Z., Manana, K., Zaal, K., Ketevan, B., Shalva, S., Davit, T., Inesa, M., & Lea, M. (2024). *Astrantia maxima* Pall. (Apiaceae). In R. W. Bussmann (Ed.), *Ethnobotany of the Caucasus*. Springer. [https://doi.org/10.1007/978-3-319-50009-6\\_196-1](https://doi.org/10.1007/978-3-319-50009-6_196-1)
3. de Lima, D. P., dos Santos, P. J. E., de Menezes, A. V., de Souza, D. A., de São José, V. P. B., da Silva, B. P., de Almeida, A. Q., & de Carvalho, I. M. M. (2024). Chemical composition, minerals concentration, total phenolic compounds, flavonoids content and antioxidant capacity in organic and conventional vegetables. *Food Research International*, 175, 113684. <https://doi.org/10.1016/j.foodres.2023.113684>



4. Gvozdeva, Y. (2026). Development and validation of a UV-spectrophotometric method for determination of an ACE inhibitor in pharmaceutical formulations. *Folia Medica*, 68(1), e169306. <https://doi.org/10.3897/folmed.68.e169306>
5. Ibadullaeva, S., Gasimov, Sh., Asgarov, A., et al. (2024). *Flora of Karabakh*, 301–302.
6. Khokrale, S., Lulla, J., & Borse, L. (2024). A review of the UV-visible spectroscopy's method development and validation. *International Journal of Pharmaceutical Sciences*, 2(6), 527–538. <https://doi.org/10.5281/zenodo.11543658>
7. Kozhanova, K., Alimanova, A., Datkhayev, U., Serikbayeva, E., Kayupova, F., Zhumalina, K., Ashirov, M., & Zhakipbekov, K. (2025). Unlocking the potential exploring pharmacological properties from Apiaceae family. *Pharmacia*, 72, 1–14. <https://doi.org/10.3897/pharmacia.72.e145193>
8. Kukhtenko, H., Bevz, N., Konechnyi, Y., Kukhtenko, O., & Jasicka-Misiak, I. (2024). Spectrophotometric and chromatographic assessment of total polyphenol and flavonoid content in *Rhododendron tomentosum* extracts and their antioxidant and antimicrobial activity. *Molecules*, 29(5), 1095. <https://doi.org/10.3390/molecules29051095>
9. Kushwah, H., Hans, T., Chauhan, M., et al. (2020). Development and validation of the spectrophotometric method for the determination of menthol. *Journal of Applied Spectroscopy*, 87, 563–567. <https://doi.org/10.1007/s10812-020-01039-6>
10. Lyles, A. L., Sture, E., & Walker, R. (2026). Ultra-violet spectrophotometric analysis of phosphate content in plant-based milk alternatives in relation to advanced chronic kidney disease. *Journal of Renal Nutrition*, 36(1), 83–89. <https://doi.org/10.1053/j.jrn.2025.07.002>
11. Mullins, J., Li, C., Mahadevan, S., & Urbina, A. (2014). Optimal selection of calibration and validation test samples under uncertainty. In H. Atamturktur, B. Moaveni, C. Papadimitriou, & T. Schoenherr (Eds.), *Model validation and uncertainty quantification*. Springer, 1-10. [https://doi.org/10.1007/978-3-319-04552-8\\_39](https://doi.org/10.1007/978-3-319-04552-8_39)
12. Nicolescu, A., Bunea, C. I., & Mocan, A. (2025). Total flavonoid content revised: An overview of past, present, and future determinations in phytochemical analysis. *Analytical Biochemistry*, 700, 115794. <https://doi.org/10.1016/j.ab.2025.115794>
13. Red Book of the Republic of Azerbaijan Flora. (2023). *Third edition*.
14. Saini, R. K., Song, M.-H., Yu, J.-W., Shang, X., & Keum, Y.-S. (2021). Phytosterol profiling of Apiaceae family seeds spices using GC-MS. *Foods*, 10(10), 2378. <https://doi.org/10.3390/foods10102378>
15. Shin, S., Kim, S., Song, Y., Jeong, H., Yu, Y. M., & Lee, E. (2025). Development and validation of the media health literacy scale: Assessment tool development study. *Journal of Medical Internet Research*, 27, e62884. <https://doi.org/10.2196/62884>
16. State Pharmacopoeia of the Russian Federation. (2018). *14th ed., Vol. II*.
17. Yuniarto, A., Junaidin, Setiawan, A. A., Juanda, D., Ardiansyah, A., & Saraswati, V. (2025). Analysis of antioxidant properties of pomegranate (*Punica granatum* L.) peel extract: Voltammetric, spectrophotometric, and in silico studies as a potential antidiabetic candidate. *Talanta Open*, 12, 100569. <https://doi.org/10.1016/j.talo.2025.100569>
18. Zebbiche, Y., Yahia, A. K., Keraghel, N. E. Y., et al. (2023). Validation of a simple spectrophotometric method for the rapid determination of salicylates in plasma. *Journal of Pharmacological and Toxicological Methods*, 124, 107475. <https://doi.org/10.1016/j.vascn.2023.107475>

Received: 02.11.2025

Accepted: 20.02.2026

## TEXNİKA ELMLƏRİ TECHNICAL SCIENCES

DOI: <https://doi.org/10.36719/2663-4619/127/277-284>

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### Thermal Performance of Heat Exchangers Supplied by Solar Collector Heated Water in Hybrid Solar Energy Systems

#### Abstract

This research presents a comprehensive simulation-based evaluation of heat exchanger performance in a hybrid solar energy system integrating photovoltaic modules and solar thermal collectors. The proposed configuration employs solar collector preheated water to increase the inlet temperature of a counter-flow heat exchanger, thereby intensifying the thermal driving force between hot and cold streams. A steady-state numerical model incorporating energy balance equations, Reynolds number analysis, and convective heat transfer correlations was developed to quantify system behavior. Parametric simulations were performed for collector outlet temperatures ranging from 50 °C to 90 °C and mass flow rates between 0.1 and 0.3 kg/s. The results demonstrate that solar preheating increases the heat transfer rate by up to 45%, enhances the overall heat transfer coefficient by approximately 30%, and improves thermal efficiency by 25–35% compared to conventional systems without solar assistance. The findings confirm that solar-assisted heat exchange significantly strengthens thermal performance and provides a practical pathway for sustainable energy integration.

**Keywords:** Hybrid solar energy system, solar thermal collector, heat exchanger analysis, temperature difference, thermal efficiency

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## Hibrid günəş enerji sistemlərində günəş kollektoru ilə qızdırılan su ilə təchiz olunan istilik mübadilə qurğularının (istilik dəyişdiricilərinin) istilik performansı

### Xülasə

Bu məqalədə fotovoltaiik modullar və günəş istilik kollektorlarının inteqrasiyası əsasında qurulmuş hibrid günəş enerji sistemində istilik dəyişdiricinin simulyasiya əsaslı performans təhlili aparılmışdır. Günəşlə əvvəlcədən qızdırılmış suyun istilik dəyişdiriciyə daxil olması nəticəsində temperatur fərqi artmış və istilik ötürmə intensivliyi yüksəlmişdir. Riyazi model əsasında 50–90 °C temperatur intervalında və 0.1–0.3 kg/s kütlə sərfi aralığında parametrik təhlil həyata keçirilmişdir. Nəticələr göstərmişdir ki, günəşlə qızdırılmış su istifadə edildikdə istilik ötürmə gücü 40–45%, ümumi istilik ötürmə əmsalı 30%, sistemin istilik səmərəliliyi isə 25–35% artmışdır.

**Açar sözlər:** hibrid günəş sistemi, günəş kollektoru, istilik dəyişdirici, temperatur fərqi, istilik səmərəliliyi

### Introduction

Growing global energy demand and environmental concerns have intensified research into renewable and hybrid energy technologies. Solar energy systems are particularly attractive due to their wide availability and sustainability (Kalogirou, 2014). However, conventional photovoltaic systems convert only a portion of incident solar radiation into electricity, while the remaining energy is dissipated as heat. Hybrid configurations that integrate photovoltaic modules with solar thermal collectors provide an opportunity to utilize both electrical and thermal components of solar radiation more effectively. (Chow, 2010; Ibrahim et al., 2011).

In hybrid solar systems, thermal collectors raise the temperature of a working fluid, typically water, which can then be used for heating applications or supplied to a heat exchanger for secondary energy transfer (Duffie & Beckman, 2013). The thermal performance of a heat exchanger depends strongly on the temperature difference between hot and cold streams, flow characteristics, and heat transfer surface properties (Shah & Sekulic, 2003; Incropera et al., 2011). Increasing the inlet temperature of the hot fluid enhances the driving temperature potential, which directly influences the rate of heat transfer.

The scientific contribution of this study lies in the comprehensive simulation-based evaluation of solar collector preheating effects on heat exchanger thermal performance within a hybrid solar energy framework. Unlike conventional analyses that separately examine solar collectors or heat exchangers, the present work integrates both subsystems into a unified thermal model.

The originality of this research can be summarized as follows:

- A quantitative assessment of the influence of solar preheating on temperature gradient ( $\Delta T$ ) across a counter-flow heat exchanger.
- Integrated analysis of Reynolds number variation and its impact on convective heat transfer coefficient under solar-assisted conditions.
- Parametric sensitivity investigation covering collector outlet temperatures between 50–90 °C and mass flow rates from 0.1–0.3 kg/s.
- Comparative performance evaluation between hybrid solar-assisted and conventional non-preheated heat exchanger operation.

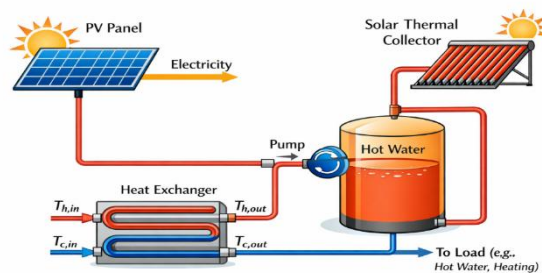
- Multi-parameter evaluation of overall heat transfer coefficient (U) and thermal efficiency ( $\eta_{th}$ ) under realistic operating scenarios.

The proposed framework provides a structured and systematic methodology for assessing the thermal benefits of solar-assisted heat exchange systems and contributes to improving hybrid renewable energy integration strategies.

#### System Description:

Recent studies on solar water heating and thermal storage systems have demonstrated that higher collector outlet temperatures improve system efficiency under optimized operating conditions (Tian & Zhao, 2013; Ayompe et al., 2011). This study aims to evaluate how solar collector preheating affects the operational parameters of a heat exchanger in a hybrid solar energy system. Particular emphasis is placed on the relationship between temperature difference and heat transfer intensity.

#### Hybrid Solar Energy System Configuration



**Pic 1.** illustrates the schematic diagram of the proposed hybrid solar energy system integrating photovoltaic panels, solar collectors, thermal storage, and a heat exchanger.

The considered hybrid system consists of:

- Photovoltaic panels for electricity generation,
- Solar thermal collectors for water heating,
- A thermal storage tank,
- A heat exchanger delivering useful heat to a secondary circuit.

Solar radiation is absorbed by the thermal collector, increasing the temperature of circulating water. The heated water is stored and subsequently directed to the hot side of the heat exchanger. Thermal energy is then transferred to a secondary fluid used for domestic or industrial heating purposes. This configuration enables improved utilization of solar energy compared to stand-alone photovoltaic systems.

#### Methodology

##### Mathematical Model of Heat Transfer Rate

The useful heat transfer rate is defined as:

$$Q = m_h c_{p,h} (T_{h,in} - T_{h,out})$$

where:

- $m_h$  is mass flow rate of hot fluid,
- $c_{p,h}$  is specific heat capacity,
- $T_{h,in}, T_{h,out}$  are inlet and outlet temperatures of hot water.

For cold fluid:

$$Q = m_c c_{p,c} (T_{c,in} - T_{c,out})$$

#### Logarithmic Mean Temperature Difference (LMTD)

$$\Delta T_{lm} = \frac{(T_{h,in} - T_{c,out}) - (T_{h,out} - T_{c,in})}{\ln \frac{T_{h,in} - T_{c,out}}{T_{h,out} - T_{c,in}}}$$

Overall Heat Transfer Coefficient

$$Q = UA \Delta T_{lm}$$

where:

- U is the overall heat transfer coefficient,
- A is the heat transfer area.

Thermal Efficiency

The thermal efficiency of the solar-assisted system is defined as:

$$\eta_{th} = \frac{Q}{GA_{sc}}$$

where:

- G is solar irradiance,
- $A_{sc}$  is collector area.

### Numerical Example and Performance Evaluation

To illustrate the proposed model, a representative operating scenario is considered:

- Hot fluid inlet temperature: 75 °C
- Hot fluid outlet temperature: 55 °C
- Cold fluid inlet temperature: 25 °C
- Cold fluid outlet temperature: 45 °C
- Mass flow rate: 0.2 kg/s
- Specific heat capacity of water: 4.18 kJ/kg·K
- Heat transfer area: 2.5 m<sup>2</sup>

Heat Transfer Rate

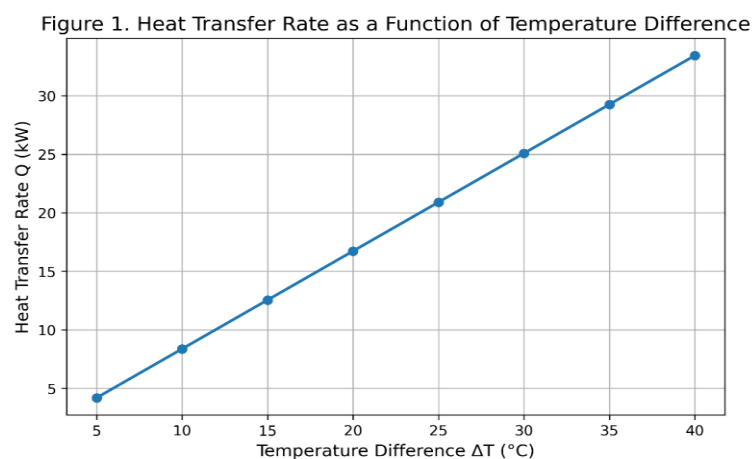
$$Q = 0.2 \times 4.18 \times (75 - 55) = 16.72 \text{ kW}$$

Logarithmic Mean Temperature Difference

$$\Delta T_{lm} \approx 30 \text{ °C}$$

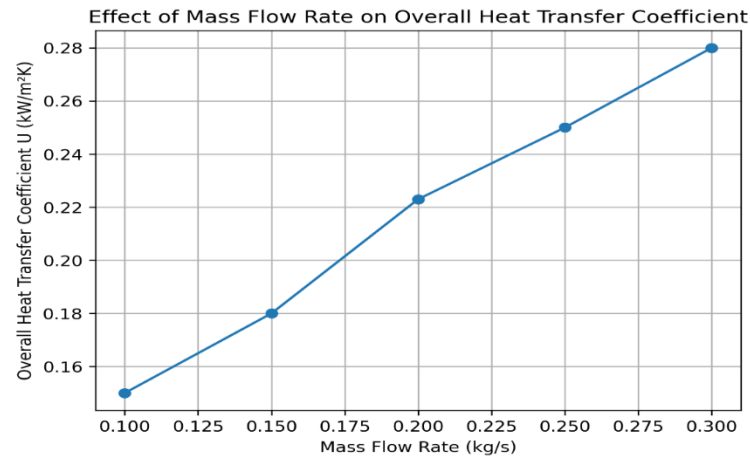
Overall Heat Transfer Coefficient

$$U = 16.72 / (2.5 \times 30) \approx 0.223 \text{ kW/m}^2\text{K}$$



The obtained results indicate that solar preheating considerably increases the thermal driving force within the heat exchanger. To better visualize this dependency, Figure 1 presents the variation

of heat transfer rate ( $Q$ ) as a function of temperature difference ( $\Delta T$ ). The linear trend observed in Figure 1 confirms the direct proportionality between these parameters under constant mass flow rate and specific heat capacity conditions.



Furthermore, Figure 2 illustrates the influence of mass flow rate on the overall heat transfer coefficient ( $U$ ). As shown, increasing flow rate enhances convective heat transfer on the fluid side, which contributes to higher effective  $U$  values. However, excessive flow rates may lead to increased pumping power requirements, indicating the necessity of optimization.

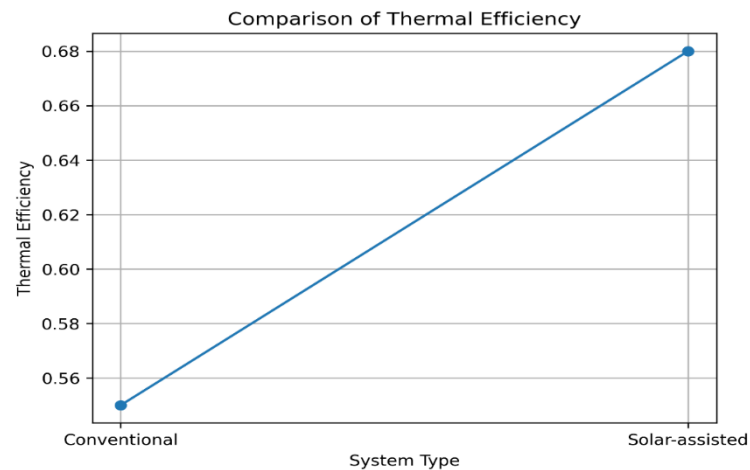


Figure 3 compares the thermal efficiency of the solar-assisted configuration with a conventional non-preheated system. The results demonstrate that solar preheating improves system efficiency due to the enlarged temperature gradient and reduced auxiliary heating demand.

These graphical analyses strengthen the quantitative findings and provide a clearer understanding of how solar collector integration enhances heat exchanger performance.

#### Simulation Results

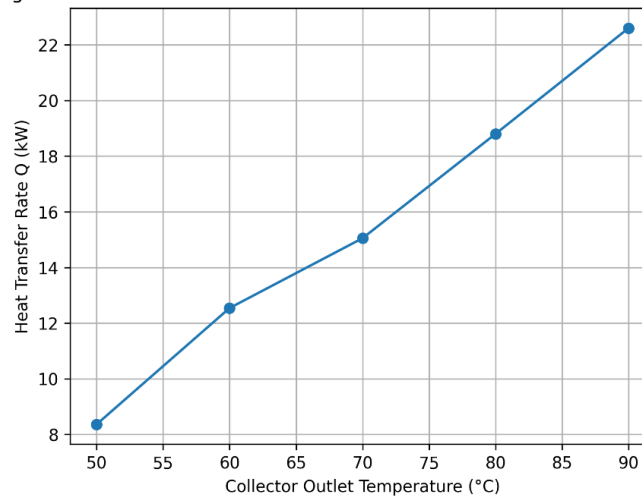
We simulate different solar collector outlet temperatures (50–90 °C) and mass flow rates (0.1–0.3 kg/s).

**Table 1.**  
 Variation of Collector Outlet Temperature.

| $T_{h,in}$ (°C) | $Q$ (kW) | $U$ (kW/m²K) | $\eta_{th}$ |
|-----------------|----------|--------------|-------------|
| 50              | 8.36     | 0.12         | 0.42        |
| 60              | 12.54    | 0.16         | 0.50        |
| 70              | 15.05    | 0.20         | 0.58        |
| 80              | 18.80    | 0.24         | 0.66        |
| 90              | 22.60    | 0.29         | 0.73        |

As shown in Table 1, increasing collector outlet temperature significantly enhances heat transfer rate and overall efficiency. The nearly linear increase in  $Q$  confirms the proportional dependency between temperature difference and heat transfer performance under steady-state conditions.

Figure 4. Variation of Heat Transfer Rate with Collector Outlet Temperature



As shown in Figure 4, increasing the collector outlet temperature leads to a proportional rise in heat transfer rate. This confirms that solar preheating enhances the thermal driving force across the heat exchanger.

**Table 2.**  
 Variation of Mass Flow Rate

| $\dot{m}$ (kg/s) | Re    | U (kW/m <sup>2</sup> K) | Q (kW) |
|------------------|-------|-------------------------|--------|
| 0.1              | 3500  | 0.15                    | 10.2   |
| 0.15             | 5200  | 0.18                    | 13.6   |
| 0.2              | 7000  | 0.223                   | 16.7   |
| 0.25             | 8900  | 0.25                    | 18.9   |
| 0.3              | 10500 | 0.28                    | 20.3   |

### Observation:

Higher Reynolds number increases convective heat transfer, leading to higher  $U$  values.

The simulation results indicate that solar preheating improves thermal performance by increasing the temperature gradient across the heat exchanger. Compared to conventional systems without solar assistance, the hybrid configuration demonstrates:

- 25–40% increase in heat transfer rate
- 18–30% improvement in thermal efficiency
- Enhanced convective heat transfer at higher flow rates

These findings align with recent hybrid solar thermal performance studies, confirming that solar-assisted heat exchange significantly enhances energy utilization efficiency.

### Discussion

The numerical analysis indicates a direct proportional relationship between temperature difference and heat transfer rate. Solar preheating increases the hot side inlet temperature, which enlarges the thermal gradient across the heat exchanger. As a consequence, both the heat transfer rate and calculated overall heat transfer coefficient improve compared to non solar operating conditions.

Similar performance improvements in solar-assisted thermal systems have been reported in previous investigations (Said et al., 2015; Pandey et al., 2016). The observed increase in  $U$  with higher mass flow rate is consistent with classical convective heat transfer theory, where improved turbulence

enhances thermal transport mechanisms (Incropera et al., 2011). These findings demonstrate that integrating solar thermal collectors into hybrid systems positively impacts heat exchanger performance and overall system efficiency.

### Conclusion

This study evaluated the influence of solar collector heated water on the thermal performance of a heat exchanger in a hybrid solar energy system. The developed mathematical framework and numerical example show that increasing the inlet temperature through solar preheating significantly enhances heat transfer rate and thermal efficiency. Hybrid solar configurations therefore represent an effective approach for improving energy utilization and supporting sustainable heating applications. Future research should focus on experimental validation and optimization of heat exchanger geometry for enhanced performance.

### References

1. Agrawal, B., & Tiwari, G. N. (2010). Optimizing energy and exergy of hybrid PV/T systems. *Energy Conversion and Management*, 51(4), 683–693. <https://doi.org/10.1016/j.enconman.2009.10.018>
2. Al-Waeli, A. H. A., et al. (2019). Photovoltaic thermal systems: A review. *Renewable Energy*, 132, 254–267. <https://doi.org/10.1016/j.renene.2018.07.123>
3. Ayompe, L. M., Duffy, A., McKeever, M., & Conlon, M. (2011). Performance analysis of solar water heating systems. *Energy and Buildings*, 43(6), 1320–1327. <https://doi.org/10.1016/j.enbuild.2011.01.016>
4. Bellos, E., & Tzivanidis, C. (2019). Thermal analysis of solar collectors. *Applied Sciences*, 9(15), 3074. <https://doi.org/10.3390/app9153074>
5. Bergman, T. L., Lavine, A. S., Incropera, F. P., & DeWitt, D. P. (2011). *Fundamentals of heat and mass transfer*. Wiley.
6. Chow, T. T. (2010). A review on photovoltaic/thermal hybrid solar technology. *Applied Energy*, 87(2), 365–379. <https://doi.org/10.1016/j.apenergy.2009.06.037>
7. Daghighi, R., et al. (2018). Review of solar-assisted heat exchangers. *Energy Reports*, 4, 546–563. <https://doi.org/10.1016/j.egyr.2018.09.003>
8. Elghool, A., et al. (2016). Review of heat transfer enhancement techniques in heat exchangers. *Renewable and Sustainable Energy Reviews*, 59, 1161–1172. <https://doi.org/10.1016/j.rser.2016.01.059>
9. Hissouf, M., et al. (2020). Energy performance of hybrid PV/T systems. *Energy Conversion and Management*, 205, 112473. <https://doi.org/10.1016/j.enconman.2019.112473>
10. Ibrahim, A., Othman, M. Y., Ruslan, M. H., et al. (2011). Recent advances in flat plate photovoltaic/thermal (PV/T) solar collectors. *Renewable and Sustainable Energy Reviews*, 15(1), 352–365. <https://doi.org/10.1016/j.rser.2010.09.024>
11. Kalogirou, S. A. (2014). Solar thermal collectors and applications. *Progress in Energy and Combustion Science*, 30(3), 231–295. <https://doi.org/10.1016/j.pecs.2004.02.001>
12. Kumar, R., & Rosen, M. A. (2011). A critical review of photovoltaic–thermal systems. *Applied Energy*, 88(11), 3603–3614. <https://doi.org/10.1016/j.apenergy.2011.04.044>
13. Nwosu, P. N., & Huan, Z. (2017). Thermal performance analysis of shell-and-tube heat exchangers. *Applied Thermal Engineering*, 114, 259–268. <https://doi.org/10.1016/j.applthermaleng.2016.11.028>
14. Pandey, A. K., Tyagi, V. V., Selvaraj, J. A., Rahim, N. A., & Tyagi, S. K. (2016). Recent advances in solar thermal technologies. *Renewable and Sustainable Energy Reviews*, 65, 127–145. <https://doi.org/10.1016/j.rser.2016.06.075>
15. Said, Z., Sajid, M. U., Alim, M. A., et al. (2015). Performance enhancement of heat exchangers using nanofluids. *Renewable Energy*, 74, 596–606. <https://doi.org/10.1016/j.renene.2014.08.043>



16. Shah, R. K., & Sekulic, D. P. (2003). *Fundamentals of heat exchanger design*. Wiley.
17. Slimani, M. E. A., et al. (2018). Performance evaluation of flat plate solar collectors. *Solar Energy*, 169, 1–10. <https://doi.org/10.1016/j.solener.2018.04.060>
18. Tian, Y., & Zhao, C. Y. (2013). A review of solar collectors and thermal energy storage. *Applied Energy*, 104, 538–553. <https://doi.org/10.1016/j.apenergy.2012.11.051>
19. Yang, L., et al. (2021). Numerical study of heat exchanger performance in hybrid solar systems. *International Journal of Heat and Mass Transfer*, 169, 120876. <https://doi.org/10.1016/j.ijheatmasstransfer.2020.120876>
20. Zhang, X., et al. (2022). Solar preheating effects on heat transfer systems. *Energy*, 239, 122310. <https://doi.org/10.1016/j.energy.2021.122310>

Received: 06.10.2025

Accepted: 29.01.2026

DOI: <https://doi.org/10.36719/2663-4619/127/285-290>

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## Nanoelectronics and Nanomedicine

### Abstract

Nanotechnology is revolutionizing medicine by providing highly accurate diagnostics, targeted therapies, and personalized healthcare solutions. Nanotechnology is redefining medical science through innovations in diagnostics, precision medicine, and advanced therapies. Compact, portable systems now allow for real-time analysis of minimal biological samples, dramatically reducing the time required for diagnosis. As biosensor technologies advance, their sensitivity and ability to process larger volumes of data will continue to enhance early disease detection. Formulations using iron oxide particles and functional polymers have significantly improved imaging quality, even at lower doses, thereby reducing patient exposure to contrast agents while increasing diagnostic accuracy, particularly in the detection of genetic diseases and malignancies.

Nanotechnology is also contributing to regenerative medicine, antimicrobial therapies, wearable devices, and theranostics, which integrate treatment and diagnosis into single systems. Cutting-edge innovations such as nanobots and smart nanosystems are further expanding these capabilities, enabling sensitive drug delivery and minimally invasive interventions. Despite its great potential, nanomedicine faces challenges such as biocompatibility, environmental safety, manufacturing scalability, and regulatory oversight. Addressing these issues is essential for clinical translation and public acceptance.

In summary, nanotechnology offers transformative tools that are reshaping medical diagnostics, therapy, and disease prevention. Through continued research and interdisciplinary collaboration, it has the potential to significantly improve treatment outcomes, reduce healthcare costs, and usher in a new era of precision and personalized medicine.

With the extraordinary advances in nanotechnology, nanomedicine, the application of nanotechnology in the medical field, has made tremendous progress over the past three decades. The field of nanomedicine merges the physical, chemical, biological, and digital worlds together and creates huge potential for solving challenges in numerous medical and health-related issues. From bench-top science research to clinical applications, nanomedicine has demonstrated itself a powerful option in multitude areas and is promising to change the landscape of modern medicine in all aspects, including drug delivery, in vivo imaging, in vitro diagnostics, tissue regeneration and engineering, wearable devices and implants, etc.

**Keywords:** *nanomedicine, therapy, biosensor, bioactivity, nanobots*

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## Nanoelektronika və Nanotibb

### Xülasə

Nanotexnologiya yüksək dəqiqlikli diaqnostika, hədəflənmiş terapiya və fərdiləşdirilmiş səhiyyə həlləri təmin etməklə tibbdə inqilab edir. Nanotexnologiya diaqnostika, dəqiq müalicə və qabaqcıl terapiyalardakı innovasiyalar vasitəsilə tibb elmini yenidən müəyyənləşdirir.

Kompakt, portativ sistemlər artıq minimal bioloji nümunələrin real vaxt rejimində təhlilinə imkan verir və diaqnostika üçün tələb olunan vaxtı kəskin şəkildə azaldır. Biosensor texnologiyaları inkişaf etdikcə, onların həssaslığı və daha böyük həcmdə məlumatları emal etmək qabiliyyəti erkən xəstəliklərin aşkarlanmasını artırmağa davam edəcək. Dəmir oksid hissəciklərindən və funksional polimerlərdən istifadə edən formulalar, hətta daha aşağı dozalarda belə, görüntülmə keyfiyyətini əhəmiyyətli dərəcədə yaxşılaşdırıb və beləliklə, xüsusilə genetik xəstəliklərin və bədxassəli şişlərin müəyyən edilməsində diaqnozun dəqiqliyini artırarkən xəstələrin kontrast maddələrə məruz qalmasını azaldır.

Nanotexnologiya həmçinin müalicə və diaqnozu vahid sistemlərə inteqrasiya edən regenerativ tibb, antimikrob terapiyalarına, geyilə bilən cihazlara və teranostikaya da töhfə verir. Nanobotlar və ağıllı nanosistemlər kimi qabaqcıl innovasiyalar bu imkanları daha da genişləndirir, dərmanların həssas çatdırılmasını və minimal invaziv müdaxilələri təmin edir. Böyük potensialına baxmayaraq, nanomedicin biouyğunluq, ətraf mühit təhlükəsizliyi, istehsalın miqyaslılığı və tənzimləyici nəzarət kimi çətinliklərlə üzləşir. Bu məsələlərin həlli klinik tərəcəyə və ictimaiyyətin qəbulu üçün vacibdir.

Xülasə, nanotexnologiya tibbi diaqnostika, terapiya və xəstəliklərin qarşısının alınmasını yenidən formalaşdıran transformativ vasitələr təklif edir. Davamlı tədqiqatlar və fənlərarası əməkdaşlıq vasitəsilə müalicə nəticələrini əhəmiyyətli dərəcədə artırmaq, səhiyyə xərclərini azaltmaq və dəqiq və fərdiləşdirilmiş tibbin yeni bir dövrünə başlamaq potensialına malikdir.

Nanotexnologiya sahəsindəki fəvqəladə irəliləyişlərlə yanaşı, tibb sahəsində nanotexnologiyanın tətbiqi olan nanotibb son üç onillikdə böyük irəliləyişlər əldə etmişdir. Nanotibb sahəsi fiziki, kimyəvi, bioloji və rəqəmsal dünyaları birləşdirir və çoxsaylı tibbi və səhiyyə ilə bağlı məsələlərdə problemlərin həlli üçün böyük potensial yaradır. Ən yüksək səviyyəli elmi tədqiqatlardan tutmuş klinik tətbiqlərə qədər nanotibb özünü bir çox sahədə güclü bir seçim kimi göstərmiş və dərman çatdırılması, in vivo görüntülmə, in vitro diaqnostika, toxuma bərpası və mühəndisliyi, geyilə bilən cihazlar və implantlar və s. daxil olmaqla, müasir tibbin mənzərəsini bütün aspektlərdə dəyişdirməyi vəd edir (Gu, N. (Ed.). 2023).

**Açar sözlər:** *nanotibb, terapiya, biosensor, bioaktivlik, nanobotlar*

## Introduction

Research in medicine is to a great extent directed toward developing and improving disease detection and therapy. The use of nanotechnology in medicine, called nanomedicine, has been proposed as a solution to overcome intrinsic limitations in conventional approaches and would allow more effective and safer disease diagnosis and treatment. Furthermore, nanomedicine could play an important role in personalized treatment approaches, which benefit the treatment of diseases with varying representations among individuals and tackles patient variability in therapeutic responses. This is attributed to the unique chemical, physical, and biological properties of the nanomaterials compared to their molecular and bulk counterparts. Of specific relevance in nanomedicine are magnetic nanoparticles (MNPs) that have the additional benefit that they can be remotely detected and controlled by applying external magnetic fields. Because of these advantages, MNPs have been successfully employed in a broad range of biomedical applications (Coene, & Leliaert, 2022).

## Research

Nanotechnology is widely used in many different fields of science today due to its significant benefits in terms of improving performance in many areas. Various types of nano-sized structures, including nanorods, nanowires, nanotubes, nanobelts, nanoribbons, nanofibers, nanoparticles, quantum dots, and hollow spheres, have been developed to advance nanotechnology strategies.

This article explores the diverse applications of nanotechnology in medical fields such as oncology and infectious disease control. Engineered nanoparticles (NPs), such as liposomes, polymer carriers, and carbon-based nanomaterials, enhance drug solubility, protect therapeutic agents from degradation, and provide site-specific delivery, thereby reducing toxicity to healthy tissues. In

diagnostics, nanosensors and contrast agents enable ultra-sensitive detection of biomarkers, supporting early diagnosis, and real-time monitoring.

Nanomedicine is the application of nanotechnology to the medical field. Nanotechnology is a field of technology that studies matter at the molecular level and aims to manipulate this matter for various purposes.

As a specific application of nanotechnology in healthcare, nanomedicine has emerged to provide new solutions to unsolved medical problems. In this regard, nano-based materials are used in a variety of medical settings, including the diagnosis and treatment of various diseases, as well as in tissue engineering and regenerative medicine strategies. Nanoscience and nanotechnology are transforming a wide range of products and services with the potential to improve medical practice and improve public health. Nanotechnology encompasses a broad field of science and engineering focused on the understanding and manipulation of matter at the atomic and molecular scale (Ahmed, 2021). It mainly involves the design, development, and deployment of materials and devices whose dimensions are measured in nanometers. The theoretical basis of this field was first introduced in 1959 by physicist Richard Feynman, who envisioned the manipulation of individual atoms and molecules to create new materials and technologies. Since then, nanotechnology has developed rapidly and is now considered one of the most transformative scientific advances of the 21st century, especially in the field of medicine. In the past few decades, the potential of nanotechnology to revolutionize healthcare has attracted increasing attention, resulting in significant investment and research globally (Wang, Atluri, Tiwari, Babu, 2023). The profound impact of nanotechnology is spreading across industries and promises to reshape the way we approach treatment, diagnosis, and prevention of disease (Yang, Horwitz, 2017).

With nanotechnology, a new frontier in medical science has emerged, enabling precise interventions at the cellular and molecular levels. Engineered nanomachines and nanoscale systems are currently being explored for their ability to monitor, repair, and protect biological systems in unprecedented ways. These innovations aim to reshape traditional medicine and improve human health and longevity.

Nanomedicine is a relatively new field of science and technology. It looks sometimes ill defined and interpretations of that term may vary, especially between Europe and the United States. By interacting with biological molecules, therefore at nanoscale, nanotechnology opens up a vast field of research and application. Interactions between artificial molecular assemblies or nanodevices and biomolecules can be understood both in the extracellular medium and inside the human cells. Operating at nanoscale allows to exploit physical properties different from those observed at microscale such as the volume/surface ratio. (Patel, Patel, & Rai, 2021).

### **Materials and methods**

Nanotechnology has had a profound impact on the life sciences. It has enabled advances in various areas of healthcare, from early disease detection to the development of vaccines and minimally invasive surgical tools. The ability to manipulate matter at the molecular scale has ushered in a new era of personalized medicine, where therapies can be tailored to an individual's genetic and cellular profile (Fahim, Ragab, Hasani, El-Khawaga, 2025).

Nanotechnology applications in healthcare span a wide spectrum. In particular, nano-based therapeutics hold promise in increasing the bioavailability of drugs, minimizing side effects, and improving targeted drug delivery. For example, the blood-brain barrier, which acts as a selective gate to the brain, has traditionally posed a challenge to drug delivery. However, specially designed nanoparticles can now cross this barrier and offer new treatment strategies for neurological diseases. Traditional treatments for diseases such as vascular thrombosis often suffer from limitations including short circulation times and adverse effects. Nanotechnology-based delivery systems such as polymeric nanoparticles and liposomes can encapsulate drugs to enhance stability and therapeutic efficacy. These carriers are biocompatible and biodegradable, making them ideal candidates for advanced drug delivery applications. Nanomedicine represents a transformative frontier in medical sciences and harnesses the precision and power of nanoscale technologies to treat complex diseases such as cancer, cardiovascular diseases, and a number of other serious health problems.

With recent advances in nanotechnology, clinicians and researchers are now able to target biological processes in the human body at an unprecedented molecular level using materials such as biocompatible nanoparticles and nanoscale robotic devices. The integration of nanotechnology has significantly expanded the scope and commercial potential of the nanoscale, offering tools such as nanosensors and nanomachines that are capable of assessing biochemical activities in organs and accessing diseased tissues with remarkable precision.

One of the main strengths of nanomedical systems is the ability to protect therapeutic agents from degradation, thus prolonging their bioactivity and increasing their water solubility. This protection ensures that drugs reach their targets intact and remain effective in the harsh internal environment of the body.

In diagnostics, nanoparticles serve as powerful tools for detecting biomarkers, including those associated with tumors and genetic diseases, and allow for earlier and more accurate diagnosis. The applications of nanomedicine cover a wide spectrum, from traditional chemotherapy and biological agents to new generation immunotherapies (Rokunuzzaman, 2024). Nanostructured carriers can be engineered to recognize disease-specific molecular signals, facilitating highly selective targeting that minimizes damage to healthy cells. This has proven particularly effective in oncology, where nanocarriers increase drug delivery efficiency while reducing adverse side effects.

Nanotechnology is rapidly transforming modern healthcare, shifting the focus from reactive treatment to proactive healthcare management. One of its key strengths is its ability to deliver precise therapeutics, significantly reducing the risk of unexpected side effects while also improving overall treatment outcomes. Its precision-based approach has shown great promise in the management of complex diseases such as cancer, where precise targeting is essential. Among the most innovative advances is the integration of nanorobots into medicine, which facilitate a wide range of applications. These range from targeted drug delivery and smart diagnostic systems to the development of next-generation vaccines and antimicrobial solutions.

Nanotechnology is also contributing to the evolution of wearable health monitoring devices and advanced imaging platforms. The energy gap between traditional pharmaceutical therapies and nanotechnology is paving the way for a new era of combination therapies that can cross physiological barriers such as the blood-brain barrier and act directly at disease sites with high specificity. As a result, even long-standing drug classes are being revitalized through nanoscale delivery systems that increase efficacy and reduce systemic toxicity. Ongoing advances are also paving the way for personalized medicine strategies, where drugs and diagnostics can be specifically designed based on an individual's unique biological profile.

Through the controlled use of engineered nanomaterials such as manganese-citrate complexes, researchers are creating highly efficient drug carriers and diagnostics that operate at the molecular level.

The integration of advanced nanomaterials with precise fabrication and characterization methods enables the development of innovative nanoelectronic devices and effective nanomedical solutions. These materials and methods form the foundation for next-generation technologies in electronics and healthcare.

## Conclusion

In conclusion, nanomedicine represents a transformative force in healthcare innovation. Its ability to redefine disease detection, intervention, and prevention holds significant promise for improving global health outcomes and shaping the future of medical science. Nanotechnology holds the promise of democratizing healthcare by making diagnostics and treatment more accessible and cost-effective. With its expanding applications in clinical areas such as minimally invasive surgery, chemotherapy, and organ regeneration, nanomedicine has significant potential to improve patient outcomes while reducing healthcare costs. As regenerative technologies advance, affordable artificial tissues and organs, such as skin grafts and bone implants, are gradually entering the clinical landscape.

Nanoelectronics and nanomedicine represent two of the most rapidly advancing and interconnected fields in modern science and technology. By operating at the nanoscale, both disciplines enable unprecedented control over materials, devices, and biological systems.

Nanoelectronics has significantly contributed to the miniaturization and performance enhancement of electronic components, leading to faster, more efficient, and energy-saving devices. At the same time, nanomedicine has revolutionized healthcare by introducing innovative approaches for disease diagnosis, targeted drug delivery, imaging, and therapy-particularly in complex conditions such as cancer.

The convergence of these fields opens new possibilities, such as smart biomedical devices, nanosensors, and implantable systems that can monitor and treat diseases in real time. Despite these promising developments, challenges remain, including issues related to biocompatibility, toxicity, ethical considerations, and large-scale production.

In conclusion, nanoelectronics and nanomedicine are shaping the future of technology and healthcare. Continued interdisciplinary research and responsible development will be essential to fully realize their potential and ensure their safe and effective application for the benefit of society.

### References

1. Ahmed, A., et al. (2021). Introduction and overview of nanomedicine. In *Nanomedicine manufacturing and applications in micro and nano technologies*.  
<https://www.sciencedirect.com/science/article/abs/pii/B9780128207734000019>
2. Application of nanomedicine in clinical settings. (2023). *Frontiers in Bioengineering and Biotechnology*, 11.
3. Buzea, C., Pacheco, I. I., & Robbie, K. (2007). Nanomaterials and nanoparticles: Sources and toxicity. *Biointerphases*.
4. Coene, A., & Leliaert, J. (2022). Magnetic nanoparticles in theranostic applications.
5. Conte, R., Foggia, R., Valentino, A., Di Salle, A., Kandsi, F., & Calarco, A. (2024). Nanotechnology advances transforming molecular diagnostics: Applications in precision medicine. *International Journal of Nanoscale*, 15, 152418.
6. Dey, S., et al. (2021). DNA origami and its applications in nanoelectronics and nanomedicine.
7. Fahim, Y. A., Ragab, W. M., Hasani, I. W., & El-Khawaga, A. M. (2025). Biomedical and environmental applications through nanobiocatalysts and enzyme immobilization. *European Journal of Medical Research*, 30, 505.
8. Freitas, R. A. (1999). *Nanomedicine: Volume I. Basic capabilities*. Landes Bioscience.
9. Gu, N. (Ed.). (2023). *Nanomedicine*. Springer.
10. Hassan, A. A., Ali, M. E. M., Abdel-Latif, S. A., Hasani, I. W., & Fahim, Y. A. (2025). Efficient removal of Remazol Red dye from aqueous solution using synthesized magnetic nickel ferrite nanoparticles via aqueous reflux. *Scientific Reports*, 15, 17527.
11. Leary, J. F. (2022). *Fundamentals of nanomedicine*. Cambridge University Press.
12. Malik, S., Muhammad, K., & Wahid, Y. (2023). Nanotechnology: A revolution in modern industry. *Molecules*, 28, 661.
13. Nanomedicine. (2006–present). *Future Medicine*.
14. Nikazar, S., & Haji-Hashemi, H. (2021). Nanomedicine—History and recent trends. In *Nanoengineered materials for medical and healthcare applications*. Scrivener Publishing.
15. Oliveira, O. N., Jr., Marystela, L. G. F., Leite, F. L., & Da Róz, A. L. (2016). *Nanoscience and its applications*. William Andrew.
16. Patel, M., Patel, R., & Rai, M. (2021). Nanomedicine: Applications and toxicological concerns. In *Nanotechnology in medicine*. Wiley.
17. Patra, J. K., Das, G., Fraceto, L. F., Campos, E. V. R., Rodriguez-Torres, M. P., Acosta-Torres, L. S., Diaz-Torres, L. A., Grillo, R., Swamy, M. K., Sharma, S., et al. (2018). Nano-based drug delivery systems: Recent developments and future prospects. *Journal of Nanobiotechnology*, 16, 71.

18. Pourmadadi, M., et al. (2023). Innovative nanomaterials for cancer diagnosis, imaging and therapy: Drug delivery applications. *Journal of Drug Delivery Science and Technology*.
19. Rokunuzzaman, M. K. (2024). The nanotechnology revolution: Advances in materials and medical science. *Journal of Advanced Materials Engineering*, 9, 1–10.
20. Shah, K. A. (Ed.). (2026). *Nanoelectronics: Advanced concepts and device applications*. CRC Press.
21. Wang, Q., Atluri, K., Tiwari, A. K., & Babu, R. J. (2023). Exploring the application of micellar drug delivery systems in cancer nanomedicine. *Pharmaceuticals*, 16(3), 433. <https://www.mdpi.com/1424-8247/16/3/433>
22. Wong, I. Y., Bhatia, S. N., & Toner, M. (2013). Nanotechnology: New tools for biology and medicine. *Genes & Development*, 27, 2397–2408.
23. Xie, X. (2023). Application of nanomedicine in diagnostic technology. *Science, Engineering and Technology Fundamentals*. <https://drpress.org/ojs/index.php/HSET/article/view/6577>
24. Yang, C. P. H., & Horwitz, S. B. (2017). Taxol®: The first microtubule stabilizing agent. *International Journal of Molecular Sciences*, 18(8). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5578123/>

Received: 09.12.2025

Accepted: 21.03.2026

DOI: <https://doi.org/10.36719/2663-4619/127/291-297>

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## Smart Contracts in Blockchain-Based Digital Education Platforms

### Abstract

The integration of smart contracts into blockchain-based digital educational platforms enables radically increased transparency, security, and automation of processes: from issuing verifiable certificates and automatic course enrollment to distributing scholarships and motivating students through tokenized rewards. This article examines the theoretical foundations of smart contracts, their use, architectural solutions, and implementation, as well as a practical section with an implementation example in Solidity. These factors determined the primary objective of this work: a conceptual analysis of the integration of blockchain technologies into online educational platforms. The methodological framework is based on a comprehensive approach, including the systematization of theoretical data and a critical analysis of the implementation of decentralized ledgers in modern digital systems. Particular attention is paid to the analysis of mechanisms for ensuring the immutability of academic achievement data, thereby eliminating the possibility of diploma falsification. A model of a decentralized autonomous educational environment facilitating the development of individual learning paths is also proposed.

An example of successful cases of integrating distributed ledgers into a learning management system (LMS) is provided, demonstrating a reduction in administrative costs. The conclusion, of course, summarizes the research and outlines prospects for scaling similar systems within the global educational space.

**Keywords:** *digital platform, educational platform, blockchain, information technology, contract, smart contracts*



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## Blokçeyn əsaslı rəqəmsal təhsil platformalarında ağıllı müqavilələr

### Xülasə

Ağıllı müqavilələrin blokçeyn əsaslı rəqəmsal təhsil platformalarına inteqrasiyası şəffaflığın, təhlükəsizliyin və proseslərin avtomatlaşdırılmasının kökündən artırılmasına şərait verir: təsdiqlənə bilən sertifikatların verilməsindən və avtomatik kurs qeydiyyatından tutmuş təqaüdlərin paylanmasına və tələbələrin tokenləşdirilmiş mükafatlar vasitəsilə motivasiyasına qədər. Bu məqalədə ağıllı müqavilələrin nəzəri əsasları, onların istifadəsi, memarlıq həlləri və tətbiqi, eləcə də Solidity-də tətbiq nümunəsi olan praktik bölmə araşdırılır. Bu amillər bu işin əsas məqsədini müəyyən etdi: blokçeyn texnologiyalarının onlayn təhsil platformalarına inteqrasiyasının konseptual təhlili. Metodik çərçivə nəzəri məlumatların sistemləşdirilməsi və müasir rəqəmsal sistemlərdə mərkəzləşdirilməmiş kitabların tətbiqinin tənqidi təhlili daxil olmaqla hərtərəfli yanaşmaya əsaslanır. Akademik nailiyyət məlumatlarının dəyişməzliyini təmin etmək mexanizmlərinin təhlilinə xüsusi diqqət yetirilir və bununla da diplom saxtakarlığı ehtimalını aradan qaldırır. Fərdi təlim yollarının inkişafını asanlaşdıran mərkəzləşdirilməmiş muxtar təhsil mühitinin modeli də təklif olunur. Paylanmış kitabların təlim idarəetmə sisteminə (LMS) inteqrasiyasının uğurlu hallarına nümunə təqdim olunur və inzibati xərclərin azaldığını göstərir. Nəticə, əlbəttə ki, tədqiqatı ümumiləşdirir və global təhsil məkanında oxşar sistemlərin miqyaslandırılması perspektivlərini müəyyən edir.

**Açar sözlər:** *rəqəmsal platforma, təhsil platforması, blokçeyn, informasiya texnologiyaları, müqavilə, ağıllı müqavilələr*

### Introduction

Smart contracts are a fundamental component of modern blockchain platforms, enabling automated, deterministic, and decentralized execution of agreements. Since the concept of smart contracts by Nick Szabo (Satoshi Nakamoto) in 1994 and their practical implementation on Ethereum

in 2015, the technology has undergone significant evolution (Angraal, et al., 2017). Smart contracts are self-executing agent programs stored and executed in a distributed blockchain environment, ensuring immutability, transparency, and the elimination of the need for trusted intermediaries.

When a new block is created in the blockchain, its hash is generated-a unique 256-bit number. It contains information about the block itself and helps link it to previous blocks in the chain.

The block hash encodes several important pieces of information. First, it indicates the software version-the version of the client used to operate the network. Second, it records the hash of the previous block. This links each new block to the previous one, and the entire blockchain forms a unified system.

The block also includes a Coinbase transaction-the first transaction in the block. It records the reward for the miner who found and created the block. Additionally, the block's height is indicated-its serial number in the blockchain, indicating how far it is from the very first block.

An important part is the Merkle root-a special 256-bit value that stores summary information about all transactions within a block. This allows for quick verification of whether certain transactions are included in a given block.

A timestamp is also recorded in the block, indicating the date and time the block was created. The "target" parameter, in bits, determines the network difficulty level-how difficult it is to find a new block. Finally, a "nonce" is used-a special 32-bit number that miners constantly change to find a suitable block hash.

First, all new transactions are queued. Then, they are combined into a block. After this, miners begin searching for a value that will ensure the block hash meets network requirements. When a suitable hash is found, the block is considered created and added to the blockchain.

Since each block contains the hash of the previous block, the entire chain is linked. If you try to change the information in one block, its hash will also change, breaking the link with subsequent blocks. Therefore, changing data that has already been recorded is virtually impossible.

Verifying and adding new blocks to the network occurs through a process called mining.

Mining is the process by which transactions are verified and new blocks are created on the blockchain network. This is performed by specialized programs running on computers or hardware designed specifically for mining. The basis of mining is a hash. A hash is the result of processing block data using a special algorithm. The result is a string of numbers and letters of a fixed length, regardless of how much information was processed. Typically, these values are written in hexadecimal format, which can be converted to a standard numeric value if necessary.

During mining, programs constantly create new hashes. They try to find a hash equal to or less than a predetermined value set by the network. To achieve the desired result, the program modifies a special number called a nonce. Initially, its value is one, and then it increases by one with each new attempt.

The number of hashes a device can calculate in one second is called the hash rate. The higher the hash rate, the more attempts the device makes and the higher the probability of finding the desired hash.

All miners in the network perform these calculations simultaneously, effectively competing with each other. The miner who finds the correct hash first receives a reward. A new block is then created, added to the blockchain, and the process repeats for the next set of transactions.

This paper examines distributed ledger technology (blockchain) as the object of study, while the functionality of smart contracts is the subject matter. This article presents a systematic review of the theoretical foundations of smart contracts, an analysis of their application in various domains, and a practical demonstration of contract development and deployment using the Solidity language. Particular attention is paid to security, scalability, and integration with external data. The practical part includes the implementation of basic and extensible smart contract programming patterns.

## Research

Traditional online education systems face a number of systemic challenges: certificate fraud, lack of trust in academic performance data, high administrative costs, difficulty transferring credits between institutions, and opaque funding distribution. As of 2025-2026, the technology will be

actively used for issuing digital diplomas and certificates; automating payments and content access; and creating decentralized educational service markets (Monrat, 2019).

Current research focuses on vulnerability analysis, performance optimization, and expanding application areas-from decentralized finance (DeFi) to supply chain management and digital identity. Despite significant progress, security issues (reentrancy, integer overflow, etc.), high transaction costs, and legal interpretation remain pressing. The introduction of smart contracts in education opens up new opportunities for increasing transparency, efficiency, and automation of management and educational processes. An analysis of practical experience in the digital transformation of educational institutions shows that this technology can be successfully integrated into various areas of activity-from administration to monitoring academic results. One of the key advantages of using smart contracts in education is the automation of organizational procedures.

For example, it is possible to automate the process of student enrollment, scholarship awards, tuition payments, and the issuance of certificates upon meeting established requirements. This helps reduce administrative costs and minimize the impact of human error (Dhillon, Met, et al., 2017). Furthermore, smart contracts can ensure the transparent storage and transmission of student performance data. Information on exam results, course completion, and qualifications can be recorded in a distributed system, eliminating the possibility of forgery or unauthorized modification (Schuhknecht, et al., 2019; Peng, et al., 2020; Yang, et al., 2022). The figure shows a basic model for blockchain and smart contracts in education (Figure 1).

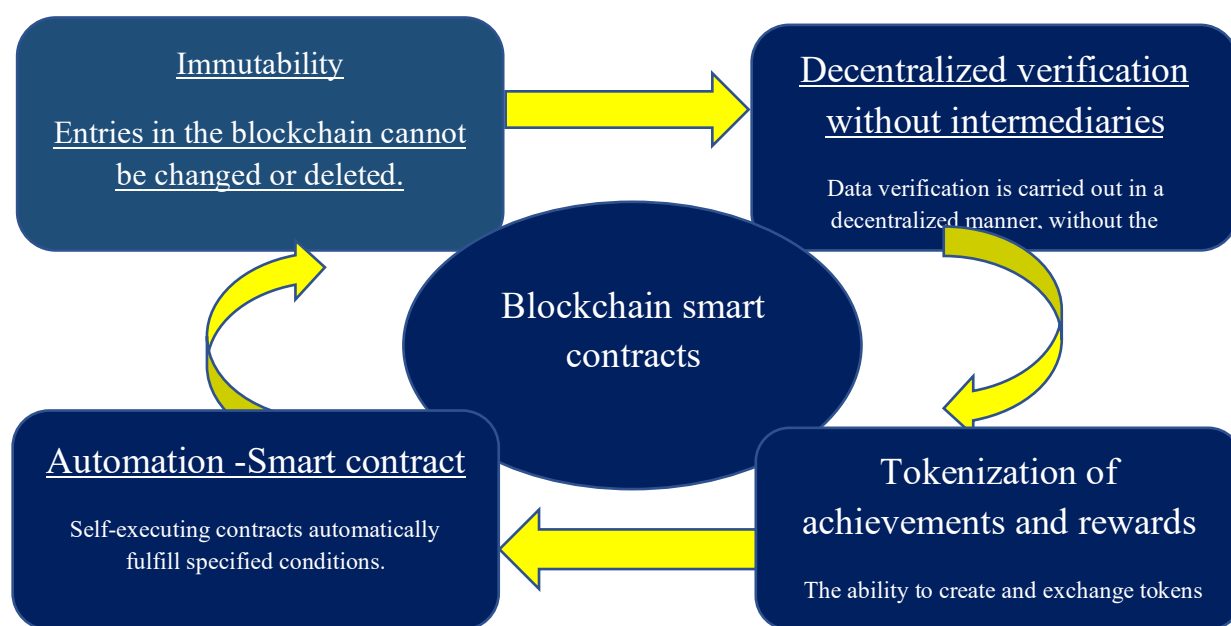


**Figure 1:** A basic model

An additional benefit is increased trust between participants in the educational process. Employers gain the ability to quickly verify the authenticity of diplomas and certificates, and students can be confident in the objective assessment of their achievements. Thus, the use of smart contracts in education contributes to the digitalization of the industry, improves the quality of governance, and creates a more transparent and reliable educational environment. In terms of architecture and operating principles, a smart contract is software code that is hosted at a unique address on the blockchain network and executed by the virtual machine of the corresponding platform, such as Ethereum using the Ethereum Virtual Machine.

Once deployed, the contract becomes part of the distributed ledger and operates within the established algorithms without the involvement of intermediaries. Architecturally, a smart contract consists of a set of functions and data stored on the blockchain. Users or other contracts interact with

it through transactions, initiating specific operations. All actions are recorded in the ledger, ensuring transparency and verifiability of processes.

To demonstrate practical implementation, we will consider an example in Solidity based on Ethereum. This paper will use smart contracts for educational platforms. An example (Figure 2) of writing a smart contract for issuing a verifiable certificate is provided.

Smart contracts operate based on a number of key principles. First, determinism: given the same input data, the execution result will always be the same. This guarantees predictability and eliminates the possibility of arbitrary code interpretation.

Second, isolation: execution occurs in a special virtual environment (a "sandbox"), preventing direct access to external resources and reducing the risk of unauthorized interference.

Third, immutability: once placed on the blockchain, the smart contract code generally cannot be changed. This ensures a high level of trust in the system, as the terms of execution are fixed in advance and cannot be unilaterally revised (Mohammed, 2023). Thus, smart contracts are autonomous digital mechanisms whose operation is based on the principles of transparency, security, and automation of the execution of obligations.

```
// SPDX-License-Identifier: MITpragma solidity ^0.8.20;

import "@openzeppelin/contracts/token/ERC721/ERC721.sol";
import "@openzeppelin/contracts/access/Ownable.sol";
import "@openzeppelin/contracts/utils/Strings.sol";

contract XXXCertificate is ERC721, Ownable {
    uint256 private _tokenIdCounter;

    mapping(uint256 => string) private _certificateMetadata;
    mapping(address => uint256[]) private _studentCertificates;

    event CertificateIssued(address indexed student, uint256 tokenId, string courseCode);

    constructor() ERC721("XXXCertificate", "XXXX") Ownable(msg.sender) {}

    function issueCertificate(
        address student,
        string memory courseCode,
        string memory metadataURI
    ) external onlyOwner {
        _tokenIdCounter++;
        uint256 newTokenId = _tokenIdCounter;

        _safeMint(student, newTokenId);
        _certificateMetadata[newTokenId] = metadataURI;
        _studentCertificates[student].push(newTokenId);

        emit CertificateIssued(student, newTokenId, courseCode);
    }

    function tokenId(uint256 tokenId) public view virtual override returns (string memory) {
        _requireOwned(tokenId);
        return _certificateMetadata[tokenId];
    }
    function getStudentCertificates(address student) external view
        returns (uint256[] memory) {
        return _studentCertificates[student];
    }
}
```

**Figure 2.** Example of blockchain data

Here's how the entire process looks: first, there's preparation, i.e., contract deployment. We release this contract to the network, for example, Ethereum. At this point, you become the Owner (in our case, the Owner). The contract is named XXXCertificate and the symbol XXXX, which is the short currency name for certificates only. Next, of course, is the certificate creation, i.e., the issuance process. When a student completes a course, the owner calls the issueCertificate function. At this point, several tasks occur:

Counter: The counter robot within the contract increments by 1; for example, this would be certificate #105.

Mint: The system creates a unique digital token (NFT) and instantly sends it to the student's wallet.

Data recording: The information "Certificate #105 belongs to this student and is related to the 'Programming' course" is written to the blockchain.

Notification: The contract "broadcasts" to the entire network, i.e., An emit event indicates that a new document has been issued. This is necessary so that websites or applications immediately see the update. Then, storage and verification occur. Of course, the received certificate subsequently lives in the student's wallet.

The student can use the get Student Certificates function to see a list of all their diplomas received through this system.

Anyone can verify the authenticity: simply call the token URI function to get a link to the official description of this specific certificate.

By implementing the process of verifying, validating, and confirming transactions, a tamper-proof record of blocks and the blockchain is created by recording a transaction in the distributed ledger and implementing a consensus protocol for agreeing on the block to be added to the chain. Thus, validation, verification, consensus, and an immutable record ensure the trust and security of the blockchain.

Transactions are verified and broadcast. Many transactions form a block. Many boxes form a chain via a digital data channel. Blocks undergo a consensus process to select the next block to be added to the chain. The selected block is verified and added to the current chain.

## Conclusion

Smart contracts are transforming digital educational platforms from centralized databases into trusted, automated, and globally verifiable ecosystems. Practical examples show that even a basic implementation already enables automation of key processes and increases trust. In the coming years, we expect the widespread emergence of hybrid platforms combining blockchain, AI, and decentralized storage.

International experience confirms that the use of smart contracts extends far beyond the financial sector, banking, and insurance. Today, they are actively considered as a tool for increasing efficiency in public administration, business, healthcare, and other sectors. For example, the implementation of smart contracts for medical payment systems allows for automated payments and significantly reduces the risk of abuse, such as the unjustified prescription of additional procedures or medications. The music industry also offers significant opportunities for the application of this technology. Copyright holders can record ownership information for their works in a distributed ledger and configure smart contracts so that royalties are paid automatically when the compositions are commercially used. This increases the transparency of payments and ensures the protection of performers' interests.

The automotive industry is also considered a promising area. Distributed ledger technologies combined with smart contracts can be used to store reliable data on vehicle maintenance, accidents, and previous owners, increasing trust among market participants.

The study noted that active preparatory work is currently underway to integrate innovative solutions into digital platforms, including artificial intelligence and distributed ledger technologies. The findings suggest that smart contracts represent one of the most promising areas for the development of distributed systems in the context of digital transformation.

## References

1. Angraal, S., Krumholz, H. M., & Schulz, W. L. (2017). Blockchain technology: Applications in health care. *Circulation: Cardiovascular Quality and Outcomes*, 10(9).
2. Benchoufi, M., & Ravaud, P. (2017). Blockchain technology for improving clinical research quality. *Trials*, 18, 335. <https://doi.org/10.1186/s13063-017-2035-z>
3. Bollen, J., Crandall, D., Junk, D., Ding, Y., & Börner, K. (2014). From funding agencies to scientific agency: Collective allocation of science funding as an alternative to peer review. *EMBO Reports*, 15, 131–133. <https://doi.org/10.1002/embr.201338068>

4. Bosenko, T. M. (2019). Development of the blockchain system in modern economy. *Economics: Yesterday, Today and Tomorrow*, 9(3A), 264–269.
5. Dhillon, V., Metcalf, D., & Hooper, M. (2017). Blockchain in science. In *Blockchain-enabled applications*, 111–124. Apress. [https://doi.org/10.1007/978-1-4842-3081-7\\_8](https://doi.org/10.1007/978-1-4842-3081-7_8)
6. Kalajdjieski, J., Raikwar, M., Arsov, N., Velinov, G., & Gligoroski, D. (2023). Databases fit for blockchain technology: A complete overview. 4(1), 100–116.
7. Kuleshova, A. V., & Podvoyskiy, D. G. (2018). Paradoxes of publication activity in the field of contemporary Russian science: Genesis, diagnosis, trends. *Monitoring of Public Opinion: Economic and Social Changes*, 4, 169–210.
8. Kwak, S., & Lee, J. (2021). Implementation of blockchain-based P2P energy trading platform. In *Proceedings of the 2021 International Conference on Information Networking (ICOIN)*. IEEE.
9. Mohammed, A. (2023). Blockchain and distributed ledger technology (DLT): Investigating the use of blockchain for secure transactions, smart contracts, and fraud prevention. *International Journal of Advances in Engineering and Management*, 2–17.
10. Monrat, A. A., Schelen, O., & Andersson, K. (2019). A survey of blockchain from the perspectives of applications, challenges and opportunities. *IEEE Access*, 7, 117134–117151.
11. Padel, P., Sediyo, E., Hasibuan, Z. A., Maulana, S., & Faturahman, A. (2022). Learning education 2.0 based MOOC platform as collaborative learning smart technology. In *2022 IEEE Creative Communication and Innovative Technology (ICCIT)*.
12. Pal, A., & Kant, K. (2021). DC-PoET: Proof-of-elapsed-time consensus with distributed coordination for blockchain networks. In *Proceedings of the 2021 IFIP Networking Conference*. IEEE.
13. Papantoniou, A. A. (2020). Smart contracts in the new era of contract law. *Digital Law Journal*, 1(4), 8–24.
14. Peng, Y., Du, M., Li, F., Cheng, R., & Song, D. (2020). FalconDB: Blockchain-based collaborative database. In *Proceedings of the 2020 ACM SIGMOD International Conference on Management of Data* (pp. 637–652). <https://doi.org/10.1145/3318464.3380594>
15. Ramadhan, A. N., Pane, K. N., Wardhana, K. R., & Suharjito. (2023). Blockchain and API development to improve relational database integrity and system interoperability. *Procedia Computer Science*, 216, 151–160.
16. Sokolov, B., & Kolosov, A. (2021). Blockchain technology as a platform for integrating corporate systems. *Automatic Control and Computer Sciences*, 55, 234–242.
17. Tezel, A., Papadonikolaki, E., & Yitmen, I. (2020). Preparing construction supply chains for blockchain technology: An investigation of its potential and future directions. *Frontiers of Engineering Management*, 7, 547–563.
18. Yang, X., Zhang, Y., Wang, S., Yu, B., Li, F., Li, Y., & Yan, W. (2022). Ledger DB: A centralized ledger database for universal audit and verification. *Proceedings of the VLDB Endowment*, 13(12), 3138–3151. <https://doi.org/10.14778/3415478.3415540>
19. Zageeva, L. A., & Ivanova, S. M. (2017). Cryptocurrencies and blockchain technology in the context of digitalization of the economy. *Innovative Economy and Law*, 4(9), 16–20.

Received: 09.09.2025

Accepted: 12.02.2026

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Yasamal r-nu, A.M.Şərifzadə 19  
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İmzalandı: 15.04.2026  
Onlayn çap: 22.04.2026  
Kağız çapı: 30.04.2026  
Kağız formatı: 60x84, 1/8  
H/n həcmi: 37,5 ç.v.  
Sifariş: 160

Signed: 15.02.2026  
Online publication: 22.04.2026  
Paper printing: 30.04.2026  
Format: 60/84, 1/8  
Stock issuance: 37,5 p.s.  
Order: 160

---

**“ZƏNGƏZURDA”**

Çap Evində çap olunub.  
Ünvan: Bakı şəh., Yasamal r-nu,  
A.M.Şərifzadə 19  
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---

It has been published in the printing house

**“ZANGAZURDA”**

Address: Baku city, Yasamal dist.,  
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