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## Economic Sciences

# The Importance of Marketing Models in Digital Marketing

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**Keywords:** Digital Marketing Models, Strategic Planning, Customer Behavior Analytics, Performance Metrics, Marketing Innovation

### Abstract

The dynamic nature of digital marketing makes it imperative to apply structured frameworks for guiding strategy and execution. Marketing models thus become critical tools for clarity, identifying behavioral patterns, maximizing resource allocation, and measuring success. This study focuses on introducing the concept of marketing models to the digital marketing sector, especially their role in strategic planning, adaptability, and innovation development. It brings an in-depth review of such popular models as SOSTAC, AIDA, and the RACE Framework, marking their uses during the navigation of the complexity that comes along in the digital landscape.

### Introduction

Digital marketing represents the new way of doing things in marketing with consumers. In fact, rapid changes make it very difficult for a marketer to comprehend the way in which technology is going to change consumer behavior. Marketing models are a systematic approach that guides in planning, executing, and evaluating campaigns or initiatives. They help an organization to remain directionally consistent, make sound business decisions, and redirect change as needed (Dwivedi et al., 2020).

Admittedly, digital marketing has changed the way businesses sell and communicate their marketing efforts. However, marketers sometimes find it difficult to deal with the rapid changes in technologies and the fickle tastes and trends of customers. By presenting a rigorous methodology in planning, implementing, and reviewing campaigns or initiatives, marketing models help devise a means to deal with such internal organizational complexity. It is possible through these models to give direction to the organization, improve the management of the decision-making process, and cut across diversities in interpreting change (Antczak, 2024).

By using marketing models, organizations can establish clear directives to take actions that lead to achieving their ends. SOSTAC (Situation, Objectives, Strategy, Tactics, Action, and Control) indicates the most well-known of frameworks intended to create comprehensive marketing plans. Not only does it take care of the alignment of campaigns to organizational goals, but it also ensures that every stage of execution has been well considered. It makes businesses able to anticipate hurdles that need to be overcome and lay out contingency plans preventing disruptions during campaign execution. Besides, SOSTAC applies an iterative mode of operation whereby businesses can look back at their plans and make amends whenever newer data and insights have been gathered, thereby helping make marketing plans relevant and effective (Anggraeni et al., 2024).

One of the biggest benefits of SOSTAC lies in the fact that it will be applicable to every kind of company or industry. A startup can use SOSTAC in build-basic marketing strategies and large businesses can continue to use it for the management of very complicated multi-channel campaigns. To make the whole modeling even more effective in delivering actionable insights, supplementary tools like SWOT (Strengths, Weaknesses, Opportunities, Threats) analyses can fit rather well into the "Situation" phase (Singhrachanabaghel, n.d.).

In digital marketing, the comprehension of customer interaction will help a brand. A model like the AIDA Model (Awareness, Interest, Desire, Action) declares the stages in the journey of the customer, thus allowing marketers to prepare the campaign strategies. For example, awareness content will help improve conversions when followed by a promotion at the action stage. Tools such as heat maps, session recordings, and customer behavior analytics give great insight into understanding user preferences and pain points for more personal marketing (Lee & Trim, 2022).

Behavioral segmentation forms the basis for tailoring content for different customer groups. For instance, the model can be applied to e-commerce where they will be able to know where AIDA customers are dropping off the funnel, and it will enable them to put retargeting ads or optimize the checkout process to fill the gaps. The model enables the creation of emotional connections; thus, a lot will depend on the "Desire" stage, where storytelling and brand values have a place in the impact on particular customers (Wong et al., 2024).

Digital marketing refers to various answering tools that can be used among email and social media to search engines and content marketing. It specifies the use of the Pareto Principle (Rule 80/20) that would guide the marketing people toward those channels and strategies that maximize efficiency in time and resources devoted to them. Drawing from historical data and performance figures, these organizations would bulk allocations toward campaigns that produced the highest returns so that less money is wasted while maximizing revenue from the investment. It leads to better outcomes if 80 percent effort is directed toward the top 20 percent of revenue-generating activities (Khazraje, 2024).

Advanced analytics, such as Google's analytical package and CRM tools, also help further the productivity of resource allocation by providing analyses of the most profitable customer segments and channels. Businesses can assess the findings from these to make necessary adjustments to their marketing mixes; thus, resources find themselves where the highest return is made. In addition, repetitive tasks assigned to the marketers can be automated, freeing up more time to take strategic decisions (Ayci & Tyagi, 2022).

Metrics are the rudiments which tell you how digital marketing effectively works for organizations. RACE Framework comprises Reach, Act, Convert, Engage; it provides a fundamental matrix through which organizations follow their key performance indicators (KPIs) with respect to the customer life cycle. By analyzing details like website traffic, engagement rates, and conversions, they can help businesses sharpen their strategies with metrics. The model even requires continued monitoring and feedback so that marketers can identify poorly-performing components and make timely adjustments to improve results (Chaffey, 2024).

Apart from the standard metrics, RACE also incorporates qualitative feedback for instance customer survey and social media sentiment analysis. This would then mean that performance is evaluated based on qualitative and quantitative measures. The engagement metrics may show high traffic but very few conversions. This would then indicate the requirement for user feedback since aspects like vague call-to-action or irrelevant content would surface (Poecze et al., 2018).

Digital marketing adapts continuously from changes in the environment that appear worthwhile. The materials available to companies for growth in dynamic markets are in the form of the Ansoff Matrix (Market Penetration, Market Development, Product Development, and Diversification). Marketers can analyze risks and opportunities, as well as their effectiveness, from this model. Area penetration for market approach, for example, can improve digital advertising

campaigns and enhance product development with new products for customer needs. This allows an organization to rapidly pivot its strategy according to real-time data to changes in market conditions (Denga et al., 2021).

The Ansoff Matrix requires companies to put in their risk assessment to scale even newly innovative initiatives against established methods. Efforts can be classified as low-risk (penetration) or high-risk (diversification), and thus resources can be allocated on a proportionate basis, therefore, avoiding visiting too much uncertainty (Peterdy, 2023).

They open a common language or framework through which the marketing organization could simply be brought together as a unit. Take, for instance, the case of the Balanced Scorecard. It helps ensure the marketing initiatives fit with the corporate strategy so that these cross-functional teams work holistically on common objectives. A healthy dynamic is created, hence, among departments such as sales, product development, and customer support in this case. It becomes an area of best practices in relationship management at team level where the regular performance review of teams is based on this set of agreed metrics (Carter et al., 2005).

The Balanced Scorecard emphasizes also the inclusion of those 'soft' yet indirect measures such as customer satisfaction and efficiency in internal processes. By doing so, it mobilizes teams around resolving root causes affecting direct outcomes in marketing. Further, it can now include collaborative tools like project management software that will facilitate sharing of transparency and real-time changes across different areas (Academy & Georgiev, 2017).

This is a marketing model that opens up a language or framework through which the marketing organization could simply be brought together as a unit. For example, the Balanced Scorecard ensures marketing initiatives are aligned with the corporate strategy so that these cross-functional teams work holistically on common objectives. Healthy dynamic thus is created, for example, among sales, product development, and customer support departments. In fact, it becomes an area of best practice in team relationship management where the regular review of team performance is based on such agreed metric (Academy & Georgiev, 2017).

The Balanced Scorecard also emphasizes the inclusion of those 'soft' yet indirect measures such as customer satisfaction and efficiency in internal processes. With this, the team mobilizes itself towards solving root causes affecting direct outcomes in marketing. The ability was increased to include collaborative tools such as project management software whereby an added advantage that even further stimulates inclusive transparency and real-time change across areas has now been added (Pelser & Gaffley, 2020).

From an innovative standpoint, digital marketing continues to evolve, and various models have proved successful within that culture, PDCA Cycle being one of them. It stands for Plan, Do, Check, and Act, and it allows for constant iterative testing and improvement, which leads to an environment rich in experimentation and continuous productivity. For example, it enables companies to test different ad creatives and/or landing pages and different formats of content-all to analyze the performance-to know which route is the path most traveled. It is in this very dynamic aspect of PDCA that evolution at making further strategies happens as it is fed with actual ground data, keeping campaigns alive and sustaining relevance (Chakraborty, 2016).

Cultivation of an innovation mind also involves the domain of emerging technologies such as artificial intelligence and machine learning, using the PDCA construct. Example, AI automated A/B testing; Predictions by predictive analytics on campaign outcome results. Operations are streamlined and more accurate and potent than ever for marketers (Rane, 2023).

## Conclusion

As the world of digital marketing changes very fast, a framework becomes more important than ever. Models-in like SOSTAC, a marketing kind of AIDA, and above all, RACE Framework-all enable the business to develop the necessary planning, execution, and evaluation of a campaign.

Besides this, they bring clarity, flexibility, and innovation, which organizations usually need to become successful in view of the competitive environment. The future research could also look at how new technologies, particularly artificial intelligence, can fit into the old model of marketing planning.

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# Управление рисками организации в условиях нестабильности

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Управление рисками в условиях нестабильности представляет собой одну из ключевых задач современного менеджмента. Экономические кризисы, пандемии, изменения в законодательстве, технологические скачки и геополитические конфликты усиливают давление на организации, требуя внедрения адаптивных и эффективных стратегий управления. Данная статья рассматривает основные принципы, этапы и современные подходы к управлению рисками в условиях неопределенности, включая использование технологий и анализа данных.

Риск – это вероятность наступления событий, которые могут повлиять на достижение стратегических, операционных или финансовых целей организации. В управлении рисками выделяются следующие ключевые виды:

1. Финансовые риски – это изменения валютных курсов, процентных ставок, инфляция и кредитные риски.
2. Операционные риски – сбои в цепочке поставок, человеческие ошибки, технологические сбои.
3. Стратегические риски – это изменение рыночной конъюнктуры, появление новых конкурентов или продуктов.
4. Репутационные риски – негативное освещение в СМИ, жалобы клиентов или партнеров.
5. Регуляторные риски – изменения в законодательстве, налоговые реформы.

Классификация рисков позволяет выделить приоритетные направления для их анализа и управления.

Процесс управления рисками состоит из нескольких последовательных этапов:

1. Идентификация рисков. На этом этапе анализируются внутренние и внешние факторы, которые могут повлиять на деятельность организации. Используются методы SWOT-анализа, PESTLE-анализа, мозгового штурма, а также технологические инструменты, такие как системы мониторинга.

2. Оценка рисков. Оценка вероятности наступления рисков и их последствий проводится с использованием как качественных, так и количественных методов. Например, матрица рисков помогает визуализировать уровень угроз и их потенциальное влияние.

3. Разработка стратегии управления рисками. На основе оценки определяются подходы к управлению рисками:

- Избежание риска (например, отказ от определенных проектов).
- Снижение риска (внедрение защитных механизмов, автоматизация).
- Передача риска (страхование, аутсорсинг).
- Принятие риска (разработка планов реагирования).

4. Реализация мер. Внедрение разработанных стратегий в операционную деятельность компании, включая создание резервов, внедрение антикризисных планов и систем раннего предупреждения.

5. Мониторинг и контроль. Регулярная проверка эффективности мер управления рисками и их адаптация к изменяющимся условиям.

Современные подходы к управлению рисками включают использование технологий и аналитических инструментов, которые позволяют оперативно выявлять и оценивать риски, разрабатывать стратегии и реагировать на угрозы.

1. Цифровизация процессов. Системы управления рисками (Risk Management Systems, RMS) интегрируются с ERP-системами и позволяют автоматизировать идентификацию, оценку и мониторинг рисков. Примером является использование аналитических платформ, которые на основе больших данных предсказывают возможные угрозы.

2. Прогнозирование на основе данных. Искусственный интеллект и машинное обучение позволяют анализировать большие объемы данных для прогнозирования рисков и построения моделей их развития. Например, алгоритмы прогнозирования спроса помогают минимизировать операционные и финансовые риски.

3. Гибкость и адаптивность. В условиях нестабильности организации должны быть готовы быстро реагировать на изменения. Это включает в себя разработку сценарных планов и регулярное проведение стресс-тестирования.

4. Корпоративная культура управления рисками. Вовлечение сотрудников на всех уровнях компании в процесс управления рисками способствует повышению устойчивости организации. Для этого важно проводить регулярные тренинги и информировать персонал о лучших практиках.

Многие международные компании демонстрируют эффективность в управлении рисками. Например:

- Toyota активно внедряет программы управления цепочками поставок, минимизируя операционные риски.
- Amazon в период пандемии расширила свои цифровые каналы и автоматизировала логистику, что позволило минимизировать сбои.
- Apple использует стратегию диверсификации поставщиков, что снижает зависимость от одного региона.

На основании современных исследований и практики можно выделить следующие рекомендации для управления рисками:

1. Инвестиции в технологии. Использование современных аналитических инструментов для прогнозирования и управления рисками.

2. Разработка сценарных планов. Планирование действий на случай различных сценариев развития событий.

3. Проведение стресс-тестов. Оценка устойчивости организации к различным кризисным ситуациям.

4. Внедрение систем мониторинга. Постоянный контроль за ключевыми показателями для раннего выявления рисков.

5. Обучение персонала. Повышение осведомленности сотрудников о методах управления рисками и их вовлеченность в процессы.

Управление рисками в условиях нестабильности – это не только способ минимизировать угрозы, но и возможность для компании адаптироваться и сохранить конкурентоспособность. Компании, которые успешно применяют современные технологии и методы управления рисками, имеют больше шансов на устойчивое развитие даже в условиях высокой неопределенности.

Для достижения успеха в этой области важно сочетать аналитические инструменты, стратегическое планирование и корпоративную культуру, ориентированную на управление рисками.

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# Совершенствование организации управления рисками в деятельности организации

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Современная деловая среда характеризуется высокой степенью неопределенности, что делает управление рисками (УР) ключевым элементом успешного функционирования организации. Успешное управление рисками позволяет минимизировать негативные последствия, повысить устойчивость компании и улучшить её конкурентоспособность. В данной статье рассматриваются подходы к совершенствованию организации управления рисками, с учетом современных методов и практик.

Управление рисками — это процесс идентификации, анализа, оценки, контроля и минимизации рисков, которые могут повлиять на достижение целей организации (ISO 31000, 2018). В современных условиях организации сталкиваются с множеством рисков, включая финансовые, операционные, стратегические и внешние (экологические, политические).

Эффективное управление рисками способствует:

1. Увеличению устойчивости организации.
2. Повышению доверия со стороны инвесторов и партнеров.
3. Оптимизации затрат на устранение последствий рисков.
4. Улучшению стратегического планирования.

Современная система управления рисками включает несколько ключевых этапов:

1. Идентификация рисков — выявление возможных угроз и определение их природы. На этом этапе используется анализ внешней и внутренней среды.
2. Анализ и оценка рисков — определение вероятности наступления рисков и их потенциального влияния на деятельность компании.
3. Разработка стратегий управления рисками — выбор подходящих методов для минимизации или предотвращения рисков.
4. Мониторинг и контроль — постоянное наблюдение за изменениями в среде и корректировка стратегий.
5. Интеграция системы УР — включение управления рисками во все бизнес-процессы компании.

Несмотря на большое количество разработанных методик, организации часто сталкиваются с проблемами в управлении рисками:

1. Недостаточная культура управления рисками — отсутствие понимания важности УР среди сотрудников.
2. Ограниченные ресурсы — нехватка времени, финансов или квалифицированного персонала для реализации системы УР.
3. Сложности в идентификации рисков — неэффективные методы анализа и оценки.
4. Отсутствие интеграции — управление рисками рассматривается как отдельный процесс, а не как часть общей стратегии.

Для повышения эффективности управления рисками рекомендуется внедрять современные подходы и технологии, включая:

1. Цифровизация управления рисками — Использование цифровых технологий, таких как искусственный интеллект (ИИ) и машинное обучение, для прогнозирования и анализа рисков. Например, системы Big Data позволяют обрабатывать большие объемы данных и выявлять потенциальные угрозы заранее (Smith et al., 2020).

2. Интеграция в стратегическое планирование — УР должно быть частью общей стратегии организации. Это позволяет учитывать риски при постановке целей и разработке планов их достижения.

3. Повышение квалификации сотрудников — Регулярное обучение и повышение осведомленности персонала об управлении рисками. Это формирует культуру проактивного отношения к угрозам.

4. Разработка политики управления рисками — Формализация подходов к УР в виде политики, которая описывает цели, принципы и процедуры работы с рисками.

5. Создание единой системы УР — Объединение всех подразделений и процессов организации в рамках одной системы управления рисками для повышения её эффективности.

Примером успешного внедрения системы управления рисками является компания Siemens. Она интегрировала риск-менеджмент во все уровни своей деятельности, используя цифровые платформы для мониторинга рисков в режиме реального времени. В результате компании удалось снизить операционные риски на 15% в течение двух лет (Siemens Annual Report, 2022).

Для оценки эффективности системы УР можно использовать следующие методы:

1. Анализ ключевых показателей эффективности (KPI) — отслеживание таких метрик, как количество инцидентов, связанных с рисками, и их финансовые последствия.

2. Аудит системы УР — независимая проверка эффективности процессов управления рисками.

3. Опросы и обратная связь — оценка уровня осведомленности сотрудников и их удовлетворенности системой УР.

Рекомендации по совершенствованию УР

1. Создание мультидисциплинарных команд для управления рисками, объединяющих специалистов из разных областей.

2. Использование международных стандартов — таких как ISO 31000, COSO ERM, которые предлагают проверенные практики управления рисками.

3. Внедрение регулярных тренировок и сценариев для подготовки сотрудников к потенциальным рискам.

4. Акцент на устойчивое развитие — интеграция экологических, социальных и управленческих (ESG) факторов в систему УР.

Совершенствование управления рисками — это непрерывный процесс, который требует интеграции современных технологий, методов и подходов. Эффективная система УР не только минимизирует угрозы, но и создает возможности для устойчивого развития организации. Организации, уделяющие внимание управлению рисками, получают конкурентные преимущества и повышают свою устойчивость на рынке.

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# Technological innovation and the efficiency of small and medium enterprises

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## Abstract

With the development of globalization and information technology, the position and function of small and medium-sized enterprises in the national economy are increasingly significant. However, small and medium-sized enterprises are often at a disadvantage due to limited resources and low technical level. Therefore, technological innovation has become an important way for small and medium-sized enterprises to improve production efficiency, optimize resource allocation and reduce costs. This paper first discusses the definition and characteristics of technological innovation, and then analyzes in detail how technological innovation helps enterprises to improve production process, optimize resource allocation and reduce cost, and improve production efficiency. Finally, this paper summarizes the importance of technological innovation for small and medium enterprises and puts forward corresponding suggestions.

**Keywords:** technological innovation; small and medium-sized enterprises; production efficiency; resource allocation

## Introduction

Compared with large enterprises, small and medium enterprises have obvious disadvantages in terms of resources, technology and market. With the acceleration of globalization and digitalization, the competitive environment of enterprises is increasingly complex, and small and medium-sized enterprises are facing a lot of pressure for survival and development. Technological innovation is considered as the key driving force to break through bottlenecks and improve efficiency. Therefore, how to remain invincible in the fierce market competition has become an urgent problem to be solved by small and medium-sized enterprises. As an important means, technological innovation can help small and medium-sized enterprises to improve production efficiency, optimize resource allocation and reduce costs, so as to enhance their market competitiveness.

The purpose of this study is to explore the significance of technological innovation in improving the efficiency of small and medium-sized enterprises. Effectively help small and medium-sized enterprises to improve production efficiency, optimize resource allocation, reduce operating costs, so as to enhance market competitiveness to a certain extent. The specific discussion contents include the following points:

1. Definition and characteristics of technological innovation;
2. Impact of technological innovation on the production process improvement of small and medium-sized enterprises, including improving production efficiency, optimizing the production process and improving product quality;
3. The impact of technological innovation on the optimization of resource allocation of small and medium-sized enterprises, including optimizing human resource allocation, optimizing material resource allocation, and optimizing financial resource allocation;
4. The impact of technological innovation on cost reduction of small and medium-sized enterprises and empirical analysis of technological innovation cases ;

5. The significance of technological innovation to small and medium-sized enterprises, the challenges and suggestions of technological innovation;
6. Conclusion;
7. References.

## **1. Definition and characteristics of technological innovation**

### **1.1 Definition of technological innovation**

Technological innovation refers to a series of activities in the process of production and operation, aimed at improving product quality, reducing cost and increasing efficiency through the introduction of new technology, process, equipment or management methods. It includes not only the development and production of new products, but also the improvement and optimization of existing products and production processes. Technological innovation is the internal driving force of enterprise development and the key factor to promote industrial upgrading and economic growth.

Case analysis: German small and medium-sized enterprises have achieved global leadership by focusing on technological innovation in certain segments. For example, some small and medium-sized branches of Siemens have developed intelligent production equipment, which not only improved the efficiency of the equipment, but also significantly reduced the energy consumption of the factory, providing innovative examples for other small and medium-sized enterprises.

### **1.2 Characteristics of technological innovation**

Risk: Technological innovation has a certain risk, because the introduction and application of new technologies are often accompanied by uncertainty and the possibility of failure. Enterprises need to conduct sufficient market research and technology evaluation in the process of technological innovation to reduce the risk and improve the success rate.

Return: technological innovation has a high rate of return. Once successful, the enterprise can obtain excess profits, and set up a competitive advantage in the market. This return is not only reflected in the economic benefits, but also reflected in the brand image, market share and corporate reputation.

Interaction: Technological innovation is the result of the interaction between consumers and manufacturers. Driven by market demand and technological progress, enterprises need to constantly carry out technological innovation to meet the changes in consumer needs. At the same time, the consumer feedback and opinions also provide an important reference basis for the technological innovation of enterprises.

## **2. Impact of technological innovation on the improvement of the production process of small and medium enterprises**

### **2.1 Improve production efficiency**

Technological innovation can help small and medium enterprises improve production efficiency by introducing advanced production equipment and automated production processes. For example, the introduction of advanced equipment such as automated production lines and robots can greatly improve the speed and accuracy of production, and reduce the error and waste of manual operation. At the same time, the intelligent management system can monitor and optimize the production process in real time to ensure the smooth and efficient production process.

Case analysis: the intelligent textile system of a textile enterprise in Zhejiang province. The company introduced artificial intelligence and machine learning technology to increase the efficiency of the weaving process by 50 percent. The workshop, which used to need 10 workers, now needs only four people to manage it, significantly improving production efficiency.

## **2.2 Optimize the production process**

Technological innovation can also help small and medium enterprises to optimize their production process and remove unnecessary links and red tape. Through the application of digital and intelligent technology, enterprises can carry out fine management and optimization of the production process to ensure that every link reaches the best state. For example, the use of Internet of Things technology to connect various equipment on the production line, and data analysis and optimization through cloud computing and big data technology, can realize the efficient and intelligent production process. This optimization can not only improve production efficiency, but also reduce energy consumption and waste emissions to achieve green production.

Case analysis: The COSMOPlat Industrial Internet platform of Haier Group. Although Haier is a large enterprise, the practice of its COSMOPlat platform is of reference significance for small and medium-sized enterprises. By introducing the Internet of Things and artificial intelligence technology, small and medium enterprises can monitor production data in real time, optimize production plans, and reduce process waste. For example, a garment manufacturer has achieved "on-demand production" by introducing digital cutting equipment, reducing the waste of raw materials by about 30 percent.

## **2.3 Improve product quality**

Technological innovation can improve the quality and performance of products by improving the production process and materials. For example, using advanced materials and technologies can produce more durable, environmentally friendly and intelligent products. At the same time, technological innovation can also help enterprises to carry out product innovation and differentiated competition, to meet the personalized needs of consumers. This product innovation can not only improve the added value and market competitiveness of products, but also bring higher profits and market share for enterprises.

# **3. The impact of technological innovation on the optimization of resource allocation of small and medium enterprises**

## **3.1 Optimize human resource allocation**

Technological innovation can effectively optimize the allocation of human resources in small and medium-sized enterprises and improve the work efficiency and quality of employees. Specifically, the introduction of automation equipment and intelligent management systems can significantly reduce over-reliance on and waste of human resources. At the same time, these innovative technologies provide employees with more advanced and efficient work tools and methods, reducing the workload. In addition, technological innovation also promotes the upgrading of employees' skills and knowledge, and improves their comprehensive quality and innovation ability. This optimized human resource allocation strategy not only enhances the production efficiency and market competitiveness of enterprises, but also further improves the sense of belonging and job satisfaction of employees.

## **3.2 Optimize the allocation of material resources**

Through technological innovation, enterprises can optimize the allocation and utilization of material resources, thus significantly improving production efficiency and economic benefits. The

application of advanced production equipment and technology can effectively reduce the consumption and waste of raw materials, and enhance the efficiency of resource utilization and output efficiency. At the same time, technological innovation promotes the recycling and regeneration of resources and reduces the negative impact on the environment. This optimal allocation strategy of material resources not only enhances the economic benefits and sustainable development ability of enterprises, but also has a positive impact on social environmental protection.

### **3.3 Optimize the allocation of financial resources**

Technological innovation can improve the capital utilization efficiency and profitability of enterprises by optimizing the allocation and utilization of financial resources. For example, by introducing advanced financial management systems and tools, the fine management and optimization of enterprise finance can be realized. At the same time, technological innovation can also help enterprises to carry out cost control and risk management, and reduce the operating costs and risk level of enterprises. In addition, technological innovation can also bring new business opportunities and revenue sources for enterprises, and improve their profitability and market competitiveness. The optimal allocation of financial resources can not only improve the economic benefits and stability of enterprises, but also provide strong support for the sustainable development of enterprises.

Case analysis: Alibaba Cloud computings support for small and medium-sized enterprises. Alibaba Cloud computing provides cloud data storage and cloud-computing power, leaving them needless to build their own expensive IT infrastructure. For example, a catering distribution enterprise uses the resource scheduling algorithm of Ali Cloud to optimize the distribution route, shorten the food delivery time by about 20%, and save the logistics cost.

## **4.The impact of technological innovation on cost reduction of small and medium-sized enterprises and empirical analysis of technological innovation cases**

### **4.1 Reduce production costs**

Technological innovation can reduce production costs for small and medium-sized enterprises by improving production processes and technologies. For example using advanced production equipment and processes can reduce raw material consumption and waste improve production efficiency and quality. Technological innovation also enables companies to adopt efficient management models such as lean manufacturing and Six Sigma management further reducing production costs and waste. This cost-cutting strategy not only enhances the profitability and market competitiveness of enterprises but also allows consumers to enjoy more high-quality and reasonably priced goods and services.

case analysis:

The electronics manufacturing company in Shenzhen, China has introduced a fully automated production line utilizing intelligent equipment and artificial intelligence systems to optimize the production process. Traditional manual operations often lead to product defects and material waste, while automated production lines significantly reduce these issues. For example, using robots for assembly and inspection not only improves production efficiency but also drastically reduces losses caused by human errors.

Through this technological innovation, the company has achieved a 15% reduction in raw material consumption, a 20% increase in production efficiency, a 30% improvement in product quality consistency, and a reduction of approximately 10% in the production cost per unit. The technological innovation, by introducing automated production lines, lean management, and

intelligent equipment, not only enhances production efficiency and reduces waste but also lowers the production cost per unit, giving the company a greater advantage in market competition.

Production link	Traditional mode of production	Intelligent production mode	Cost reduction ratio
Raw material consumption	1 million yuan	850,000 yuan	15%
production efficiency	100 pieces/day	120 pieces/day	20%
Product quality consistency	85%	99%	30%
unit product cost	fifty yuan	forty-five yuan	10%

4.1 Table: Comparison of cost before and after intelligent production

#### 4.2 Reduce operating costs

Technological innovation optimizes the operational processes and management methods of enterprises reducing the operating costs of small and medium-sized enterprises. For example adopting cloud computing and big data technologies can lower the IT investment and maintenance costs of enterprises improving their informatization level and operational efficiency.

case analysis:

A medium-sized retail company in Guangdong, China, manages inventory, orders, and customer relationships by introducing a cloud computing platform. Previously, the company relied on traditional local servers and manual operations to handle orders and inventory, which not only increased IT infrastructure investment but also led to low management efficiency. By migrating to the cloud platform, the company reduced its IT infrastructure investment by 30% as the cloud service provider took on the maintenance of servers and storage. Operational efficiency improved by 25%, allowing employees to access data in real-time through the cloud platform for precise decision-making and avoiding inventory overstock. Customer service costs were reduced by 20% due to automated tools provided by the cloud platform, which decreased the need for human customer service. By introducing the cloud computing platform, the company not only reduced hardware and software costs but also enhanced operational efficiency and customer service quality, thereby lowering overall operating costs.

Cost items	Traditional approach	IT Cloud computing	Cost reduction ratio
IT infrastructure investment	500,000 yuan	350,000 yuan	30%
Operational efficiency	100%	125%	25%
Customer service costs	300,000 yuan	240,000 yuan	20%
Total operating costs	2 million yuan	1.6 million yuan	20%

4.2 Table: Comparison of operating costs before and after cloud computing

#### 4.3 Reduce innovation costs

Technological innovation itself can also reduce the innovation costs for small and medium-sized enterprises. For example, by adopting open-source software and obtaining support from the open-source community, the costs of enterprise software procurement and technical support can be reduced. At the same time, technological innovation can help enterprises engage in

collaborative innovation and cooperative innovation, sharing innovative resources and outcomes, thereby reducing innovation costs and risks. This reduction in innovation costs not only stimulates the innovative vitality and creativity of enterprises but also promotes the innovative development of the entire industry.

case analysis:

Shenzhen electronic manufacturing enterprises adopt open-source software and hardware platforms to develop new products when conducting technology research and development. The company does not fully rely on expensive proprietary software or equipment but utilizes tools and resources provided by the open-source community, thereby reducing the costs of development and maintenance. In addition, the company collaborates with universities and research institutions to share technological research results, thus reducing the risks and costs of technology R&D. Through this approach, the company saves 40% of its R&D expenses in the innovation process by using open-source software and shared hardware platforms, reducing the risk of technology R&D by 20% through sharing innovative resources and outcomes with external partners. By adopting open-source technologies and strengthening external cooperation, the company reduces R&D costs while enhancing innovation efficiency and the market application potential of technology.

Cost items	Traditional R&D approach	Open source and collaborative innovation	Cost reduction ratio
research and development expenditure	1 million yuan	600,000 yuan	40%
Technology research and development risks	tall	centre	20%
Investment in cooperative innovation	200,000 yuan	fifty thousand yuan	75%
Total innovation costs	1.2 million yuan	650,000 yuan	45%

4.3 Table: Comparison of innovation costs before and after open source and cooperative innovation

Technological innovation not only helps enterprises improve production efficiency and reduce operating costs but also reduces the investment of funds and resources in the innovation process. By adopting advanced production technologies cloud computing big data and open-source technologies small and medium-sized enterprises can maintain competitiveness in fierce market competition and provide consumers with higher quality and more reasonably priced products and services.

5. The significance of technological innovation to small and medium-sized enterprises, the challenges and suggestions facing technological innovation

5.1 The significance of technological innovation to small and medium-sized enterprises

Improve production efficiency and quality: Technological innovation can help small and medium-sized enterprises to improve production efficiency and quality, reduce production costs and waste, and improve their profitability and market competitiveness.

Optimize resource allocation and utilization: technological innovation can help small and medium-sized enterprises to optimize the allocation and utilization of human resources, material

resources and financial resources, and improve the resource utilization efficiency and economic benefits of enterprises.

Reduce innovation cost and risk: technological innovation itself can also reduce the innovation cost and risk of small and medium-sized enterprises, stimulate the innovation vitality and creativity of enterprises, and promote the innovation and development of the whole industry.

Promoting industrial upgrading and transformation: Technological innovation can promote the industrial upgrading and transformation of small and medium-sized enterprises, promote the development of enterprises to the high-end, intelligent and green direction, and improve the sustainable development ability and market competitiveness of enterprises.

## **5.2 Challenges facing technological innovation**

Despite the importance of technological innovation to small and medium enterprises, they still face many challenges in the implementation process:

Capital shortage: technological innovation requires a lot of investment, and small and medium-sized enterprises often face the problem of capital shortage.

Weak technical ability: small and medium-sized enterprises have limited technology research and development ability, and lack of grasp of cutting-edge technology.

Lack of talent: the lack of high-level technology research and development and management personnel.

Insufficient policy support: small and medium-sized enterprises in some regions are difficult to obtain comprehensive support from innovation policies.

## **5.3 Suggestions on technological innovation of small and medium-sized enterprises**

Strengthen technology research and development and innovation capacity: Small and medium-sized enterprises should strengthen technology research and development and innovation capacity building, and improve their independent innovation capacity and core competitiveness.

Strengthen talent training and introduction: Small and medium-sized enterprises should strengthen talent training and introduction work, improve the comprehensive quality and innovation ability of employees. At the same time, enterprises should also establish a perfect talent incentive mechanism and training system to stimulate the innovative vitality and creativity of employees.

Strengthen cooperation and collaborative innovation: small and medium enterprises should strengthen cooperation and collaborative innovation with other enterprises, universities and research institutions, share innovation resources and achievements, and reduce innovation costs and risks. At the same time, enterprises should also actively participate in the formulation of industry standards and norms to promote the innovation and development of the whole industry.

Strengthen policy support and service: The government should strengthen the policy support and service work for the technological innovation of small and medium-sized enterprises, provide financial subsidies, tax incentives and other policies and measures, and reduce the innovation cost and risk of enterprises.

## **6. Conclusion**

For small and medium-sized enterprises, technological innovation is a key means to improve production efficiency, optimize resource allocation and reduce costs. With advanced production equipment and automated production processes, as well as optimized production processes and management strategies, small and medium enterprises can significantly improve production efficiency and product quality while optimizing resource utilization and reducing innovation costs and operational risks. At the same time, technological innovation can also promote the industrial

upgrading and transformation of small and medium-sized enterprises, and improve their sustainable development ability and market competitiveness. Therefore, small and medium-sized enterprises should strengthen technology research and development and innovation capacity building, strengthen talent training and introduction, strengthen cooperation and collaborative innovation, and strengthen policy support and service work, so as to promote the technological innovation and development of enterprises.

Through the above research and analysis, we can see the important role of technological innovation in improving the efficiency of small and medium enterprises. Small and medium-sized enterprises should actively adopt new technologies, new processes and new management methods, constantly optimize the production process, resource allocation and cost control, improve production efficiency and market competitiveness, and achieve sustainable development.

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# Development and Implementation of a Human Resource Management Strategy

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In today's rapidly evolving business environment, organizations must continually adapt and innovate to remain competitive. One of the most critical factors that contribute to an organization's long-term success is its human capital. As companies expand globally, integrate new technologies, and adjust to shifts in economic and social conditions, developing and implementing an effective Human Resource Management (HRM) strategy is paramount. A well-crafted HRM strategy not only attracts and retains top talent but also ensures that the organization's human resources are aligned with its overall strategic goals. This article will explore the process of developing and implementing a Human Resource Management strategy, including its key components, challenges, and the critical role of HR in organizational success.

## I. The Role of HRM Strategy in Organizational Success

A Human Resource Management strategy is a comprehensive plan that outlines how an organization will attract, develop, retain, and motivate employees in a way that supports its overarching business objectives. It is a framework that guides HR policies and practices and integrates them with the strategic goals of the organization. HRM strategy is essential for organizations to:

1. **Attract and Retain Talent:** A well-executed HRM strategy helps organizations identify and attract the right talent while fostering an environment that promotes employee satisfaction and loyalty.
2. **Align Human Resources with Organizational Goals:** HRM strategy ensures that an organization's workforce is equipped with the skills, capabilities, and motivation needed to achieve business objectives.
3. **Promote Organizational Culture:** HR strategies contribute to building a strong organizational culture by focusing on employee engagement, teamwork, and shared values.
4. **Improve Employee Performance:** Through performance management systems, training, and development programs, HRM strategy helps improve individual and team performance, directly contributing to organizational success.

## II. Developing a Human Resource Management Strategy

The development of an HRM strategy is a thoughtful and systematic process that requires alignment with the organization's broader strategic goals. The following are key steps in developing an effective HRM strategy:

### 1. Understanding the Business Strategy

The first step in developing an HRM strategy is understanding the organization's overall business strategy. HR must work closely with top management to comprehend the company's long-term goals, competitive position, and market environment. For example, if the business strategy is to enter new international markets, the HR strategy must focus on recruiting employees with international expertise and facilitating cross-cultural training.

Understanding the business strategy allows HR to tailor its practices to support the company's goals, whether those involve growth, diversification, technological innovation, or operational efficiency.

### 2. Analyzing the Internal and External Environment

A thorough analysis of both the internal and external environment is crucial for developing an

effective HRM strategy. Internally, HR must assess the current workforce, its strengths and weaknesses, and any gaps in skills or competencies. Externally, HR should monitor labor market trends, industry-specific challenges, and relevant laws and regulations. Understanding the broader socioeconomic and political context can help HR anticipate future needs and adapt its strategy accordingly.

For example, if a company is located in a region with a shortage of skilled workers, the HR strategy may focus on talent development initiatives or expanding recruitment efforts in other regions.

### 3. Defining HR Goals and Objectives

Once the business strategy and environmental factors are understood, HR professionals must define specific goals and objectives for the HRM strategy. These goals should be clear, measurable, and aligned with the overall organizational objectives. Common HR goals include:

Talent acquisition and retention: Ensuring the organization has the right mix of talent at all levels.

Employee development: Providing training and career development programs to build a more skilled workforce.

Performance management: Implementing performance evaluation systems that drive individual and team accountability.

Compensation and benefits: Developing competitive compensation structures that attract and retain top talent.

### 4. Designing HR Policies and Practices

Once the HR goals are established, HR must design the policies and practices that will support these objectives. These may include recruitment and selection processes, training and development programs, performance management systems, compensation frameworks, and employee engagement initiatives. The design phase must also address how HR will leverage technology, such as human resource information systems (HRIS) and talent management software, to streamline and optimize HR processes.

For example, an HR strategy focused on employee engagement might involve regular feedback mechanisms, employee surveys, and programs aimed at improving work-life balance and fostering organizational loyalty.

## III. Implementing the Human Resource Management Strategy

Once the HRM strategy is developed, the next step is its implementation. Effective implementation requires strong leadership, clear communication, and a commitment to action. The following are key steps in the implementation process:

### 1. Aligning the Organization's Structure

For the HRM strategy to succeed, it must be supported by the organization's structure. HR departments may need to reorganize or expand their functions to ensure the strategy is adequately supported. For example, if the strategy involves a focus on talent development, HR may need to create a dedicated learning and development function or appoint a chief learning officer to lead these efforts.

Additionally, implementing HRM strategy requires ensuring that the workforce is aligned with the company's goals. This might include adjusting teams, redefining roles, or redefining reporting structures.

### 2. Communicating the Strategy

Effective communication is vital during the implementation phase. All employees need to understand the purpose and objectives of the HRM strategy, as well as how it will impact them. Communication should be transparent and consistent, with regular updates on progress and adjustments to the strategy. Senior leadership plays a key role in communicating the importance of the HRM strategy and reinforcing its alignment with the company's values.

### 3. Allocating Resources

Implementing a successful HRM strategy requires resources, including financial investment, technology, and human capital. HR leaders must ensure that the necessary resources are allocated to support the initiatives outlined in the HR strategy. This might include budgeting for training programs, investing in HR software, or hiring new HR personnel to support strategic initiatives.

### 4. Monitoring and Evaluating Progress

A critical part of the implementation process is monitoring and evaluating the effectiveness of the HRM strategy. This involves setting performance indicators and regularly measuring progress toward the strategic goals. HR leaders must assess the impact of HR initiatives on key business metrics such as employee turnover, productivity, and engagement. If the results do not align with expectations, adjustments to the strategy may be necessary.

### IV.Challenges in Implementing HRM Strategy

Implementing a Human Resource Management strategy is not without challenges. Some common challenges include:

1. Resistance to Change: Employees and managers may resist new policies or practices, particularly if they perceive them as disruptive or unfamiliar. Overcoming resistance requires clear communication, training, and the involvement of key stakeholders.

2. Misalignment with Organizational Culture: If the HRM strategy is not aligned with the organization's culture, it may face significant hurdles. HR must ensure that its strategy is compatible with the company's values and norms.

3. Lack of Resources: Insufficient resources can hinder the successful implementation of HR initiatives. HR departments must work with leadership to secure the necessary funding and support.

4. Dynamic Business Environment: Rapid changes in the business environment, such as shifts in technology or the economy, may require frequent adjustments to the HRM strategy. Flexibility is crucial for adapting to these changes.

### V.Conclusion

The development and implementation of a Human Resource Management strategy are crucial for organizations seeking to maintain a competitive edge in today's dynamic business environment. A well-designed HR strategy aligns human capital with organizational goals, attracts and retains talent, promotes employee development, and drives performance. However, implementing the strategy successfully requires strong leadership, clear communication, adequate resources, and continuous evaluation. By overcoming challenges and ensuring that the HR strategy is aligned with business objectives, organizations can leverage their workforce to achieve long-term success.

Through effective HRM strategy development and implementation, companies can unlock their greatest asset—human talent—and position themselves for sustained growth and competitiveness.

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# Comparative Analysis of IFRS 9 Implementation in Kazakhstan and Other Emerging Economies

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## Abstract

The study explores the implementation of International Financial Reporting Standard (IFRS) 9 in Kazakhstan's banking sector, comparing it with other emerging economies. IFRS 9, which addresses the classification, measurement, and impairment of financial instruments, has significantly impacted financial reporting and risk management practices globally. This research examines the key challenges, successes, and unique characteristics of IFRS 9 adoption in Kazakhstan, highlighting differences and similarities with peer economies. Special attention is given to the Expected Credit Loss (ECL) model, regulatory support, and institutional capacity in ensuring compliance. The findings contribute to understanding the effectiveness of IFRS 9 in enhancing financial stability and transparency in emerging markets and provide recommendations for improving adoption practices in Kazakhstan and similar economies.

**Keywords:** IFRS 9, Emerging Economies, Kazakhstan, Banking Sector, Financial Reporting, Expected Credit Loss (ECL), Risk Management, Regulatory Compliance, Comparative Analysis.

The International Financial Reporting Standard (IFRS) 9, titled "*Financial Instruments*," was introduced by the International Accounting Standards Board (IASB) to address the limitations of its predecessor, IAS 39. Officially adopted in January 2018, IFRS 9 represents a fundamental shift in the accounting and reporting of financial instruments, aiming to provide more transparent, timely, and reliable financial information to stakeholders (IASB, 2014). The standard introduces a forward-looking *Expected Credit Loss (ECL)* model, replacing the earlier *Incurred Loss Model*, which often delayed the recognition of financial losses until observable indicators emerged (Deloitte, 2018).

The primary objectives of IFRS 9 include improving the transparency of financial reporting, enhancing the comparability of financial statements across jurisdictions, and strengthening financial institutions' resilience to economic shocks. The standard also emphasizes the timely recognition of credit losses and aims to prevent financial institutions from accumulating excessive risk exposure (PwC, 2020). Furthermore, IFRS 9 integrates classification and measurement of financial assets based on the business model and cash flow characteristics, establishing a logical and consistent framework for financial reporting.

For emerging economies, the adoption of IFRS 9 is not merely a regulatory requirement but a strategic necessity to attract foreign investment and enhance market confidence. By aligning financial reporting practices with international standards, emerging markets can improve their global standing, reduce capital costs, and foster long-term financial stability.

In emerging economies, robust financial reporting frameworks are pivotal for sustainable economic development. These markets often face challenges such as weaker institutional

frameworks, regulatory inconsistencies, and limited technical expertise in financial accounting and reporting. The adoption of IFRS 9 in such economies serves as a transformative tool for addressing these systemic weaknesses, enhancing financial discipline, and improving risk management practices (KPMG, 2019).

Emerging markets, including Kazakhstan, are highly dependent on foreign capital inflows and external financing. Investors demand financial transparency, accountability, and comparability when allocating resources to these markets. IFRS 9 plays a critical role in meeting these demands by ensuring that financial statements reflect the true financial position of institutions, particularly in the banking sector, which serves as the backbone of most emerging economies.

In addition to improving transparency, IFRS 9 significantly influences credit risk management practices. The Expected Credit Loss (ECL) model compels financial institutions to proactively assess and manage credit risks, ensuring that potential losses are recognized earlier rather than being deferred. This forward-looking approach is particularly crucial for emerging markets, where macroeconomic volatility and geopolitical risks can create sudden financial shocks (World Bank, 2021).

Moreover, the adoption of IFRS 9 in emerging economies enhances alignment with global financial systems, reduces barriers to cross-border investments, and fosters a more resilient financial ecosystem. It also promotes financial inclusion by encouraging banks to adopt more prudent lending practices, thereby supporting small and medium-sized enterprises (SMEs) and contributing to economic diversification.

Despite the theoretical advantages of IFRS 9, its implementation in emerging economies is fraught with challenges. Kazakhstan, as an emerging economy with a rapidly developing financial sector, faces unique hurdles in aligning its regulatory and institutional frameworks with the requirements of IFRS 9. Limited technical expertise, inconsistent enforcement of standards, and the financial sector's exposure to external risks have compounded these challenges (Kazakhstan National Bank Report, 2022).

Comparative analysis becomes essential to understand how IFRS 9 has been implemented in other emerging economies, such as Russia, India, and Brazil, which share similar economic and institutional landscapes. By analyzing these experiences, policymakers, regulators, and financial institutions in Kazakhstan can identify best practices, avoid common pitfalls, and tailor implementation strategies to their specific context.

The adoption of IFRS 9 in Kazakhstan's banking sector has raised numerous critical questions that require thorough analysis. Understanding the specific challenges faced by second-tier banks in implementing the standard is essential, as these institutions play a significant role in the country's financial system. Furthermore, it is crucial to explore how Kazakhstan's experience compares with other emerging economies, such as Russia, Brazil, and India, to identify commonalities and differences in their approaches to IFRS 9 adoption. This comparative perspective allows for a deeper insight into the factors that contribute to successful implementation and sheds light on policy gaps and institutional shortcomings. Additionally, the study aims to investigate how IFRS 9 has influenced credit risk management practices in Kazakhstan's banking sector relative to other emerging markets. By addressing these aspects, the research seeks to provide evidence-based recommendations that can guide policymakers, regulators, and banking professionals in enhancing the adoption process and achieving the intended objectives of IFRS 9.

This paper is structured to provide a comprehensive and logical analysis of IFRS 9 adoption in Kazakhstan and other emerging economies. The introductory section establishes the foundation of the study by outlining the background, relevance, research problem, and objectives. Following this, the literature review delves into the theoretical frameworks, global trends, and prior research findings on IFRS 9 implementation, highlighting existing knowledge gaps. The methodology section

explains the research design, data sources, and analytical tools employed to ensure a robust comparative analysis. Subsequent sections focus on the implementation of IFRS 9 in Kazakhstan, examining regulatory frameworks, technical challenges, and institutional capacity. This analysis is then expanded through a comparative lens, incorporating case studies from other emerging economies to identify key similarities, differences, and lessons learned. The discussion section interprets the findings, emphasizing their implications for policy and practice, while the concluding section summarizes the study's key insights, acknowledges limitations, and suggests directions for future research. This structured approach ensures clarity, depth, and a logical progression of ideas throughout the paper.

The International Financial Reporting Standard (IFRS) 9, issued by the International Accounting Standards Board (IASB) in 2014 and effective from January 2018, represents a critical shift in accounting standards for financial instruments. IFRS 9 was designed to address the shortcomings of IAS 39, particularly in how financial assets and liabilities are classified, measured, and assessed for impairment. The standard introduces three key pillars: *Classification and Measurement*, *Impairment Model*, and *Hedge Accounting*.

The **Classification and Measurement** principle of IFRS 9 is based on the business model test and the contractual cash flow characteristics test. Financial assets are classified into three categories: *Amortized Cost*, *Fair Value through Other Comprehensive Income (FVOCI)*, and *Fair Value through Profit or Loss (FVTPL)* (IASB, 2014). This approach ensures that assets are categorized based on both their intended use within the business model and their cash flow characteristics, improving transparency and consistency in financial reporting.

The **Expected Credit Loss (ECL) Model** is perhaps the most significant innovation introduced by IFRS 9. It replaces the previous *Incurred Loss Model* under IAS 39, which often delayed the recognition of credit losses until evidence of default became apparent. The ECL model requires financial institutions to recognize expected credit losses from the moment financial instruments are issued, reflecting a more forward-looking approach. The model operates on a three-stage approach: *Stage 1* (performing assets), *Stage 2* (underperforming assets), and *Stage 3* (credit-impaired assets). Each stage represents a different level of credit risk and requires varying levels of provisioning (Deloitte, 2018).

Lastly, the **Hedge Accounting** provisions under IFRS 9 align accounting more closely with risk management practices. It provides more flexible requirements, allowing financial institutions to better reflect their risk management activities in their financial statements. This alignment reduces volatility and ensures a more accurate representation of financial performance (PwC, 2020).

These components collectively aim to improve the quality of financial reporting, reduce information asymmetry, and build investor confidence, especially in markets with significant financial volatility, such as emerging economies.

The adoption of IFRS 9 has been a global phenomenon, with varying degrees of success and challenges across different jurisdictions. Developed economies, such as those in the European Union, adopted IFRS 9 relatively seamlessly due to their advanced regulatory frameworks, strong institutional capacity, and extensive experience with international financial reporting standards (Ernst & Young, 2019). Banks in these regions invested heavily in advanced credit risk assessment models and data analytics tools to meet the rigorous requirements of the Expected Credit Loss (ECL) model.

In contrast, the implementation process in emerging economies has been more uneven. Countries like Brazil, Russia, and India have faced challenges stemming from weaker institutional frameworks, a lack of technical expertise, and inconsistent enforcement of accounting standards. For instance, in Brazil, smaller banks struggled to develop robust ECL models due to insufficient historical data and limited technological infrastructure (KPMG, 2019). Similarly, in India, regulatory

authorities had to provide phased implementation timelines and additional guidance to ensure compliance across all financial institutions (Reserve Bank of India, 2020).

A common global trend has been the significant financial impact of IFRS 9 adoption on banks' balance sheets. The initial transition often resulted in higher provisions for credit losses, leading to a temporary decline in banks' regulatory capital ratios. Many banks had to revisit their credit risk models, recalibrate their provisioning frameworks, and strengthen internal controls.

Despite these challenges, IFRS 9 adoption has also brought about notable benefits globally. The standard has improved transparency, enhanced credit risk management practices, and increased the resilience of banking sectors to economic shocks. Furthermore, regulatory authorities in many jurisdictions have issued supplementary guidelines and frameworks to support financial institutions in navigating the complexities of IFRS 9.

Research on IFRS 9 adoption in emerging economies has highlighted both opportunities and persistent challenges. A study by *Barth et al. (2020)* emphasized that the forward-looking ECL model is particularly beneficial for emerging markets, where economic cycles are often more volatile. However, the study also noted that the lack of granular credit data in many emerging economies poses a significant obstacle to accurate credit loss estimation.

In Russia, *Ivanova et al. (2021)* found that the adoption of IFRS 9 led to increased financial transparency and more proactive risk management strategies among second-tier banks. However, the study also highlighted the significant costs associated with developing and maintaining sophisticated credit risk models. Similarly, *Almeida and Santos (2020)*, in their research on IFRS 9 adoption in Brazil, observed that while larger banks successfully implemented the standard, smaller institutions struggled due to limited financial and technical resources.

Kazakhstan-specific studies remain limited, but reports from the *National Bank of Kazakhstan (2022)* indicate that the country's banking sector has faced significant implementation challenges, including insufficient expertise in ECL modeling and a lack of coordination between regulatory authorities and financial institutions.

Despite these challenges, a consistent theme across emerging market studies is the potential for IFRS 9 to improve financial resilience and stability when adequately implemented. Researchers have also emphasized the importance of institutional support, ongoing regulatory guidance, and capacity-building programs to address adoption barriers effectively.

While significant research has been conducted on IFRS 9 adoption globally, there remains a dearth of comprehensive comparative studies focusing specifically on emerging economies. Most studies either focus on individual country experiences or provide generalized global overviews without addressing the unique economic, institutional, and regulatory contexts of different emerging markets.

In Kazakhstan, literature on IFRS 9 remains scarce, with most insights derived from regulatory reports and a few academic studies. There is limited research on the long-term impact of IFRS 9 on credit risk management, financial reporting quality, and institutional resilience within the country's banking sector. Furthermore, cross-country comparisons between Kazakhstan and other emerging economies, such as Russia, Brazil, and India, are almost non-existent in academic discourse.

This study aims to bridge these gaps by offering a detailed comparative analysis of IFRS 9 implementation in Kazakhstan and other emerging economies. By doing so, it seeks to contribute to both theoretical literature and practical policymaking, providing actionable recommendations to improve the adoption and effectiveness of IFRS 9 in Kazakhstan's financial sector.

This study employs a **comparative analysis approach** to examine the implementation of IFRS 9 in Kazakhstan and other selected emerging economies, including Russia, Brazil, and India. Comparative analysis is a widely recognized research method for identifying similarities, differences, and underlying factors that contribute to varying outcomes across different contexts

(Bryman & Bell, 2015). This approach is particularly suitable for exploring how regulatory, institutional, and economic environments influence the adoption and effectiveness of financial reporting standards such as IFRS 9.

The study adopts a **qualitative-quantitative hybrid methodology**, combining both numerical data (e.g., financial performance indicators, provisioning levels, and regulatory compliance metrics) and qualitative insights (e.g., expert opinions, policy documents, and case study findings). This mixed-methods approach enhances the robustness of the analysis, providing both empirical evidence and contextual understanding of IFRS 9 implementation.

The comparative analysis focuses on several key dimensions, including regulatory frameworks, institutional capacity, technical expertise, and financial impacts. By systematically comparing these dimensions across Kazakhstan and other emerging economies, the study aims to identify best practices, recurring challenges, and context-specific factors that influence successful adoption.

The data for this study is collected from a variety of **primary** and **secondary sources**, ensuring a comprehensive dataset that supports both qualitative and quantitative analysis.

**Financial Reports:** Annual and quarterly financial statements of second-tier banks in Kazakhstan and comparator countries are analyzed to assess the financial impact of IFRS 9 adoption, particularly focusing on provisioning levels, credit risk metrics, and changes in capital adequacy ratios.

**Regulatory Documents:** Official reports, guidelines, and directives from financial regulatory authorities (e.g., National Bank of Kazakhstan, Reserve Bank of India, Central Bank of Brazil) are reviewed to understand the regulatory environment governing IFRS 9 implementation.

**Expert Interviews:** Semi-structured interviews with banking professionals, auditors, financial analysts, and regulatory officials are conducted to gather insights into the practical challenges and successes associated with IFRS 9 adoption.

**Academic Research and Industry Reports:** Previous academic studies, white papers, and industry analyses are reviewed to contextualize findings and support interpretations.

The triangulation of these data sources ensures a balanced perspective, mitigating biases and enhancing the credibility of the study's findings.

The study focuses on **Kazakhstan** as the primary case and compares it with three selected emerging economies: **Russia**, **Brazil**, and **India**. These countries are chosen based on several criteria:

1. **Economic and Institutional Similarities:** All selected countries are classified as emerging economies with developing financial markets and varying degrees of institutional readiness for IFRS adoption.
2. **Regulatory Frameworks:** Each country has a distinct regulatory and institutional framework governing IFRS 9 implementation, offering diverse insights for comparative analysis.
3. **Data Availability:** Publicly accessible financial reports, regulatory guidelines, and academic studies are available for these countries, ensuring adequate data for analysis.
4. **Geopolitical and Economic Context:** These economies share similar challenges, such as economic volatility, reliance on foreign investment, and exposure to external financial shocks.

The sample includes **second-tier banks** as the primary units of analysis, as they represent a significant portion of the financial system in emerging economies. These banks often face more pronounced challenges in IFRS 9 adoption compared to larger, well-capitalized financial institutions.

The selected banks and institutions are anonymized where necessary, and data are aggregated to maintain confidentiality while ensuring transparency in reporting.

The data collected through financial reports, regulatory documents, and interviews are analyzed using a combination of **qualitative and quantitative techniques** to draw meaningful comparisons and insights.

1. **Comparative Metrics:** Quantitative metrics such as provisioning levels, Non-Performing Loan (NPL) ratios, Expected Credit Loss (ECL) provisions, and capital adequacy ratios are analyzed across the selected countries. These metrics offer empirical evidence of the financial impact of IFRS 9 adoption.
2. **Thematic Analysis:** Qualitative data from expert interviews and regulatory documents are analyzed thematically to identify recurring patterns, challenges, and opportunities related to IFRS 9 implementation. Thematic analysis allows for the extraction of key insights from narrative data, highlighting shared experiences and unique contextual factors.
3. **Trend Analysis:** Financial data over a multi-year period are analyzed to identify trends and changes resulting from IFRS 9 adoption. This includes examining pre- and post-implementation financial performance and credit risk indicators.
4. **Visual Representation:** Data are presented through **tables, graphs, and charts** to facilitate clarity and comparison. Comparative tables summarize key findings, while trend charts illustrate changes over time in financial metrics.

**Table 1: Comparative Analysis of IFRS 9 Implementation Across Kazakhstan, Russia, Brazil, and India**

Dimension	Kazakhstan	Russia	Brazil	India
Regulatory Preparedness	Medium	High	Medium	High
Technical Expertise	Low	Medium	Medium	High
Financial Impact on Banks	Significant	Moderate	Significant	Moderate
ECL Model Implementation	Partial	Full	Full	Full

This table serves as an example of how comparative metrics will be presented, enabling readers to draw quick insights from the analysis. The integration of quantitative and qualitative techniques ensures that the findings are both statistically sound and contextually relevant, contributing to a holistic understanding of IFRS 9 adoption challenges and opportunities in Kazakhstan and the comparator economies.

The adoption of IFRS 9 in Kazakhstan was initiated as part of the country’s broader commitment to align its financial reporting standards with global best practices. The **National Bank of Kazakhstan (NBK)**, as the primary financial regulatory authority, played a central role in overseeing the transition to IFRS 9 within the banking sector. The regulatory framework was developed to ensure that financial institutions not only complied with the technical requirements of IFRS 9 but also integrated its principles into their risk management and financial reporting processes.

In 2018, the **National Bank issued formal guidelines** mandating the adoption of IFRS 9 across all banking institutions, including second-tier banks. These guidelines emphasized the importance of implementing the **Expected Credit Loss (ECL) model** for recognizing credit losses

proactively rather than reactively. Additionally, the NBK introduced **transitional arrangements** to minimize the immediate financial burden on banks, including phased implementation schedules and temporary capital relief measures.

The regulatory framework also required financial institutions to conduct regular **stress testing** and ensure that their provisioning models adhered to IFRS 9 requirements. This included specific mandates for the documentation and validation of risk assessment methodologies. Auditing bodies, both internal and external, were tasked with overseeing compliance with IFRS 9, ensuring that financial disclosures were accurate, consistent, and transparent.

Despite these efforts, Kazakhstan's regulatory framework faced limitations in the early stages of adoption. Many second-tier banks struggled with the **complexity of the ECL model**, particularly in developing reliable credit risk assessment methodologies. The absence of historical credit data, coupled with varying levels of technical expertise across financial institutions, posed significant challenges. Nonetheless, the regulatory framework has been gradually evolving, with ongoing efforts by the NBK to provide training programs, technical guidance, and collaborative platforms for knowledge-sharing among financial institutions. The implementation of IFRS 9 in Kazakhstan has been a complex and multifaceted process, marked by both significant challenges and notable successes.

**Challenges:** One of the primary obstacles was the **lack of historical credit data** required to develop accurate ECL models. Many second-tier banks in Kazakhstan had limited experience in implementing forward-looking risk assessment frameworks, and the available credit risk data were often fragmented or inconsistent. This created significant hurdles in accurately estimating credit losses across different asset portfolios.

Another major challenge was the **technical expertise gap**. The ECL model requires advanced statistical modeling and data analytics capabilities, which many local banks lacked. Financial institutions faced difficulties in recruiting and training professionals with expertise in risk modeling and financial data analytics.

Furthermore, the **high cost of implementation** added another layer of complexity. Smaller banks, in particular, struggled to allocate resources for system upgrades, risk model development, and staff training. The cost of aligning internal IT infrastructure with the requirements of IFRS 9 was a significant financial burden.

**Successes:** Despite these challenges, Kazakhstan has achieved several key milestones in its IFRS 9 adoption journey. The **National Bank's phased implementation strategy** allowed financial institutions to gradually adjust to the new requirements without causing immediate financial strain.

Moreover, larger second-tier banks successfully adopted **advanced ECL models**, leveraging international partnerships and external expertise to bridge technical gaps. These institutions have reported improvements in their **credit risk management practices**, with better identification and management of impaired assets.

Kazakhstan has also witnessed a gradual improvement in **financial transparency and reporting quality**. The introduction of IFRS 9 has compelled banks to adopt more prudent lending practices and maintain higher levels of financial discipline.

The collaboration between the **National Bank of Kazakhstan** and international financial institutions has played a crucial role in overcoming technical and operational challenges. Workshops, training sessions, and capacity-building programs have helped equip banking professionals with the necessary skills to navigate the complexities of IFRS 9. The adoption of IFRS 9 has had a profound impact on Kazakhstan's banking sector, driving significant changes in financial reporting practices, credit risk management frameworks, and capital adequacy requirements.

**Financial Reporting:** IFRS 9 has introduced a more forward-looking approach to financial reporting, with the Expected Credit Loss (ECL) model replacing the reactive Incurred Loss model. As a result, banks are now required to recognize credit losses earlier in the lending lifecycle, improving the accuracy and timeliness of financial reporting. This shift has enhanced the **transparency and reliability** of financial statements, instilling greater confidence among investors, regulators, and other stakeholders.

**Risk Management:** The implementation of IFRS 9 has transformed credit risk management practices across Kazakhstan's banking sector. Financial institutions are now required to integrate **ECL calculations into their risk assessment processes**, allowing for more proactive identification and management of high-risk assets. Additionally, banks have improved their **stress testing frameworks** to assess the potential impact of macroeconomic shocks on their credit portfolios. However, the reliance on advanced statistical models for ECL estimation has increased the **complexity of risk management practices**. Smaller second-tier banks, in particular, continue to face challenges in maintaining and validating these models due to resource constraints.

**Capital Adequacy:** The transition to IFRS 9 initially resulted in a significant increase in **loan loss provisions**, which temporarily reduced regulatory capital ratios across many second-tier banks. The National Bank of Kazakhstan introduced **transitional capital relief measures** to cushion the immediate financial impact, allowing banks to gradually adjust their capital structures.

Despite the short-term impact on capital adequacy, the long-term effect of IFRS 9 is expected to be positive, as the standard promotes more resilient financial practices and reduces the risk of unexpected credit losses.

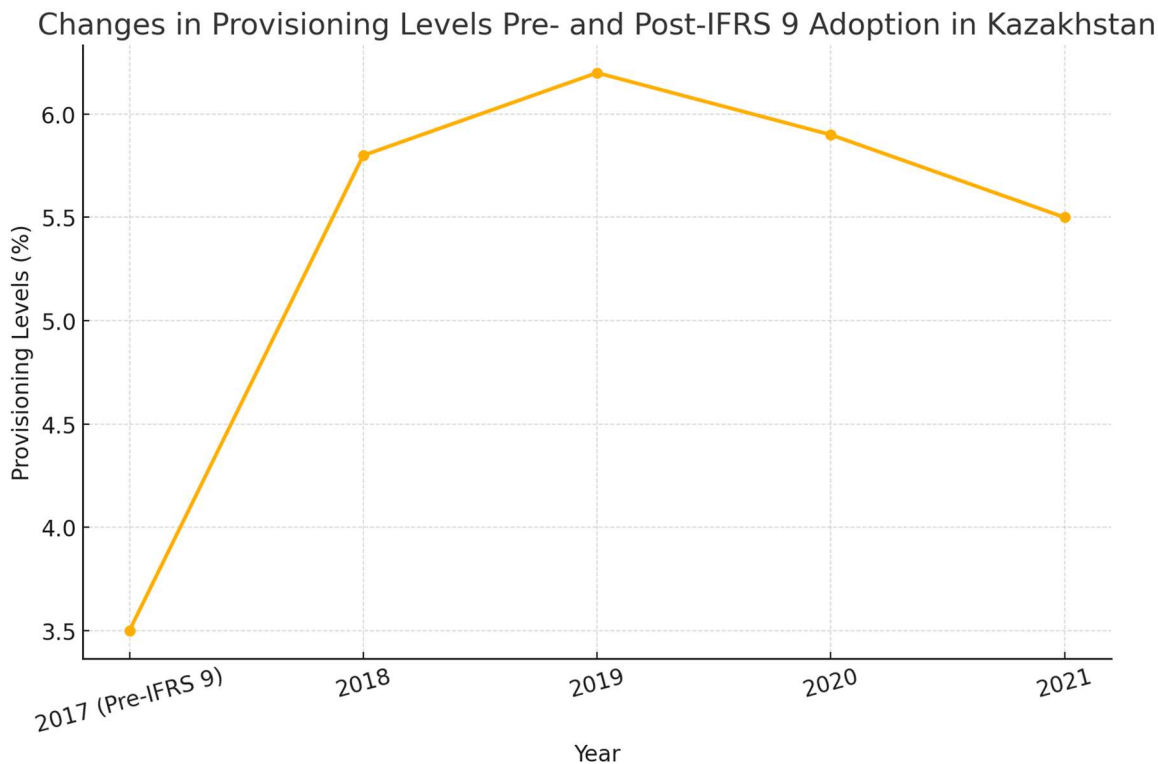


Figure 1: Changes in Provisioning Levels Pre- and Post-IFRS 9 Adoption in Kazakhstan

**Figure 1** illustrates the changes in provisioning levels in Kazakhstan's banking sector before and after the adoption of IFRS 9. The sharp increase in provisioning in 2018 reflects the initial impact of transitioning to the Expected Credit Loss (ECL) model, requiring banks to recognize

higher provisions for potential credit losses. Over subsequent years, provisioning levels stabilized as banks adapted to the new standard and improved their credit risk assessment methodologies.

This trend highlights both the short-term financial strain and the long-term stabilization benefits associated with IFRS 9 adoption. The standard has undoubtedly enhanced financial reporting transparency, improved credit risk management practices, and strengthened the resilience of Kazakhstan's banking sector against future economic shocks.

**Russia:** The adoption of IFRS 9 in Russia was driven by the **Central Bank of Russia (CBR)**, which played a central role in ensuring a smooth transition across the banking sector. Russian banks faced similar challenges to those in Kazakhstan, including **limited historical credit data** and the complexity of developing Expected Credit Loss (ECL) models. However, Russia benefited from a more robust regulatory infrastructure and the presence of larger, internationally connected financial institutions with prior experience in implementing complex risk assessment frameworks. The CBR provided detailed **regulatory guidelines** and conducted extensive training sessions for banking professionals to address the knowledge gap. Despite initial increases in provisioning levels and short-term impacts on capital adequacy, Russian banks managed to stabilize their financial indicators by 2020 (Ivanova et al., 2021).

**Brazil:** Brazil's adoption of IFRS 9 was overseen by the **Central Bank of Brazil (Banco Central do Brasil, BCB)**. One of the primary challenges faced by Brazilian banks was the **heterogeneity in financial sector readiness**, with larger institutions implementing IFRS 9 more effectively than smaller ones. Brazil also faced significant hurdles in developing accurate **credit risk assessment models** due to macroeconomic volatility and inconsistent historical data. Nevertheless, the Central Bank adopted a **phased implementation approach**, allowing smaller institutions to gradually comply with IFRS 9 requirements. Brazilian banks reported improved transparency and enhanced risk management practices as key outcomes of IFRS 9 adoption (Almeida & Santos, 2020).

**India:** In India, the **Reserve Bank of India (RBI)** played a proactive role in facilitating the adoption of IFRS 9. Indian banks faced challenges related to **data availability, model validation, and resource allocation** for technical infrastructure upgrades. The RBI provided extensive **guidelines and transitional relief measures**, helping financial institutions navigate the complexities of ECL modeling. Indian banks benefited from a relatively well-developed financial infrastructure, allowing for smoother adoption compared to many other emerging markets. By 2021, Indian banks reported notable improvements in **provisioning accuracy** and **credit risk management practices** (RBI Annual Report, 2021).

A comparative analysis of IFRS 9 adoption across Russia, Brazil, India, and Kazakhstan reveals both **similarities and key differences** in their approaches.

Table 2: Key Comparative Metrics of IFRS 9 Adoption in Kazakhstan, Russia, Brazil, and India

Key Metric	Kazakhstan	Russia	Brazil	India
Regulatory Readiness	Moderate	High	Moderate	High
Technical Expertise	Limited	Adequate	Limited (Smaller banks)	Adequate
Availability of Historical Credit Data	Limited	Moderate	Limited	Adequate
Implementation Model	Phased	Regulatory-driven	Phased	Regulatory-driven
Impact on Provisioning Levels	Significant Initial Increase	Moderate Increase	Significant Increase	Moderate Increase
Capital Adequacy Impact	Temporary Decline	Stabilized	Temporary Decline	Stabilized

**Similarities:** All four countries faced initial **increases in provisioning levels** upon adopting the ECL model. Regulatory authorities played a **central role** in facilitating adoption through phased strategies and technical guidance. Data availability and model development were consistent challenges across these economies.

**Differences:** Russia and India had better **technical expertise and institutional capacity** compared to Kazakhstan and Brazil. India demonstrated stronger regulatory preparedness and institutional support, while Kazakhstan and Brazil faced more **resource constraints** among smaller financial institutions. Brazil and Kazakhstan exhibited higher dependency on **external consultants and international partners** for technical support during adoption.

Several best practices have emerged from IFRS 9 adoption in Russia, Brazil, and India, offering valuable lessons for Kazakhstan:

1. **Phased Implementation Approach:** Both Brazil and Kazakhstan benefited from phased implementation timelines, allowing smaller institutions to adapt gradually.
2. **Regulatory Support and Oversight:** Russia and India showcased the importance of proactive regulatory guidance, including frequent audits, compliance checks, and capacity-building programs.
3. **Investment in Technical Expertise:** Indian banks invested significantly in technical training and data analytics infrastructure, facilitating smoother adoption.
4. **Collaboration with International Partners:** Brazil leveraged partnerships with global consulting firms to bridge technical knowledge gaps and ensure effective implementation.
5. **Stress Testing and Scenario Analysis:** Russia emphasized robust stress testing frameworks to simulate macroeconomic impacts on ECL models.

These practices highlight the importance of **regulatory clarity, institutional capacity, technical expertise, and phased timelines** in ensuring the successful adoption of IFRS 9.

The comparative analysis of IFRS 9 adoption across Kazakhstan, Russia, Brazil, and India focuses on the following dimensions:

- **Regulatory Support:** Effectiveness of regulatory guidelines, oversight, and enforcement mechanisms.
- **Institutional Capacity:** Technical expertise, infrastructure readiness, and availability of skilled personnel.
- **Data Availability:** Accessibility and quality of historical credit data for ECL modeling.
- **Financial Impact:** Changes in provisioning levels, capital adequacy, and financial stability.
- **Risk Management Practices:** Integration of IFRS 9 principles into credit risk assessment and management frameworks.

Despite differences in economic and institutional contexts, Kazakhstan shares several commonalities with other emerging economies in IFRS 9 adoption:

- Initial **increases in provisioning levels** and subsequent adjustments over time.
- **Data scarcity** as a critical challenge in developing accurate ECL models.
- The importance of **regulatory guidance** and capacity-building programs.
- Dependency on **external consultants and technology providers** for technical assistance.

Kazakhstan's experience with IFRS 9 implementation differs in several key aspects:

- **Limited institutional capacity** among smaller second-tier banks in developing robust ECL models.
- Higher dependency on **external consultants** compared to countries like India, where domestic expertise was more readily available.
- Slower **regulatory adaptation** to address ongoing technical and operational challenges post-implementation.
- Relatively **weaker historical credit databases**, resulting in inconsistent risk assessments across banks.

The success of IFRS 9 implementation in any emerging market depends on several interconnected factors:

1. **Institutional Strength:** Regulatory clarity, capacity, and oversight mechanisms are critical for adoption success.
2. **Economic Stability:** Macroeconomic volatility can disrupt implementation efforts and affect provisioning outcomes.
3. **Technical Expertise:** Skilled professionals with knowledge of advanced credit risk modeling are essential.
4. **Cultural Readiness:** Organizational culture within financial institutions must prioritize transparency, accountability, and proactive risk management.

Kazakhstan must address these factors holistically to fully realize the benefits of IFRS 9 adoption.

The adoption of IFRS 9 in Kazakhstan, as well as in other emerging economies like Russia, Brazil, and India, reveals a complex interplay between regulatory frameworks, institutional capacity, technical expertise, and economic stability. In Kazakhstan, the transition to IFRS 9 was marked by significant initial challenges, including **limited historical credit data, insufficient technical expertise, and financial strain on smaller second-tier banks**. Despite these obstacles, improvements in credit risk management practices, financial reporting transparency, and provisioning accuracy have gradually emerged.

The comparative analysis demonstrates that **regulatory clarity and phased implementation timelines** are critical success factors. Countries like India and Russia benefited from proactive regulatory oversight and comprehensive capacity-building programs, which minimized adoption hurdles. In contrast, Kazakhstan and Brazil faced more pronounced difficulties in developing

robust Expected Credit Loss (ECL) models and aligning risk management practices with IFRS 9 requirements.

Another key insight is the **financial impact of IFRS 9 adoption**, which manifested as a sharp increase in provisioning levels in the early stages of implementation. While these provisioning spikes temporarily affected capital adequacy ratios, they ultimately strengthened the resilience of banking institutions against potential credit shocks. Furthermore, the reliance on external consultants and international partnerships played a pivotal role in supporting the adoption process in Kazakhstan, albeit at a significant financial cost.

Lastly, the study highlights that **institutional readiness and technical infrastructure** are as important as regulatory support for successful IFRS 9 implementation. Countries with stronger institutional frameworks, such as India and Russia, were better equipped to navigate the complexities of IFRS 9 adoption compared to Kazakhstan and Brazil.

For **regulators**, the findings underscore the importance of continuous oversight and the provision of clear, actionable guidelines for IFRS 9 compliance. The **National Bank of Kazakhstan** should prioritize ongoing training programs, technical workshops, and collaborative platforms where banking professionals can exchange knowledge and best practices. Regulatory authorities must also ensure that smaller second-tier banks receive targeted support to bridge technical and financial gaps.

For **banks**, investments in **technical expertise and IT infrastructure** must remain a top priority. Banks need to develop in-house capabilities for ECL modeling, stress testing, and credit risk assessment rather than relying excessively on external consultants. Furthermore, financial institutions should adopt a culture of **proactive risk management**, where IFRS 9 principles are integrated into day-to-day decision-making processes.

For **policymakers**, supporting IFRS 9 adoption requires a multi-faceted approach. Policies should encourage collaboration between banks, regulators, and international financial institutions to share resources and technical expertise. Policymakers must also address structural issues, such as improving **data availability and quality**, to ensure more reliable credit loss estimation.

Incorporating these recommendations into Kazakhstan's financial sector can pave the way for smoother IFRS 9 implementation, ultimately enhancing financial stability, investor confidence, and the resilience of the banking sector.

This study contributes to the existing body of literature by offering a **comparative analysis** of IFRS 9 adoption across Kazakhstan, Russia, Brazil, and India. While previous studies have primarily focused on individual country experiences, this research bridges the gap by providing a **cross-country perspective**, highlighting both shared challenges and unique contextual factors.

The study also adds value by examining the **institutional, technical, and economic factors** influencing IFRS 9 adoption, offering a nuanced understanding of why certain strategies succeeded in some contexts while failing in others. Furthermore, the research emphasizes the **role of regulatory clarity, institutional capacity, and technical expertise**, providing actionable insights for stakeholders in Kazakhstan's banking sector.

By focusing specifically on Kazakhstan—a country with limited academic research on IFRS 9 adoption—this study serves as a valuable reference for scholars, regulators, and practitioners seeking to understand and improve the adoption of international financial reporting standards in emerging economies.

The implementation of IFRS 9 in Kazakhstan has been a multifaceted process characterized by both **challenges and successes**. Initial adoption was hindered by **limited historical credit data, technical expertise gaps, and significant financial costs**, particularly for smaller second-tier banks. However, over time, improvements in **credit risk management practices, financial reporting transparency, and provisioning accuracy** have become evident.

When compared to other emerging economies, Kazakhstan shares several commonalities, including **provisioning spikes, data challenges, and reliance on external technical support**. However, differences in **regulatory readiness, institutional capacity, and technical expertise** highlight Kazakhstan's unique implementation challenges. The study underscores the importance of **regulatory clarity, phased implementation strategies, and investments in technical infrastructure** as critical success factors for IFRS 9 adoption.

#### **Practical Recommendations: Steps for Improving IFRS 9 Adoption in Kazakhstan**

1. **Strengthen Regulatory Support:** The National Bank of Kazakhstan should continue providing clear guidelines, capacity-building programs, and phased implementation strategies tailored to smaller financial institutions.
2. **Invest in Technical Expertise:** Banks must prioritize internal capacity-building initiatives, including training programs for ECL modeling, risk assessment, and financial reporting.
3. **Improve Data Infrastructure:** Policymakers should focus on improving historical credit databases and ensuring data consistency across financial institutions.
4. **Encourage Collaboration:** Promote collaboration between financial institutions, regulatory bodies, and international experts to facilitate knowledge-sharing and technical support.
5. **Enhance Stress Testing Frameworks:** Banks should integrate stress testing as a routine risk management tool to proactively identify and address vulnerabilities.

While this study provides valuable insights, several limitations must be acknowledged. **Data availability** posed a significant challenge, as comprehensive credit risk data were often fragmented or inconsistent across the selected countries. Additionally, the reliance on publicly available financial statements and regulatory documents may have limited the depth of the analysis.

The **comparative nature of the study** also introduces challenges, as contextual differences between countries—such as cultural, economic, and institutional factors—may influence the outcomes of IFRS 9 adoption in ways not fully captured in this analysis.

Future research could explore the **long-term financial impacts of IFRS 9 adoption** on banking sector stability and capital adequacy in Kazakhstan. Additionally, studies focusing on the **effectiveness of specific risk management practices under IFRS 9** could offer more granular insights into the standard's practical outcomes.

Comparative research involving a **wider range of emerging economies**, particularly those in Central Asia and Eastern Europe, could provide a more comprehensive understanding of regional adoption patterns. Furthermore, qualitative studies focusing on the **perspectives of banking professionals and regulators** could enrich the findings by capturing experiential insights.

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# STRATEGIC HUMAN RESOURCES MANAGEMENT IN MEDICAL EDUCATIONAL INSTITUTIONS: NEEDS ANALYSIS AND AN INTEGRATED APPROACH

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**Abstract.** The article is devoted to the study of strategic personnel management in medical educational institutions, focusing on the analysis of current and projected needs of the healthcare system. The study examines the importance of predictive models for improving the efficiency of medical resource management and the sustainability of the healthcare system. A comparative analysis of the level of implementation of forecast models was carried out in developed countries, including the USA, Japan, Germany and the UK, as well as in Central Asian countries such as Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan.

Kazakhstan demonstrates leadership in the region thanks to an active state policy of digitalization and the introduction of analytical systems. While other Central Asian countries face constraints in funding, infrastructure, and human resources.

The article highlights the importance of an integrated approach to the implementation of predictive models, including the development of digital infrastructure, training and data integration.

The results of the study show that the use of predictive models makes it possible to effectively adapt healthcare systems to modern challenges, such as demographic changes and technological innovations, as well as improve the quality of medical services and accessibility for the population. Recommendations have been developed for the implementation of trend forecasting models in healthcare in Central Asia.

**Key words:** strategic management, staffing, analysis, comprehensive approach, cause and effect relationships.

Staffing is a key factor in the sustainability and development of the health care system, as skilled professionals determine the quality and availability of health care services. Strategic workforce planning in medical educational institutions is a complex and multifaceted process aimed at building human resources that can meet both current and future needs of the health care system, especially important in the face of a rapidly changing labor market, the influence of technological innovation and increasing requirements for the quality of training of specialists.

One of the key aspects of strategic planning is forecasting the need for medical personnel. This requires taking into account current data on the state of the labor market, demographic trends, epidemiological threats and the development of technologies in medicine.

**Experimental part.** The author Gonzalez-Garcia (2020) in his work emphasizes the importance of a systematic analysis of health care needs and the integration of educational programs with real industry challenges. In European experience, forecasting of staffing is actively supported by national strategies that adapt educational programs to changing market requirements [1].

Particular attention is paid to the interaction of educational institutions with medical organizations. Such a partnership allows the development and implementation of curricula that meet the current needs of the health care system. According to Smith (2021), the integration of educational and clinical experience contributes to the formation of students not only theoretical knowledge, but also practical skills, which increases their professional competence [2].

An important area of strategic planning is the introduction of innovative technologies into the learning process. Modern approaches include the use of simulation technologies, virtual reality and artificial intelligence, which allows students to prepare for work in the digital transformation of healthcare. According to Yamada research (2022), the introduction of such technologies in Japan has significantly improved the level of students' training and their willingness to work with high-tech equipment [3].

Strategic planning also involves the development of personnel policy within the educational institutions themselves. This includes attracting and retaining qualified teachers, creating conditions for their professional growth and motivation. Jones (2021) research highlights that the sustainability of staffing in medical colleges is directly related to investments in the development of teaching staff and the creation of a supportive corporate culture [4].

Kazakhstan's experience in strategic human resources planning also demonstrates the importance of a long-term approach. For example, Koikov and Kusainov (2021) note in their work that one of the main tasks is to create a national system for forecasting and planning personnel in healthcare. The authors emphasize the need to integrate medical educational institutions with government structures for the effective allocation of human resources [5].

In Russia, strategic personnel planning in medical education is also developing against the background of digitalization and the introduction of innovative approaches. The research of Ivanov and Smirnov (2022) shows that in the context of the growing burden on the healthcare system, the priority is to develop programs that focus on training specialists to work in difficult conditions, including emergencies and pandemics [6].

Thus, strategic personnel planning in medical educational institutions covers a wide range of tasks: from forecasting personnel needs to the introduction of innovative teaching methods and the development of teaching staff. Successful implementation of these tasks requires active cooperation between educational institutions, medical organizations and government agencies. International and domestic experience demonstrates the importance of a systematic approach to staffing planning, which contributes to strengthening the sustainability of the healthcare system and improving the quality of specialist training.

The analysis of the current and projected needs of the healthcare system for medical personnel is a fundamental step in the development of staffing strategies. Healthcare is facing global challenges, including demographic changes, increased life expectancy, an increase in the number of chronic diseases, technological innovations, and crises such as pandemics. These factors form a high dependence of the quality of medical services on the effective management of human resources.

The current need for medical personnel is often determined by their number, skill level, and distribution by region. For example, the Smith study (2021) highlights that in countries with high rates of population aging, there is a growing demand for specialists in gerontology and chronic diseases. At the same time, the shortage of health workers in remote and rural areas remains a key problem for many countries [7].

An important task is to identify the factors influencing the current shortage of personnel. According to the WHO (2020) study, one of the main reasons is the discrepancy between the graduation of educational institutions and the real needs of the market. This leads to an excess of specialists in some fields and a shortage in others, which negatively affects the availability and quality of medical services [8].

Forecasting staffing needs is a key element of long-term planning. It is based on the analysis of demographic data, epidemiological trends and technological changes. The Yamada study (2022) demonstrates that in Japan, the introduction of forecasting methods has made it possible to successfully adapt educational programs to the changing age structure of the population and the increasing demand for medical rehabilitation services.

Kazakhstan's experience in analyzing human resources needs also deserves attention. The study by A.Kusainov and V. Koikov (2021) highlights the importance of an integrated approach that includes the integration of medical organization data, demographic trends, and educational opportunities. The authors note that the creation of a unified personnel forecasting system can be an effective tool to reduce the shortage of specialists in key areas of healthcare [9].

The authors A.Ivanov and P.Smirnov (2022) note that the growth in the number of private medical organizations increases competition for qualified personnel, which requires the development of new methods for forecasting and regulating staffing. The authors suggest using digital platforms to monitor and predict needs, which will allow for flexible response to market changes [10].

Effective forecasting requires an integrated approach that takes into account both quantitative and qualitative aspects. This includes analyzing current job openings, studying labor market trends, and researching employee preferences and motivation.

Smith (2021) emphasizes the importance of surveys of healthcare professionals and employers to obtain data on current and projected health system needs.

**Research methods.** Predictive models in healthcare play a key role in ensuring effective management of medical resources, reducing costs and increasing accessibility of services to the public. This model allows healthcare systems to adapt to demographic changes, technological innovations, and epidemiological challenges.

With an increasing number of chronic diseases, an aging population, and a shortage of qualified medical personnel, the use of predictive tools is becoming not just desirable, but a necessary condition for the sustainability of the medical system. They help to identify human, financial and material resource needs in advance, which facilitates the adoption of strategically important decisions and timely adaptation of healthcare systems.

In addition, predictive models in medicine contribute to improving the quality of services provided by accurately analyzing data on the health status of the population. Forecasting epidemiological risks helps to allocate resources more effectively and prevent crisis situations in the healthcare system.

Thus, the introduction of predictive models not only contributes to improving the efficiency of medical institutions, but also improves the availability and quality of medical care for various categories of the population.

Figure 1 shows the use of predictive models in healthcare in developed countries in% such as the USA, Germany, Japan, Canada and the UK. The United States demonstrates one of the highest levels of use of predictive models (85%), due to the widespread adoption of artificial intelligence technologies and analytical systems in the medical sector. Japan leads the world with 92%, thanks to a long-term strategy for digitalizing healthcare and adapting the system to an aging population. Canada and Germany show a high level of integration of predictive models, reaching 80% and 78%, respectively. The UK has a score of 75%, which also reflects strong investments in the development of predictive technologies, although there remains potential for improvements in the integration of these models. These countries actively use analytical platforms for planning human resources and medical services.

As a result, the analysis of the current and projected need for medical personnel is the basis for the formation of a sustainable healthcare system.

The use of predictive models, data integration and adaptation of educational programs make it possible to manage human resources more effectively and increase the availability of medical services.

International and domestic experience shows that an integrated approach to the analysis and forecasting of personnel needs contributes to solving global and regional health problems.

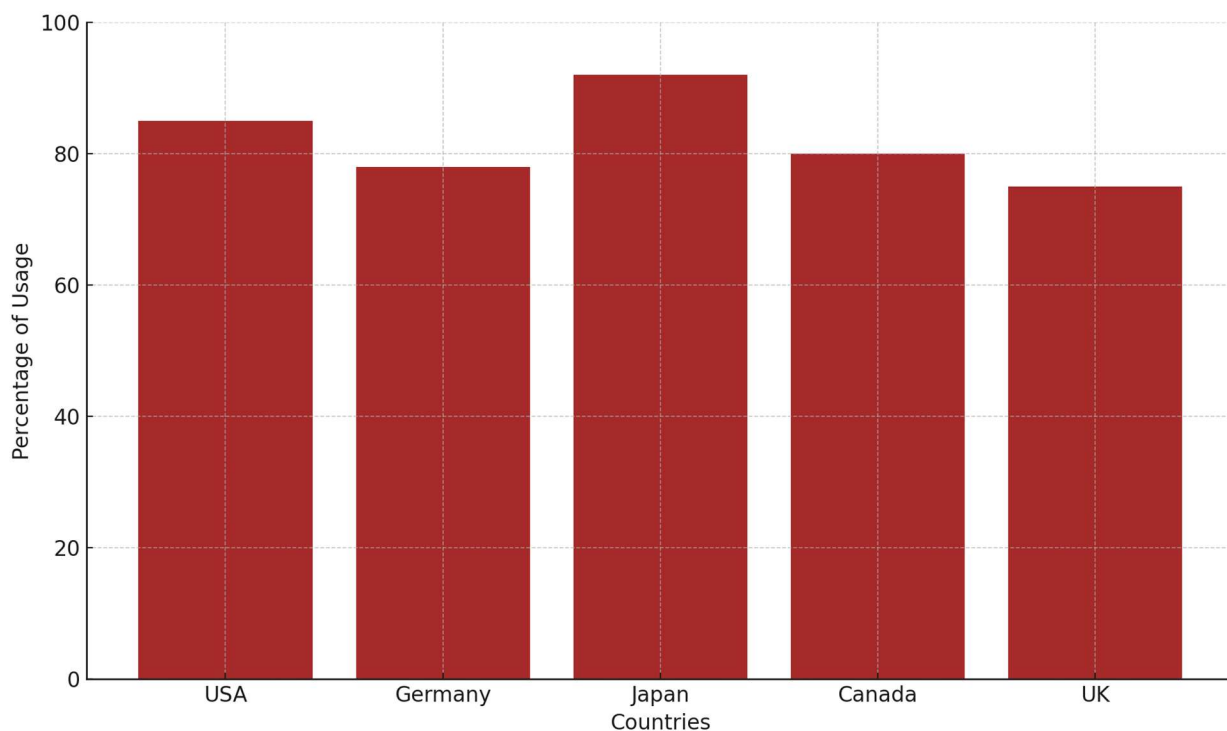


Figure 1 - Level of use of predictive models in health care in developed countries

Note: Figure is based on sources [11,12].

Figure 1 highlights the importance of predictive models for improving the efficiency of health systems, particularly in the face of demographic and technological challenges. Despite differences between countries, they all actively use these tools to manage medical resources.

Figure 2 shows the use of predictive models in health care in Central Asian countries. Consider the key patterns identified from the data and their causal relationships. Kazakhstan (65%) leads among the countries of the region in terms of the use of forecast models. Since it is associated with an active state policy of digitalization, including the Digital Kazakhstan strategy, which provides for the introduction of analytical and predictive systems in healthcare [13]. Significant investments in infrastructure, technology and workforce training create the conditions for integrating predictive models into health resource management. The consequence is improved health system efficiency, including workforce planning and management of the burden on health facilities.

Uzbekistan demonstrates a moderate level of use of predictive models. This is due to gradual reforms in healthcare aimed at improving infrastructure and introducing technology. However, limited financial resources and a lack of qualified specialists slow down the process. The consequence is the partial implementation of predictive technologies, which so far cover only certain aspects of healthcare, such as epidemiological forecasting.

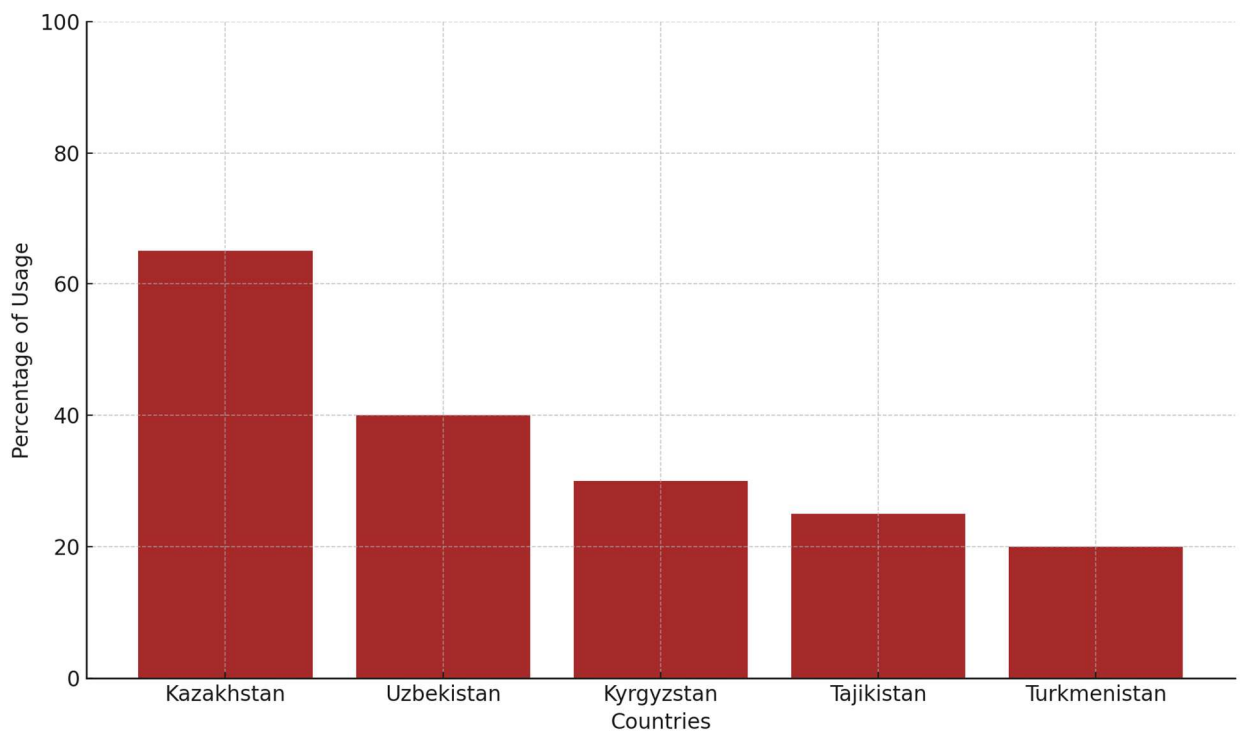


Figure 2 - Level of use of predictive health models in Central Asia

Note: figure is based on sources [11,12]

In Kyrgyzstan, the use of predictive models remains low, due to insufficient financing of healthcare and a weak technological base. The main focus in the country is on solving current problems such as staffing shortages and access to medical services. The consequence is a limited ability to apply predictive models, which reduces the long-term sustainability of the healthcare system.

Tajikistan and Turkmenistan demonstrate the lowest levels of use of predictive models, due to limited infrastructure, staff shortages, and weak government support for healthcare digitalization. The reason is also the lack of access to advanced technologies and insufficient interaction with international partners. The result is an almost complete lack of long-term planning in the management of the healthcare system, which increases dependence on traditional approaches. Based on the results of causal relationships, the high level of use of forecast models (Kazakhstan) is due to the presence of a clear state strategy and financial investments, which leads to improved planning and allocation of resources.

The average level of use (Uzbekistan) is associated with the partial introduction of technologies, which allows solving only individual tasks, such as controlling epidemics.

Low utilization (Kyrgyzstan, Tajikistan, Turkmenistan) is due to lack of resources and weak integration of technologies, which persists with problems of ineffective management.

To implement trend forecast models in the health care of Central Asian countries, it is necessary to create investments in infrastructure

The development of digital infrastructure, including high-speed Internet and data centers, will be the basis for the following indicators:

- collection, storage, analysis of large volumes and systematization of data;
- creation of a unified system for recording data on the state of public health, human resources, medical services and epidemiological risks;
- training of qualified personnel capable of working with forecasting and analytical systems;
- creating a regulatory framework, stimulating the use of predictive technologies and international cooperation.

**Results and discussions.** Predictive models have been identified as playing a key role in the sustainability of health systems, helping to adapt to the challenges of the modern world, such as an ageing population, understaffing and the growing demand for health services. These tools allow not only predicting human and material resource requirements, but also developing effective management strategies in resource-constrained settings.

Comparative analysis showed significant differences between countries in the region. Kazakhstan demonstrated the highest level of use of forecast models due to the introduction of the state digitalization strategy and the active integration of analytical technologies in the healthcare sector. Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan have faced constraints in funding, infrastructure, and human resources capacity, significantly reducing their ability to implement these models.

It should be noted that for all countries of Central Asia, the introduction of forecast models should be a priority. This requires an integrated approach, including the development of digital infrastructure, data integration, training and active government support. In addition, the introduction of trending forecasting models will allow more efficient planning and management of health resources, improving the quality of health services and public access to them.

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## Technical Sciences

# ИССЛЕДОВАНИЕ СЕЙСМОСТОЙКОСТИ БЕЗРИГЕЛЬНЫХ ЖЕЛЕЗОБЕТОННЫХ КАРКАСНЫХ ЗДАНИЙ МОНОЛИТНОЙ КОНСТРУКЦИИ

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**Аннотация.** В статье приведены результаты численного исследования работы пятиэтажного железобетонного каркасного здания монолитной конструкции, запроектированного в районе сейсмичностью 7 баллов по шкале МСК-64К. На основании данных численного исследования было обосновано принятие максимального числа этажей при проектировании безригельного железобетонного каркасного здания без вертикальных устоев жесткости. При этом ограничение количества этажей при проектировании безригельного железобетонного каркасного здания монолитной конструкции было сопоставлено требованиям СНиП РК 2.03-30-2006 «Строительство в сейсмических районах» в этой части. Рекомендовано: при проектировании каркасных зданий монолитной конструкции в сейсмических районах максимальное количество этажей здания обосновывать на основании анализа работы каркаса здания с учетом упруго пластических свойств материалов несущих конструкций (бетона и арматуры) посредством численного исследования.

**Ключевые слова:** железобетонные каркасные здания монолитной конструкции, сейсмическое воздействие, численное исследование, упруго пластические свойства материалов конструкций.

Численному исследованию подвергнута работа трехпролетного в поперечном направлении и восьмипролетного в продольном направлении пятиэтажного каркасного офисного здания монолитной конструкции. Высота здания 15м, высота этажей по 3м. Шаг колонн 6.4х6.4м. Колонны первого этажа жестко защемлены на уровне верхнего обреза фундамента. На рисунке 1 показана расчетная схема здания, построенная в программном комплексе ЛИРА для 5-ти этажного безригельного железобетонного каркасного здания

монолитной конструкции. При исследовании работы безригельных железобетонных каркасных зданий монолитной конструкции класс бетона и арматуры железобетонных элементов каркаса приняты соответственно В25 и А400 (А-III). Размеры сечения колонн 400х400мм, армирование колонн симметричное, при этом продольные арматуры расположены в четырех углах поперечного сечения колонн; плиты перекрытия и покрытия – монолитные, толщина 200 мм. Нагрузки, действующие на конструкции и здание в целом, приняты в соответствии с требованиями норм для офисных зданий.

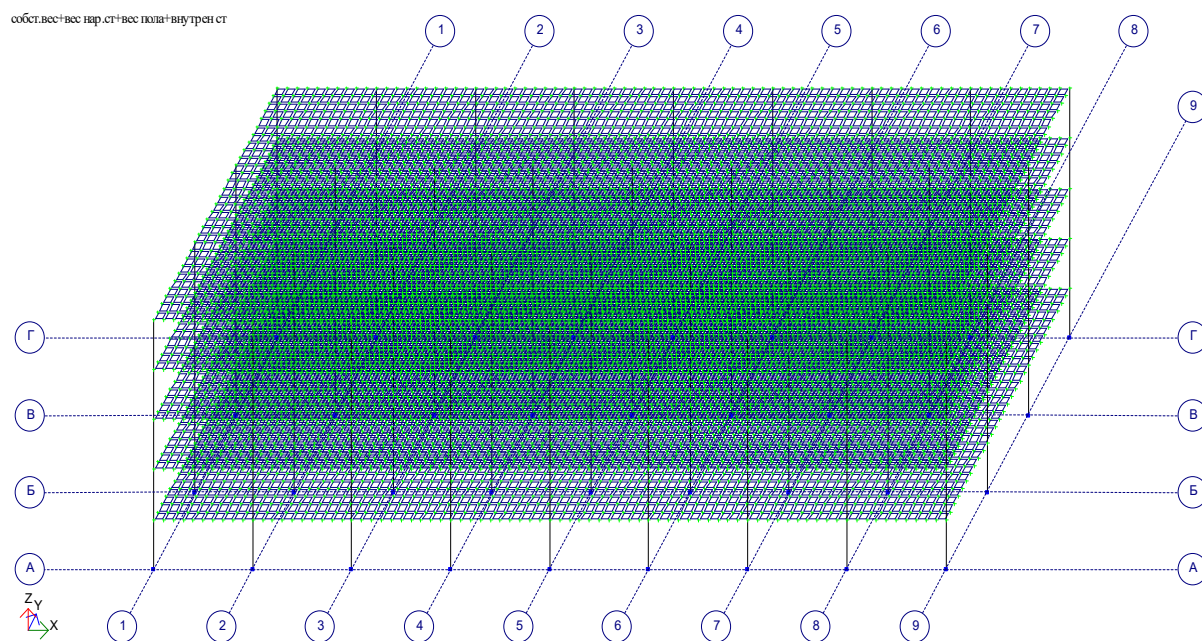


Рисунок 1 – Расчетная схема 5-ти этажного безригельного каркасного здания монолитной конструкции

### Оценка сейсмостойкости железобетонных каркасных зданий монолитной конструкции

Оценка сейсмостойкости железобетонных каркасных зданий монолитной конструкции выполнена с учетом требований норм [1].

При этом выполнены расчеты 5-ти этажного каркасного здания монолитной конструкции, запроектированного для строительства в районе с расчетной сейсмичностью **7 баллов**;

В результате упругого расчета безригельной железобетонной каркасной системы монолитной конструкции на особые сочетания нагрузок с учетом сейсмического воздействия, равной **7 баллов**, принято армирование элементов каркаса в соответствии с требованиями норм [1].

При проектировании зданий в соответствии с требованиями норм [1] ограничиваются предельные горизонтальные деформации этажей и здания в целом. При этом предельные горизонтальные деформации определяются в зависимости от типа соединения между несущими стеновыми конструкциями и ненесущими конструкциями здания.

Сравнительный анализ значений максимальных перемещений (и перекосов этажей) безригельного железобетонного каркаса монолитной конструкции, полученных в результате упругого расчета с предельными значениями перемещений (и перекосов этажей)

по требованиям норм [1] показывает, что деформации при упругой работе железобетонных каркасов, соответствующие расчетным значениям сейсмических нагрузок не превышают предельных значений, предусмотренных нормами как для типов соединений, обеспечивающих раздельную работу несущих и ненесущих конструкций, так и для типов соединений, не обеспечивающих раздельную работу несущих и ненесущих конструкций.

В таблице 1 приведены результаты расчета с учетом требований норм [1] и принятое армирование колонн для 5-ти этажного безригельного каркасного здания монолитной конструкции.

Таблица 1 - Результаты расчета и принятое армирование колонн безригельного железобетонного 5-ти этажного офисного здания

Принятое количество продольной арматуры колонн							
По результатам упругого расчета					С учетом конструктивных требований		
Номер этажа	Обозначение колонны	Процент армирования, %	Площадь сечения одной арматуры, см <sup>2</sup>	Диаметр арматуры, мм	Процент армирования, %	Площадь сечения одной арматуры, см <sup>2</sup>	Диаметр арматуры, мм
1-й этаж	УК 11	0.42	1.68	16	0.98	3.8	22
	УК 21	1.12	4.48	25	1.12	4.91	25
2-й этаж	УК 31	0.21	0.8	12	0.98	3.8	22
	УК 41	0.12	0.48	10	0.98	3.8	22
3-й этаж	УК 51	0	0	0	0.98	3.8	22
	УК 61	0.2	0.8	12	0.98	3.8	22
4-й этаж	УК 71	0	0	0	0.98	3.8	22
	УК 81	0.4	1.6	16	0.98	3.8	22
5-й этаж	УК 91	0.1	0.4	10	0.98	3.8	22
	УК 101	0.72	2.88	20	0.98	3.8	22

На основании результатов расчета принято следующее армирование колонн здания. Колонны первого этажа, расположенные вдоль разбивочных осей А, Г, 1 и 9 (рис.1) армированы четырьмя арматурами диаметром 22мм (обозначение колонн УК11). Внутренние колонны первого этажа армированы четырьмя арматурами диаметром 25мм (обозначение колонн УК21). Колонны верхних этажей армированы четырьмя стержнями диаметром 22мм (обозначение колонн УК31-УК101).

#### Методика численного исследования работы железобетонных элементов

При действии на конструкции зданий нагрузок особого сочетания с учетом сейсмической нагрузки расчетной величины имеет место работа материалов железобетонных конструкции в физически нелинейной стадии. Поэтому программа исследований предполагала изучение работы железобетонного безригельного многопролетного пятиэтажного каркаса монолитной конструкции на действие сейсмических нагрузок с целью выявления несущей способности систем с учетом работы элементов в упруго пластической стадии, принимая во внимание возможное образование трещин в железобетонных элементах и неупругие деформации бетона и арматуры.

При численном исследовании работы конструктивных систем рассматриваемых зданий производился анализ усилий, действующих в элементах конструктивной системы, а

также оценка деформативности (жесткости) конструктивной системы в целом и отдельных ее элементов. При этом физическая нелинейность бетона и арматуры в данной работе описана по зависимостям, приведенным в библиотеке ПК ЛИРА.

В целом, исследована неупругая работа железобетонного каркасного здания до его полного разрушения при совместном действии нагрузок особого сочетания. Сейсмическая нагрузка при исследовании железобетонного каркасного здания прикладывалась горизонтально этапами в поперечном направлении здания. При этом фиксировалось значение перемещения каркаса для каждого шага изменения нагрузок, на основании которого построены графики «нагрузка-перемещение».

Принятая в данной работе методика исследования работы железобетонного каркасного здания на действия нагрузок особого сочетания с учетом сейсмического воздействия более подробно описаны также в ранних работах авторов настоящей статьи [2-6].

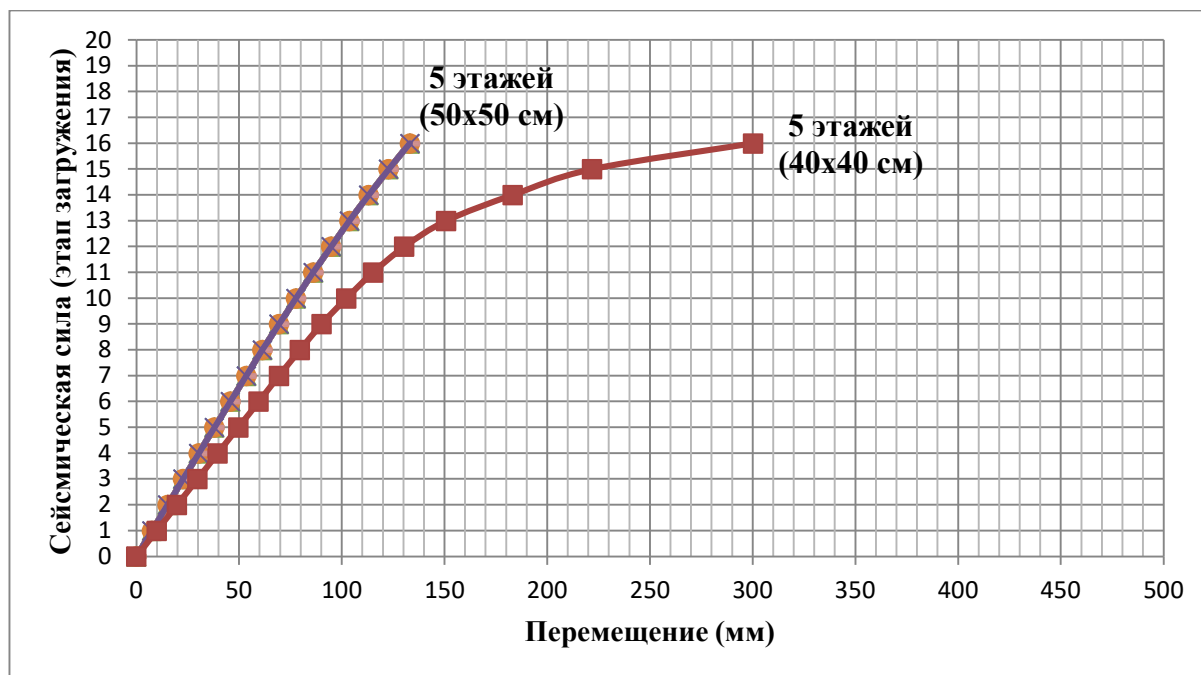
### **Численное исследование работы безригельного железобетонного каркасного здания монолитной конструкции на совместное действие нагрузок особого сочетания**

По результатам расчета с учетом упруго пластической работы материалов конструкций максимальное перемещение здания под воздействием горизонтальной сейсмической нагрузки, составило 49.6 мм, что превысило предельно допускаемое значение перемещения для 5-ти этажного безригельного железобетонного здания с типами соединений, не обеспечивающих отдельную работу несущих и ненесущих конструкций по требованиям норм [1].

Для рассматриваемого случая, т.е. для соединений, не обеспечивающих отдельную работу несущих и ненесущих конструкций, при принятых характеристиках здания применение в сейсмических районах безригельных каркасных зданий монолитной конструкции согласно данным упруго пластического расчета не допускается.

Как показывают результаты настоящего исследования, для применения безригельных каркасных зданий монолитной конструкции в сейсмических районах с традиционно применяемыми колоннами, размеры поперечного сечения которых 40х40см, жесткость здания в горизонтальном направлении оказалась недостаточной. Поэтому также была исследована работа безригельного каркасного здания монолитной конструкций с колоннами, размеры которой приняты 50х50см.

На рисунке 2 представлены результаты исследования безригельного железобетонного каркасного здания монолитной конструкций на совместное действие нагрузок особого сочетания, запроектированного для района с сейсмичностью площадки 7 баллов до полного разрушения здания.



5-ый этап нагружения (по оси ординат) соответствует 7 баллам сейсмического воздействия;

10-ый этап нагружения (по оси ординат) соответствует 8 баллам сейсмического воздействия

Рисунок 2 – Графики «нагрузка-перемещение» для 5-ти этажного железобетонного безригельного каркаса монолитной конструкции

Как видно из рисунка 2 увеличение поперечного сечения колонн с 40x40см на 50x50см, в целом способствовало увеличению жесткости здания. Ниже приведена таблица 2 с результатами численного исследования безригельного каркаса, поперечное сечение колонн которых составило 40x40см и 50x50 см, запроектированного для района с сейсмичностью площадки **7 баллов**.

Таблица 2– Значения первого тона колебаний и значения перемещений характерных узлов здания

Характеристики безригельного железобетонного каркасного здания монолитной конструкции с размерами поперечного сечения колонн <b>40x40см</b>				
Кол-во этажей здания	Т, период 1-го тона колебаний (с)	f, (мм) перемещение характерных узлов здания		Предельно допустимые значения перемещений по СНиП РК 2.03-30-2006 (мм)
		по результатам упругого расчета	с учетом упруго пластических свойств материалов	
5 эт	1.565	34.8	49.6	45
Характеристики безригельного железобетонного каркасного здания монолитной конструкции с размерами поперечного сечения колонн <b>50x50см</b>				
Кол-во этажей здания	Т, период 1-го тона колебаний (с)	f, (мм) перемещение характерных узлов здания		Предельно допустимые значения перемещений СНиП РК2.03-30-2006 (мм)
		По результатам упругого расчета	С учетом упруго пластических свойств материалов	
5 эт	1.352	30.9	38	45

Результаты упруго пластического расчета показали, что при принятом размере поперечного сечения колонн 50х50см в безригельных железобетонных каркасных зданиях с типами соединений, не обеспечивающих отдельную работу несущих и ненесущих конструкций, обеспечивается достаточная жесткость здания, что позволяет выполнению условий п. 5.28 [1].

Как показывают результаты настоящего исследования, применение безригельных железобетонных каркасных зданий монолитной конструкции в сейсмических районах необходимо обосновать дополнительными расчетами зданий с учетом упруго пластических свойств материалов конструкций, так как результаты упругого расчета могут быть недостаточными для обоснованного заключения о применимости такого рода зданий при проектировании в сейсмических районах.

### **Выводы**

Количество этажей в безригельных железобетонных каркасных зданиях монолитной конструкции при проектировании на строительных площадках сейсмичностью 7 баллов следует принимать по результатам данных упруго пластического расчета, чтобы исключить возможность получения недопустимых деформаций здания в результате воздействия землетрясений расчетной интенсивности.

Результаты численного исследования пятиэтажного безригельного каркасного здания монолитной конструкции на действие нагрузок с учетом упруго пластических свойств бетона и арматуры показывают, что при сейсмических нагрузках, соответствующих расчетным землетрясениям, максимальные перемещения здания могут превышать предельно допустимые горизонтальные деформации здания, предусмотренные требованиями норм.

На основании анализа результатов настоящего численного исследования можно утверждать о том, что современному проектировщику необходимо уделять внимание не только на традиционный расчет в упругой стадии работы конструкций в соответствии с требованиями действующих нормативных документов, но и необходимо анализировать работу конструкций и здания в целом с учетом упруго пластических свойств материалов. Такой подход к проектированию зданий в сейсмоактивных зонах дает более реальную картину работы здания при действии сейсмической нагрузки.

Результаты численного исследования работы железобетонных безригельных каркасных зданий с учетом упруго пластических свойств материалов, приведенные в настоящей работе, показывают, что в зданиях, запроектированных с учетом требований норм [1], значения максимальных перемещений здания могут превышать предельно допустимые горизонтальные деформации здания, независимо от того, что по результатам расчета согласно требованиям норм предельные деформации находятся в пределах норм.

В связи с этим при проектировании безригельного каркасного здания монолитной конструкции на расчетные значения нагрузок, с силой соответствующей сейсмичности площадки строительства, необходимо предусмотреть условия способствующие повышению жесткости здания в горизонтальном направлении для обеспечения условий предельно допустимых деформаций (перемещений) здания. Также условия, обеспечения предельно допустимых деформаций (перемещений) здания могут быть определены на основании результатов исследования работы здания с учетом физической нелинейности материалов несущих конструкций.

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# ОРИГАМИ ТӘСІЛІН КИІМДЕРДІҢ КҮЛТЕЛЕНГЕН ЭЛЕМЕНТЕРІН ОРЫНДАУДА ҚОЛДАНУ

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## Аннотация

Мақалада оригами стиліндегі киімді жобалау әдісі қарастырылады. Сәндік оригами элементтері бар киім стандартты киім үлгілеріне қарағанда адамды ерекшелендіреді. Киім элементтеріндегі күлтеленуді қалыптастыруда оригами тәсілін, материалдардың қасиетін, бөлшектердің жекелену бағытын, олардың бірімен бірінің жалғану тәсілдерін ескере отырып жобалау әдістемесі зерттелген.

Кілітті сөздер: оригами стилі, киімді жобалау, киімдегі геометриялық фигуралар, киімді құрастыру, оригами тәсілі

## Аннотация

В статье рассмотрены вопросы проектирования одежды в стиле оригами. Исследуются методы проектирования одежды с декоративными элементами оригами, свойства материалов, направленные для индивидуализации деталей, способов их соединения между собой.

Ключевые слова: стиль оригами, дизайн одежды, геометрические фигуры в одежде, конструирование одежды, метод оригами.

**Кіріспе.** Адамның үнемі кемелдік пен жаңалыққа ұмтылуы, идеялардың байлығы, таңдау еркіндігі, алуан түрлі инновациялық материалдар сәндегі жаңа шығармашылық шешімдердің дамуына әкелді. Түрлі құрастыру, сәндік және технологиялық әдістерді қолдана отырып, үлгілердің пішінінің күрделілігін атап көрсететін киімнің ерекше құрылымы бүгінгі күннің үрдісі болып табылады [1].

Көптеген шығармашыларды қатаң геометриялық фигуралар шабыттандырады және оларды барлық жерлерде, силуэттерде, күлтелерде, тіпті текстурада пайдаланады. Түрлі квадраттар, шеңберлер, үшбұрыштар мен жолақтар киім үлгілерін безендіреді. Киім құрылысына көптеген құрылымдық және сәндік элементтерді енгізу нәтижесінде көлемді күлтеленген бұйым жасалынады. Көптеген құрылымдық элементтердің болуы фигураға тығыз сәйкестігімен ерекшеленетін өнімдерді жасауға мүмкіндік береді.

Сонымен қатар, сипатталған мәселені шешуге мүмкіндік беретін зерттеу бағыты құрылымның қосымшасын азайтып, созымдал күлтеленуді бөлшектердің өзара біріктіру тәсілін негізделіп таңдаумен де байланысты болады.

Киімде белгілі бір пішінді алу үшін құрылымдық элементтерде оригами тәсілін пайдаланудың маңызды екені айқын. Оригами ертеде, ежелгі Жапонияда пайда болды. Ол қашаннан қағаз фигураларды бүктеу өнері болған [2]. Сонымен қатар, оригамидің бірегейлігі мен стилі киімде жаңа формаларға серпін береді. Бұл тақырыптың өзектілігі оригами стиліндегі киімі өзінің бірегейлігімен ерекшеленетіндігінде. Қазіргі әлемде адамды киімге жаңашылдық, ерекшелігі қызықтырады. Сәндік оригами элементтері бар киім стандартты киім үлгілеріне қарағанда адамды ерекшелендіреді. Дизайнерлер мен сәнгерлер оригами техникасында қолданылатын анық пішіндер мен нақты сызықтарға назар аударады.

Дизайнерлер өнердің бұл түріне назар аудармай тұра алмады, бірақ оны кеңінен қолдану үшін іздестіру жұмыстарын жүргізу және киім бөлшектерінің элементтерінің дизайнын әзірлеу тәсілдерін құру қажет болды. Оригами әдісімен алынған құрылымдық және сәндік элементтердің күлтелерінің орналасуы мен орындау бағытының тиімді ұсыныстары жоқ. Сонымен қатар, өзара әсер ететін параметрлер кешені, өлшемдер мен қолданылатын материалдар, бөлшектердің технологиялық байланыстарының түрлері және т.б. туралы білім жүйеленбеген. Сондықтан оригами тәсілдері қолданып орындалған киім бұйымдарын жобалау кезінде аталған мәселелер кешенді шешу өзекті болып табылады.

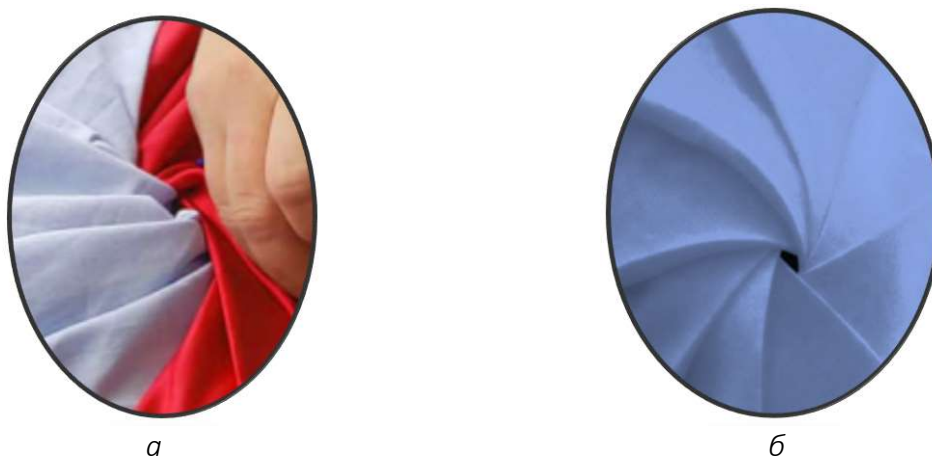
**Жұмыстың мақсаты** киім элементтеріндегі күлтеленуді қалыптастыруда оригами тәсілін, материалдардың қасиетін, бөлшектердің жекелену бағытын, олардың бірімен бірінің жалғану тәсілдерін ескере отырып жобалау әдістемесін құру болады.

**Зерттеу нысаны** – оригами стилінде жасалған күлтеленген элементтері бар киім бөлшектерін орындау үдерісі.

**Тәсілдеме.** Күрделі пішіндегі бұйымдарды жасай білу – жоғары кәсібилік пен шеберліктің белгісі. Сондықтан мұндай үлгілерді жасаудың жалпы сұлбасы мен жұмыс ретін анықтау қиын, кейде мүмкін емес. Әрбір жағдайда ол жеке болады. Үлгіні талдау, оны барлық жағынан көру, білу қабілеті күрделі кеңістіктік пішіндерді түйреу техникасында табысты орындай алу үлкен маңызды. Күрделі киім пішіндерін жасау әдістерінің бірі - оригами тәсілі.

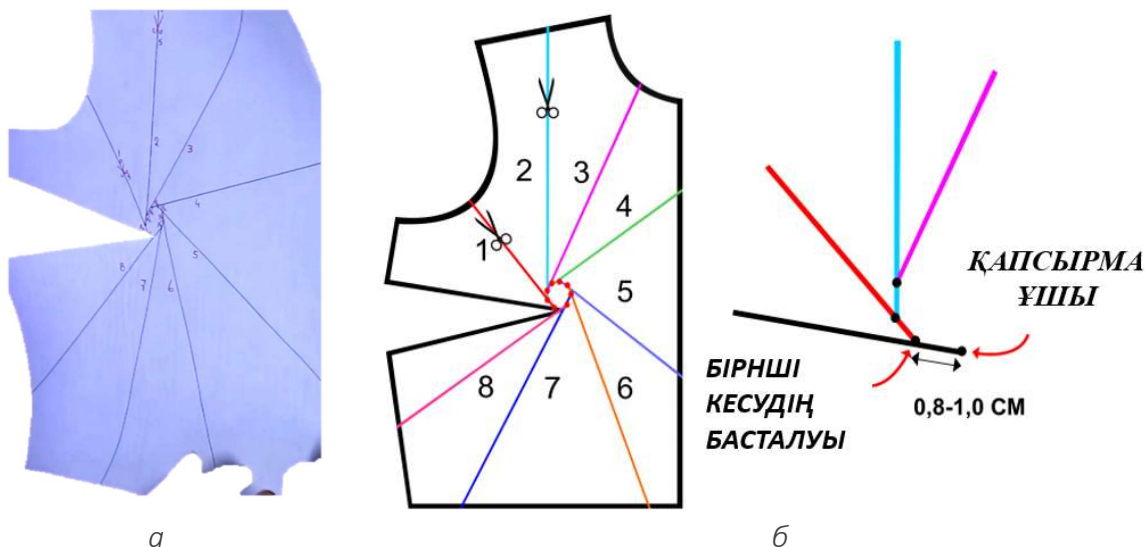
Оригами тәсілінде жұмыс істеу үрдісінде пропорционалдылықты және олардың үйлесімділігін, модельдің функционалдығын және түйіндерді жоғары сапалы өңдеу мүмкіндігін қамтамасыз ету үшін бұрын қалыптасқан элементтерге оралып, олардың пішіні мен параметрлерін реттеу керек.

Жұмысты үлгінің құрылу идеясын іздеуден және оны талдаудан бастау керек. Айта кету керек, элементтердің өлшемдері әртүрлі болуы мүмкін, ал қатпарлану бұйымның ортасында өңірінде немесе артқы жағында, сондай-ақ бүйірлік тігістер аймағында, иықта, жеңнің үстіңгі, төменгі бөліктерінде әдемі көрінеді. Қатпарлар шоғырланған жерде бұйымның көлемінің ұлғаюы пайда болатынын ескерген жөн (сурет 1).



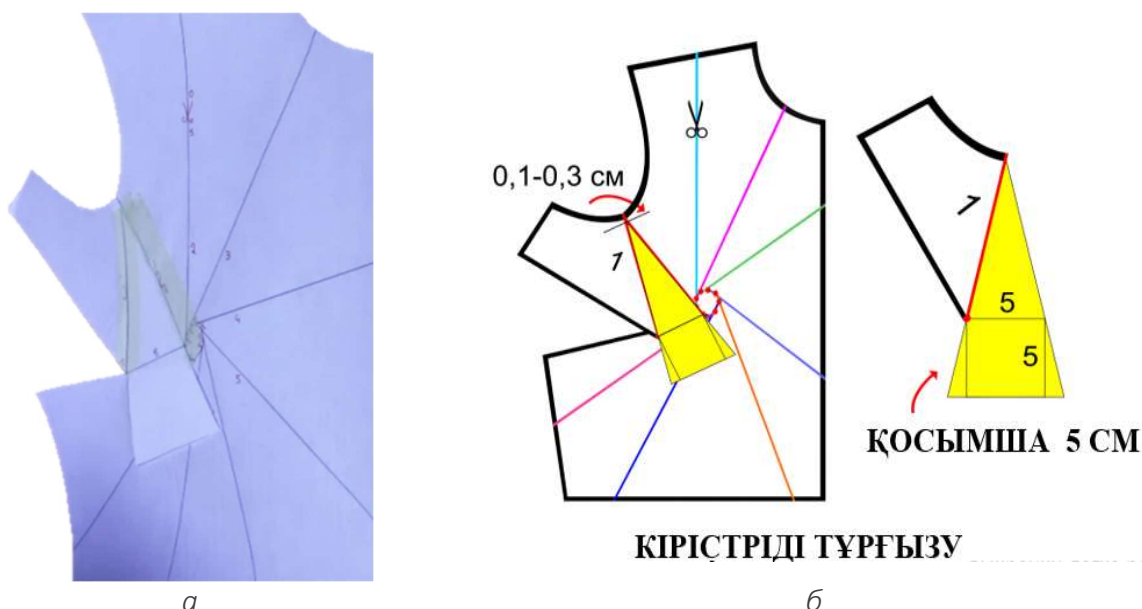
Сурет 1 - Оригами тәсілімен алынған қатпарлану элементтерінің түрлері (оригами стилінде *а*- түйреу тәсілімен қатпар құру тәсілі, *б* - оригами стилінде бүктеу).

Үлгіні салу үшін қағаз қолданған дұрыс. Қағазға сызықтар салу және дәл өлшемдерді жүргізу оңайырақ, ал қағаз шаблонын пайдаланып үтікпен матаға қатпарлар жасағанда қыртыссыз және бұрмаланбай анық қатпарлар алынады. Мысал ретінде, бүйірлік тігісінен бір кеудеге арналған жартылай көкірекше үлгісін қарастырайық. Ең алдымен, біз үлгідегі спираль сызығының сипатын белгілейміз және оны келесі жолмен орындаймыз: басында жоғарыдан белгілі бір қашықтықта шегініп, сызық сызамыз, қарастырып отырған мысалыда жағдайда - 1 см. Әрбір келесі кесінді түзу алдыңғысының басынан аз қашықтықта басталады. Соңғы арқалық міндетті түрде ілмектің жоғарғы жағын кесіп өтуі керек (сурет 2).



Сурет 2 – Қағазда қапсыма сызығын жүргізу (*а* - қағаздағы сызба, *б*- сызбаны орындау қатары) .

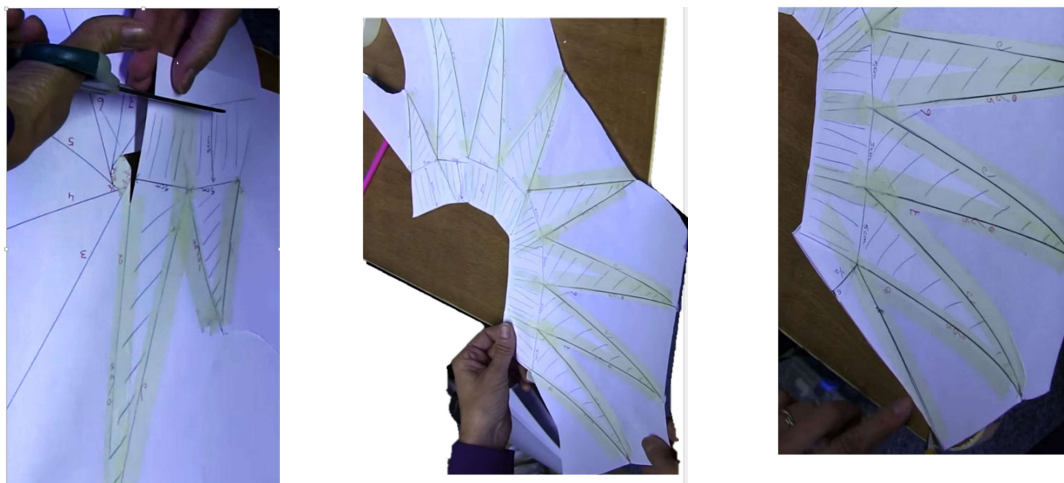
Келесі қадам - сызбадағы қатпардың бүктемелерінің сызықтарын пішу (сурет 3). Мұны орындау үшін шамамен 0,3 см соңына жетпей, үлгідегі бірінші жолдың бойымен кесеміз. Енді алынған тесікті қағазбен толтырамыз. Табаны 5 см болатын тең қабырғалы үшбұрышты салып, қиып аламыз.



Сурет 3 - Тең бүйірлі үшбұрыш түріндегі ендіріменің құрылысы (а-сызбадағы кірістіру орны, б - қосымшасы бар кірістіру құрлысының сызбасы)

Аяқталған пішінде бүктеудің тереңдігі 2,5 см болады, бұл көйлек және костюм маталары үшін оңтайлы мөлшер. Негізден мұндай бөліктерге кішкене тесіктер үшін қосымша 5 см құрайды. Егер шеңбердің диаметрі үлкенірек болса - 4-6 см, қатпарлар тереңірек болса, онда қосымша 6-7 см-ге дейін артады. Спиральдың еңіс сызығының еңістік бұрышы үлкен болғанда бұл мән одан да артады.

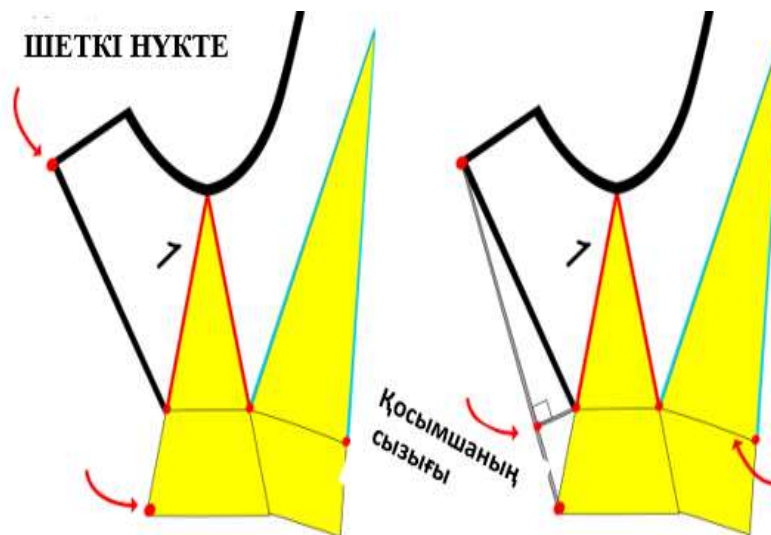
Өлшемі бойынша үшбұрыштың қалған жақтары кесілген сызықтармен сәйкес келуі керек. Қажетті арақашықтыққа (5 см) дейін ашылған бүктемені үлгінің астына қағаз парағын қою арқылы кірістіру салу ең қолайлы. Сызылған элемент кесіледі, кесілген сызықтар бойымен ұшына дейін тураланады және үшбұрыштың негізінің сызығына жабысқақ таспамен бекітіледі. Дәл осындай әрекеттер жоспарланған бүктемелердің әрқайсысы үшін орындалады (сурет 4).



Сурет 4 – Тиіспелі жалғастыру үшін қиылу сызығымен кесу

Бұл жағдайда үшбұрыштардың бос қосымшалары бір-бірімен қабаттасады. Бұл жағдайда олар бір-біріне бекітіледі. Қосылым жаңа кірістіруді бекіткеннен кейін әр уақытта жасалса, үрдіс жеңілдетіледі.

Әрі қарай, кесулерді реттеп, қосымша сызығын туралау керек. Біріктірілген бөліктер үшін қатпарларды қосу сызығы сынған сызыққа ұқсайды. Бұл кемшілікті түзету үшін проблемалы жерлерге қағаз жабыстырылады. Содан кейін екі шығыңқы нүктенің арасына түзу сызықтар сызылып - үшбұрыштың үстіңгі бөлігінің табанының жоғарғы және төменгі нүктелері және артық бөлігі кесіледі. Реттеуден кейін шеткі бөліктердің көрінісі сызбада анық көрінеді (сурет 5).



#### ТІЛІМДІ ТҮЗЕТУ

Сурет 5 - Реттеуге дейін және кейінгі шеткі кесінділер.

Аяқталған нәтижені көру үшін қатпарларды құрастыру соңғы кірістіруден басталып, бүктемеден бүктемеге ауысады. Үлгінің қатпарлары оларға анық пішін беру үшін мұқият бүктеледі, ойықтар жасалады. Жоғарыда аталған әдіс бойынша оригами тәсілімен сәндік элементтердің үлгілері жасалды (кесте 1).

Кесте 1 - Әшекей элементерді орындау қатары

сызбала р үлгілер	Сызба	Қапсырмаларды сызбада көрсету	Қима жиектерін матада сызу	Дайын оригами стиліндегі әшекей элемент
1	2	3	4	5
1				
2				
3				
4				
5				

Осы орындалған үлгілерді талдау арқылы, үлгіге тиімділері таңдалынды және оларды қолдана отырып дайын бұйымдар орындалды (6-сурет).



Сурет 6 – Оригами тәсілін қолданынып орындалған киім үлгілері.

**Қортынды.** Осылайша, оригами стилі қағаздан құрастыруының ежелгі өнері бола отырып, қазіргі әлемде пайдалы, сондықтан оны киім үлгілеуде пайдалану киімнің жаңа формаларын жасауға ықпал етеді деп қорытынды жасауға болады.

Жоғарыда келтірілген тәсілді қолдаңып, киімде көлемді – кеністік пішінді орындап киім дизайнында көлемді әсем элементерді орындауға мүмкіндік береді.

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# Получение пищевых волокон из биоотходов граната

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**Abstract.** Against the background of increasing attention to the environment, minimizing waste from the canning industry is becoming increasingly important. This also applies to by-products of pomegranate juice production - the peel (all solid parts of the pomegranate fruit, except seeds) and seeds, which account for about 60% by weight in pomegranates. However, this issue has been overlooked for a long time, since 10-20 years ago there were not so many pomegranate juice producers, and the competition for its sales markets was not as high as it is now. Activity in this area has revived somewhat after recent research, which revealed the multifaceted properties of this type of bio-waste. They showed that the peel and seeds of pomegranates are rich in several groups of substances that could become valuable food additives, and dietary fiber can be attributed to one of these groups. Obtaining dietary fiber preparations is associated with the need for appropriate processing of the feedstock, aimed at isolating the target group of substances from the rest of it. This article focuses on some important aspects of the procedure for isolating the complex called “dietary fiber” from the rest of the pomegranate peel, described in the published works of some authors and the authors of this article. This is important, since the solution to this issue is currently in the New Product Development stage - a combination of research, engineering and design processes that are needed to create it in the best form and launch it to a certain limited market.

**Keywords:** Bio-waste of pomegranate, soluble and insoluble dietary fiber, separation and purification methods.

**Аннотация.** На фоне растущего внимания к экологии все более значимым становится минимизация отходов консервной промышленности. Это касается и побочных продуктов производства гранатового сока - кожуры (все твердые части плода граната, кроме семян) и семян, на долю которых в гранатах приходится около 60 масс. %. Однако этот вопрос долгое время был упущен из виду, так как 10 -20 лет назад производителей гранатовых соков было не так много, а конкуренция за рынки его сбыта была не столь высокой, как сейчас. Деятельность в этой сфере несколько оживилась после исследований последних лет, в которых были раскрыты многогранные свойства биоотходов этого типа. Они показали, что кожура и семена гранатов богаты сразу несколькими группами веществ, которые могли бы стать ценными добавками к пище, к одной из таких групп можно отнести и пищевые волокна. Получение препаратов диетических волокон связано с необходимостью проведения соответствующей обработки исходного сырья, направленной на изолирование целевой группы веществ от остальной его части. В данной статье основное внимание как раз уделено некоторым важным аспектам процедуры по изолированию комплекса с названием “пищевые волокна” от остальной части кожуры гранатов, описанных в опубликованных работах некоторых авторов и авторов данной статьи. Это немаловажно, так как решение этого вопроса сейчас находится в этапе New Product Development - комбинация исследовательских, инженерных и дизайнерских процессов, которые нужны для ее создания в лучшей форме и запуска на определенный ограниченный рынок.

**Ключевые слова:** Биоотходы граната, растворимые и нерастворимые пищевые волокна, способы разделения и очистки.

В современном мире ориентация на высокотехнологичные и экологически чистые производственные процессы становится все более важной [1-2]. Все большее число менеджеров по инновациям в пищевой промышленности отдают предпочтение чистым разработкам, которые не оказывают вреда окружающей среде [3-4]. Все большее внимание уделяется выбору оптимальных параметров технологической переработки для минимизации потерь лабильных компонентов здоровой пищи [5-8]. Все большее число производителей и потребителей (особенно в развитых странах) выбирает более качественные и безопасные для здоровья и жизни человека продовольственное сырье и пищевые продукты с тем, чтобы предохранить себя от так называемых “болезней цивилизации” (образа жизни), связанных с неправильным (несбалансированным) питанием [9-10].

Важным функциональным компонентом (биоактивным соединением) растительной еды по влиянию на здоровье человека, является “пищевые волокна” - класс углеводных полимеров, которые не гидролизуются эндогенными пищеварительными ферментами в тонком кишечнике, но могут полностью или частично ферментироваться микробиотой толстой кишки [11]. Их используют в получении переработанных пищевых изделий для придания им заранее заданных свойств [12].

На основе растворимости пищевых волокон в воде их можно разделить на растворимые пищевые волокна (РПВ - пектины, камеди, декстраны, слизи, некоторые фракции гемицеллюлозы) и нерастворимые пищевые волокна (НПВ - целлюлоза, лигнин и часть гемицеллюлозы) [13]. РПВ обычно используются в пищевой промышленности как хорошо растворимая добавка и из-за способности удерживать много воды и масла, а также в качестве эмульгатора, загустителя, стабилизатора и заменителя жира [14-15]. РПВ обладают антиоксидантной активностью, могут снижать уровень глюкозы в крови, артериальное давление и уровень холестерина, помогая облегчить некоторые заболевания (как диабет, сердечно - сосудистые заболевания, гиперлипидемия и рак толстой кишки) [16].

РПВ также называют "мягкими" волокнами, НПВ - "грубыми" волокнами.

РПВ впитывают воду и формируют гель, понижают уровень холестерина и сахара в крови. Инулин также относится к растворимым пищевым волокнам.

Нерастворимая клетчатка - это компонент пищевых волокон, состоящий из нерастворимых в воде метаболически инертных элементов. По этой причине нерастворимая клетчатка часто применяется как наполнитель, способствующий процессу пищеварения и обеспечивающий преимущества для здоровья, связанные со снижением уровня липидов в сыворотке крови.

НПВ проходят через желудочно-кишечный тракт практически в неизменном виде, адсорбируют большое количество воды, влияют на моторику кишки.

Большинство НПВ, таких как целлюлоза, гемицеллюлоза и лигнин, влияют на увеличение объема фекального материала, но не используются или просто медленно усваиваются кишечными бактериями. Напротив, РПВ могут легко и быстро метаболизироваться кишечными бактериями, в процессе чего они значительно влияют на численность и разнообразие микробиоты кишечника человека.

Скорость извлечения РПВ может быть повышена за счет обработки исходного материала химическими, физическими и биологическими методами, с помощью которых могут быть разрушены некоторые гликозидные связи [17].

Ферментативный метод позволяет проводить обработку в мягких условиях и разрушать целлюлозу, гемицеллюлозу и лигнин в клеточной стенке, способствуя

превращению НПВ в РПВ. РПВ, полученные по результатам ферментативной экстракции, обладают низкой молекулярной массой, рыхлой структурой, хорошими способностями к гидратации и адсорбции глюкозы [15].

С помощью химического метода (обработка щелочью или кислотой) может быть улучшена растворимость пищевых волокон и повышен выход РПВ [18]. Это связано с тем, что щелочной раствор способен разрушить гликозидную связь в пищевых волокнах, а кислотная экстракция помогает расщепить гемицеллюлозу, тем самым изменяя соотношение между РПВ и НПВ [19]. Щелочная экстракция повышает выход и термостабильность РПВ [20]. РПВ от экстракции лимонной кислотой обладает высокой водоудерживающей способностью и способностью адсорбировать глюкозу [21].

На сегодняшний день особенно часто коммерческие образцы пищевых волокон получают из выжимок яблок и цитрусовых (после извлечения цитрусового пектина).

Яблочная клетчатка - препарат, получаемый из яблочных выжимок путем очистки, микронизации (механического измельчения до нескольких десятков микрон) и стерилизации (тепло -пар).

Процесс производства - строго физический процесс. Продукт не содержит никаких химических веществ и является 100% натуральным.

Это сыпучий порошок с однородной дисперсной консистенцией (допускается небольшое слеживание). Цвет порошка желто-коричневый. Вкус и запах типичные для яблок, без посторонних привкусов и запахов. Продукт может быть использован для частичной замены или добавления к твердым веществам в кетчупе, томатном соусе и мармеладе. Также полезен для некоторых хлебобулочных изделий.

(Органические) яблочные волокна получают из так называемых (органических) яблочных выжимок, представляющих собой сушеные яблоки, из которых был удален сок. Они производятся в ЕС и состоят примерно на 60% из пищевых волокон, из которых около 15% растворимых, которые смягчают стул. Кроме того, яблочные волокна естественным образом сохраняют пектин, обладают хорошей способностью связывать воду, его наличие повышает среднюю оценку Nutri-Score этого продукта.

(Органическое) яблочное волокно можно использовать различными способами. Например, его используют в разной выпечке и хлебобулочных изделиях, безглютеновых/низкоуглеводных закусках и конфетах или спредах, таких как джемы. Его также используют в колбасной и мясной промышленности и в пищевых добавках. Для спортсменов волокна оптимальны в коктейлях или батончиках мюсли.

Тенденцию валоризации цитрусовой кожуры в многофункциональные цитрусовые волокна задает компания Herbafood Ingredients GmbH, которая является пионером в области производства функциональных волокон. Вот уже 80 лет она находится на переднем крае производства многофункциональных цитрусовых волокон Herbacel AQ Plus Citrus для текстурирования, стабилизации, эмульгирования пищевых изделий, а также регулирования их вязкости.

Все большее внимание исследователей в этой области привлекает получение пищевых волокон из побочных продуктов потребления и переработки плодов граната – их кожуры и собственно семян.

Ранее нами было установлено [22], что в коже гранатов от сушки до остаточной влажности 10 % пектины, гемицеллюлозы, целлюлоза и лигнин (г/100 г) были определены в таких количествах: гидропектин 3.79; протопектин 7.69; гемицеллюлозы 2.38; целлюлоза 0.50; лигнин 13.0. Также было установлено содержание других веществ в таких концентрациях: жир 1.5; минеральные вещества 1.2; белок 5.47; свободные (водорастворимые) полифенолы 8.11; кислотогидролизуемые полифенолы (извлеченные в процессе дополнительной обработки 1.25 % водным раствором H<sub>2</sub>SO<sub>4</sub> остатка кожуры от

ее водной экстракции) 1.56; щелочногидролизуемые полифенолы (извлеченные в процессе обработки 1,25 % водным раствором NaOH остатка кожуры от ее последовательной экстракции водой и 1,25 % водным раствором H<sub>2</sub>SO<sub>4</sub>) 4.05. В комплексе “протопектин + гемицеллюлозы + целлюлоза + лигнин” массовые доли этих веществ в порядке приведенной очередности составили 32.60; 10.10; 2.10 и 55,20 % (кожура граната) и 44.30; 8.50; 13.90 и 33.30 % (семена граната), то есть в кожуре очень высокий процент лигнина или, скажем, лигнин - подобных веществ. Значит, основная особенность кожуры и семян гранатов как сырья для получения пищевых волокон состоит в том, что оба эти вида сырья относительно бедны целлюлозой и в них много лигнина.

Лигнины – группа веществ безуглеводных клеточных оболочек. Лигнины состоят из полимеров ароматических спиртов. Лигнины сообщают структурную жесткость оболочке растительной клетки, они обволакивают целлюлозу и гемицеллюлозу, способны ингибировать переваривание оболочки кишечными микроорганизмами, поэтому наиболее насыщенные лигнином продукты (например, отруби) плохо перевариваются в кишечнике.

Из табл. 1 видно, что концентрация пищевых волокон в семенах граната значительно выше, чем в их кожуре.

Таблица 1. Питательная ценность порошков кожуры и семян граната [23].

Table 1. Nutritional value of pomegranate peel and seed powders [22].

Показатели химического состава	Кожура в порошке	Семена в порошке
	г/100 г порошка	
Вода	13,7	5,82
Белок	3,10	13,66
Жир	1,73	29,60
Зола	3,30	1,49
Волокна	11,20	39,36

В муке кожуры плодов граната от ее промывки в воде с температурой 40 ° С, высушивания и измельчения, содержание пищевых волокон составило 51.80 г / 100 г сухого веса образца; из них около 27.02 г пришлось на нерастворимые волокна и 24.78 г - растворимые волокна [24].

Мука от сушки и измельчения семян граната была следующего состава (Г/100 г): влага 10.67, зола 3.21, сырой протеин 15.66 (что выше, чем в порошках лимонных выжимок, белокочанной капусты, виноградных и яблочных выжимок) и пищевые волокна 52.22 [25].

По другим данным [26], в порошке высушенной кожуры граната на диетические волокна приходится около 47% и они в основном состоят из РПВ.

Различные методы экстракции могут повлиять на выход, состав и структурные свойства РПВ гранатовой кожуры, а, значит, и их физико-химические и функциональные свойства.

Было проведено исследование, результаты которого показывают на возможность использования модифицированного метода, включающего химическую (уксус 6% и гидроксид натрия 0,4%), механическую (ультразвуковая обработка при 150 Вт) и термическую (автоклавирование при 121 °С/5 мин) обработку. Предварительно обработанный порошок кожуры смешивали с 6% ледяной уксусной кислотой (рН 2,14) в соотношениях 2; 5; и 10 г на 100 г кислоты, затем выдерживали в автоклаве при температуре 121°С в течение 15 мин. Надосадочную жидкость собрали, а остаток трижды промыли дистиллированной водой (DW). Кроме того, к остатку добавили 0,1 н. раствор NaOH и полученную смесь обработали ультразвуком (150 Вт) при 55°С в течение 15 мин. Снова собрали надосадочную жидкость, а остаток трижды промывали DW. Наконец, ко всей

собранный надосадочной жидкости добавляли 95% этанол (в трехкратном объеме), выдерживали в течение 12 часов и центрифугировали при 8000 об/мин в течение 20 мин. Выделенный осадок высушивали в лиофилизаторе для получения растворимых пищевых волокон, которые потом изучали. Выяснилось, что степень экстракции сухого вещества из двух разных образцов кожуры находилась между  $23.40 \pm 0.36$  и  $29.60 \pm 0.20$  %, а степень их чистоты -  $86.01 \pm 0.08$ - $87.46 \pm 0.09$  %; содержание воды в них изменялось в пределах  $6.47 \pm 0.10$  -  $6.62 \pm 0.24$  %, золы  $5.32 \pm 0.07$ - $5.24 \pm 0.21$  %, жира  $0.42 \pm 0.02$ - $0.91 \pm 0.03$  %, белка  $0.76 \pm 0.07$ - $0.41 \pm 0.04$  %, РПВ  $28.76 \pm 0.12$ - $60.74 \pm 0.07$  %, НПВ  $67.49 \pm 0.05$  % [27].

Также были испытаны водная, кислотная и щелочная обработка кожуры [28].

Сначала была приготовлена смесь из 10 г порошка кожуры граната и дистиллированной воды (1:15, вес/объем), которая перемешивалась при температуре окружающей среды в течение 2 часов. Затем эту смесь центрифугировали при 4000xg в течение 20 минут для удаления нерастворимой в ее части; центрифугированный супернатант концентрировали перед осаждением этанолом и обработкой вакуумной сублимационной сушкой.

Кислотная экстракция проводилась так. Около 150 мл раствора лимонной кислоты (1%, вес/объем) смешивали с 10 г порошка гранатовой кожуры. Последовательные операции были такими же, как описано выше.

При щелочной экстракции порошок кожуры граната массой 10 г смешивали со 150 мл раствора гидроксида натрия (1%, м/м). Последующие процессы были проведены также, как и при водной и кислотной экстракции.

При ферментативной экстракции 10 г порошка кожуры граната суспендировали в 150 мл дистиллированной воды. Раствор ферментативно гидролизovali добавленной целлюлазой (80 мг, 400 ед./г) в течение 4 ч на водяной бане с температурой 50 °C, термостойкой  $\alpha$ -амилазы (0,1 г,  $4 \times 10^4$  ед./г) в течение 0,5 ч на водяной бане с температурой 95 °C и папаина (5 мг, 800 ед./мг) в течение 0,5 ч на водяной бане с температурой 60 °C. Затем смесь инкубировали в кипящей водяной бане в течение 15 мин для инактивации ферментов. Последующие этапы - как и при предыдущих способах экстракции.

Было установлено, что щелочная и ферментативная экстракции обеспечивают более высокий выход РПВ, чем водная и, особенно, кислотная экстракции. Это можно объяснить тем, при осуществлении двух первых методов экстракции разрушается стенка клеток и их содержимое (в том числе определенное количество низкомолекулярных полимеров) высвобождается. Этого не происходит при кислотной экстракции, что позволяет предположить, что кислотная экстракция разрушает гликозидные связи в пищевых волокнах, что приводит к превращению РПВ в низкомолекулярные моносахариды и олигосахариды.

Таблица 2. Выход и состав образцов растворимых пищевых волокон кожуры плодов граната (в пересчете на сухое вещество) [28].

Table 2. Yield and composition of samples of soluble dietary fiber from pomegranate peel (in terms of dry matter) [28].

Метод экстракции	Выход растворимых (РПВ) и нерастворимых (НПВ) волокон		Химический состав РПВ			
	НПВ	РПВ	Влажность (г/100 г)	Зола (г/100 г)	Белок (г/100 г)	Пектин (г/100 г)
Водная экстракция	34,17 ± 0,97	15,63 ± 2,24	7,43 ± 0,33	5,43 ± 0,24	1,31 ± 0,10	10,01 ± 0,05
Кислотная экстракция	36,43 ± 0,29	10,27 ± 2,26	7,94 ± 1,17	3,19 ± 0,35	0,98 ± 0,25	2,22 ± 0,11
Щелочная экстракция	24,23 ± 0,60	27,17 ± 1,07	6,99 ± 1,49	25,19 ± 0,21	3,26 ± 0,54	16,08 ± 0,90
Ферментативная экстракция	31,57 ± 0,76	27,30 ± 1,66	6,84 ± 0,35	6,55 ± 1,39	1,43 ± 0,27	9,26 ± 0,16

С другой стороны, как видно из данных этой же таблицы, щелочная экстракция способствовала получению РПВ с максимально высоким содержанием белка (3,26 г/100 г сухого вещества против 0,98-1,43 г/100 г сухого вещества в трех других испытанных методах экстракции). Это говорит о том, значительная часть белка кожуры - это структурный белок, который образует прочные связи с высокомолекулярными полисахаридами, из которых состоят стенки клеток. При обработке исходного материала щелочью эти связи разрываются, в результате чего почти весь белок переходит в раствор.

Кстати, то же самое происходит и с протопектином (который, в отличие от растворимого пектина, водой не извлекается).

Как результат, в РПВ от щелочной экстракции общего пектина становится несравненно больше (16,08 ± 0,90 г/100 г сухого вещества), чем в РПВ от экстракции тремя другими испытанными методами (от 2,22 ± 0,16 до 10,01 ± 0,05 г/100 г сухого вещества).

Но надо иметь в виду, что использование щелочи противоречит требованиям чистых пищевых производств.

Кроме того, белок, в отличие от диетических волокон, является высокоэнергетическим веществом, поэтому повышение его содержания в РПВ не может приветствоваться.

После водной и водно-ферментативной экстракции получают РПВ с относительно низким содержанием белка и пектина. Низкие проценты белка и пектина в РПВ автоматически означает, что основная часть этих веществ осталась в проэкстрагированной кожуре, то есть во фракции с названием НПВ, которая в оптимальном варианте должна состоять только из целлюлозы, гемицеллюлоз и лигнина.

Отсюда можно сделать вывод, что обработка таким чистым растворителем как вода может быть эффективной для удаления из кожуры гранатов легкорастворимых балластных веществ (простых сахаров, кислот, полифенолов).

И это немаловажно, так как их удаление из исходного материала приводит к резкому повышению в нем концентрации волокон, а, значит, и доброкачественности кожуры как объекта дальнейшей переработки в рассматриваемом направлении.

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# ПРЕИМУЩЕСТВА И ЭФФЕКТИВНОСТЬ ВНЕДРЕНИЯ ЦИФРОВОГО РАДИОВЕЩАНИЯ В РЕСПУБЛИКЕ УЗБЕКИСТАН

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В условиях быстрого развития информационно-коммуникационных технологий цифровизация различных сфер общественной жизни становится важным фактором экономического развития и повышения уровня жизни населения. В этом контексте внедрение цифрового радиовещания (ЦРВ) в Республике Узбекистан становится особенно значимым, создавая новые перспективы для развития национальной радиовещательной отрасли и укрепления ее конкурентных позиций [1].

Однако переход на цифровые технологии в радиовещании требует значительных инвестиций в модернизацию инфраструктуры, разработку и внедрение инновационных решений, а также адаптации бизнес-моделей радиокомпаний к новым реалиям. В этом свете исследование экономических аспектов внедрения цифрового радиовещания в Узбекистане играет ключевую роль, позволяя определить наиболее эффективные пути развития отрасли и обеспечить ее стабильный рост [2].

В настоящее время радиовещание в Узбекистане в основном основано на аналоговых технологиях, которые имеют ряд существенных ограничений:

- аналоговый сигнал подвержен помехам и искажениям, что ухудшает качество звучания;
- дальность передачи аналогового сигнала ограничена, особенно в горной местности и труднодоступных регионах;
- аналоговые технологии требуют значительных частотных ресурсов для передачи небольшого числа программ;
- аналоговое вещание не предоставляет возможности передачи текстовой информации, изображений и других данных.

Эти недостатки ограничивают развитие радиовещательной отрасли, снижая её привлекательность как для аудитории, так и для рекламодателей.

Внедрение цифрового радиовещания (ЦРВ) позволит устранить ограничения аналоговых технологий и обеспечить значительные экономические преимущества:

- цифровое радиовещание обеспечивает высокое качество звука без помех и искажений, что делает его более привлекательным для слушателей;
- ЦРВ позволяет обеспечить надежный сигнал на всей территории страны, включая удаленные и горные районы;
- цифровые технологии позволяют передавать большее количество программ в пределах того же частотного диапазона.

Цифровое радиовещание (ЦРВ) позволяет передавать текстовые сообщения, изображения, данные о дорожной обстановке и другую полезную информацию, что расширяет функционал радиовещания и делает его более привлекательным для аудитории и рекламодателей.

Переход на ЦРВ способствует развитию смежных отраслей, включая производство оборудования для радиовещания и создание специализированного программного обеспечения [3]. Внедрение цифровых технологий также стимулирует создание новых рабочих мест в сфере IT и радиовещания, а также увеличивает инвестиционную привлекательность радиовещательной отрасли.

Переход на ЦРВ требует значительных вложений в следующие области:

1) модернизация аналогового оборудования, строительство новых станций и сетей передачи данных;

2) разработка программного обеспечения, а также систем управления и мониторинга цифрового вещания.

Оценка затрат на внедрение цифрового радиовещания (ЦРВ) должна учитывать особенности Узбекистана, такие как география, плотность населения, уровень инфраструктурного развития и другие факторы. Для такой оценки необходимо использовать статистические данные, результаты маркетинговых исследований и опыт других стран, которые уже внедрились ЦРВ [4-6].

Финансирование внедрения ЦРВ может быть обеспечено из различных источников:

- государственные средства, направленные на модернизацию вещательной инфраструктуры и развитие технологий;

- привлечение инвестиций от радиовещательных компаний, производителей оборудования и других заинтересованных сторон.

Для успешного привлечения инвесторов требуется разработка выгодных инвестиционных предложений с предоставлением льгот и преференций.

Государственная политика в области ЦРВ должна создавать благоприятные условия для развития отрасли и стимулировать инвестиции. Основные направления государственной поддержки включают:

- разработку законов и нормативных актов, регулирующих сферу ЦРВ;
- предоставление радиовещательным компаниям необходимых частотных ресурсов;
- разработку и внедрение стандартов и норм для ЦРВ, а также сертификацию оборудования.

Таким образом внедрение цифрового радиовещания в Узбекистане требует комплексного подхода, учитывающего географические, демографические и инфраструктурные особенности страны, а также использование опыта других государств. Финансирование перехода на ЦРВ возможно за счет государственных вложений и привлечения частных инвестиций. Государственная поддержка в виде нормативного регулирования, предоставления частотных ресурсов и сертификации оборудования играет ключевую роль в успешной реализации проекта. Развитие ЦРВ откроет возможности для роста радиовещательной отрасли, создания новых рабочих мест и повышения её инвестиционной привлекательности. Комплексное внедрение ЦРВ станет важным шагом к модернизации информационно-коммуникационной инфраструктуры Узбекистана, улучшению качества услуг и расширению их доступности для населения.

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## Legal Sciences

# Modern legal mechanisms for global food security: a focus on grain

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**Abstract:** The paper examines the state of food security in the current situation. The analysis of international legal documents regulating food security is carried out. The author provides recommendations for improving the system of ensuring world food security using the example of grain.

**Keywords:** food security, international law, food crisis, grain market, grain trade.

Today, one of the urgent global problems of mankind is the issue of ensuring food security. According to the Food and Agriculture Organization of the United Nations (FAO), 733 million people worldwide are hungry (FAO, 2023).

The concept of global food security implies that all people have constant physical, social and economic access to a sufficient amount of safe and nutritious food that allows them to meet their nutritional needs and taste preferences for an active and healthy lifestyle (CFS Reform, 2009).

International law plays an important role in ensuring food security. The institutional basis of the global food safety system is the activities of the following international organizations: the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), the International Organization for Standardization (ISO), the International Grain Council.

The Food and Agriculture Organization of the United Nations determines the level of food security of a State by quantifying grain production per person. FAO experts have established that 20% of the grain reserves in the state are sufficient to ensure national food security. Thus, grain production, stocks, and trade are of key importance in ensuring both global and national food security.

The fundamental international document regulating food security is the International Grain Agreement of 1995, which includes the Grain Trade Convention of 1995 and the Food Assistance Convention of 2012. It should be noted that the purpose of the Food Assistance Convention is to provide at least 10 million tons of grain each year, or such monetary equivalent, as food aid to vulnerable populations in countries in need. Thus, the activities of the international community, regulated by this Convention, are aimed at combating poverty and hunger caused by both emergency situations and the economic situation of developing countries. However, the limited number of parties to the Convention prevents countries from providing mandatory assistance in ensuring global food security.

In the context of the current tense international relations, characterized by increasing geopolitical contradictions and increasing protectionism, the fulfillment of obligations to provide food aid faces additional challenges. Economic sanctions, trade restrictions and conflicts can negatively affect global food supply chains, exacerbating the food crisis in the most vulnerable regions. In such circumstances, initiatives aimed at strengthening international cooperation and creating more sustainable mechanisms to ensure food security are becoming particularly relevant. One of these initiatives is the idea of forming a global granary, which, however, causes mixed reactions among participants in the global grain market.

However, it should be noted that the idea of forming a global granary is perceived ambiguously and ambiguously by countries. The Government of the United States of America, based on the experience of using the state grain storage mechanism, suggests that such a mechanism is not practical. However, for example, countries such as Russia, China and Canada have their own grain reserves.

To ensure sustainable food security in the context of global instability, it is important to take into account national approaches to creating reserves and integrate them into international mechanisms. Such a step will not only optimize the distribution of food resources, but also develop joint strategies aimed at overcoming crisis situations. The international community should take measures to avoid a global food crisis.

First, as mentioned above, the range of States parties to the 2012 Food Assistance Convention should be expanded. This solution will allow a wider range of countries to participate directly in meeting the food needs of the most vulnerable segments of the population in need.

Secondly, it is necessary to improve the system for establishing price stability for grain, as a primary strategically important food product. According to the 1974 Universal Declaration on the Elimination of Hunger and Malnutrition, "the well-being of the peoples of the world depends to a large extent on the establishment of a world food security system that would ensure adequate food availability and reasonable prices for it ...", which means control over the acceptable level of price thresholds (UN, Universal Declaration on the Eradication of Hunger and Malnutrition, 1974).

Thirdly, there is a need to expand the powers of the Food and Agriculture Organization of the United Nations. FAO should develop a unified international model of standards in the field of food security, or, in our opinion, define the legal nature of the Codex Alimentarius developed jointly by FAO and WHO.

Fourthly, as noted above, one of the factors ensuring food stability is the creation of a global granary and, accordingly, its proper regulation by the norms of international law.

Thus, the solution of food safety issues and the problems of world hunger is possible with the joint activities of the international community. The issue of ensuring food security requires coordinated actions at the national and international levels. Only through joint efforts can the challenges of hunger, poverty and the instability of global food supply chains be overcome, ensuring that everyone has access to sufficient safe and nutritious food.

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## Psychological Sciences

# Professional management skills and leadership in dynamic environments: Strategies for sustainable success

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**Abstract.** Effective leadership and management skills are essential for navigating the complexities of modern organizations. This study examines the intersection of professional management practices, adaptive leadership, and innovative strategies for overcoming challenges in dynamic environments. Highlighting case studies from local and global contexts, the paper emphasizes the role of emotional intelligence, strategic decision-making, and artificial intelligence in enhancing productivity and motivation. By integrating theoretical frameworks with practical applications, this research offers impactful insights into strengthening team dynamics, resolving conflicts, and driving organizational growth.

**Key words:** Leadership, management skills, organizational dynamics, emotional intelligence, strategic decision-making, artificial intelligence, motivation, conflict resolution.



Peşəkar idarəetmə bacarıqları və liderlik uğurlu komanda və təşkilatların formalaşmasında mühüm əhəmiyyət kəsb edir. Bu bacarıqlar yalnız insanların fəaliyyətini yönəltmək deyil, həm də onları motivasiya etmək, qərarlar qəbul etmək və səmərəli idarəetmə mühitini yaratmaq üçün vacibdir. Liderlər komanda üzvlərinə ruhlandırıcı istiqamət verir, onları ümumi məqsədə doğru yönəldir və hər kəsin fərdi bacarıqlarını maksimum dərəcədə üzə çıxarmaq üçün şərait yaradır.

İdarəetmə bacarıqları effektiv qərar qəbul etmə, resursların idarə olunması və strateji planlama ilə yanaşı, insanlarla düzgün ünsiyyət qurma bacarığını da əhatə edir. Ünsiyyət zamanı liderlik komanda üzvlərinin fikirlərini dinləmək, onları motivasiya etmək və təşkilatda qarşılıqlı

anlaşma yaratmaq üçün əsasdır. Dəqiq və şəffaf ünsiyyət komanda üzvlərinin özlərini daha dəyərli hiss etməsinə, liderə və təşkilatın məqsədlərinə daha çox inanmalarına gətirib çıxarır.

Motivasiyaedici liderlik insanların işə bağlılığını artırır və onlarda təşəbbüskarlıq ruhu oyadır. Yaxşı liderlər yalnız nəticələrə deyil, eyni zamanda prosesə də önəm verir və işçilərin inkişafına dəstək olurlar. Onlar çalışanlara öz bacarıqlarını inkişaf etdirmək üçün fərsətlər yaradır, mükəmməlliyə yönəldərək onları daha çox cəsarətli və təşəbbüskar olmağa həvəsləndirirlər. Liderin müsbət enerji və entuziazm nümayiş etdirməsi komanda ruhunu gücləndirir və daha çox işgüzar və məhsuldar atmosfer yaradır.

Strateji düşüncə və gələcəyə yönəlmiş yanaşma liderlikdə əsas amillərdən biridir. Liderlər yalnız gündəlik məsələlərə deyil, eyni zamanda uzunmüddətli məqsədlərə də diqqət yetirməlidir. Bu, müvafiq risklərin analiz olunmasını, dəyişən şəraitə uyğunlaşmağı və yeni imkanları qabaqlamağı tələb edir. Gələcəyə yönəlmiş liderlər mövcud problemləri həll edərkən, həm də təşkilatın davamlı inkişafını təmin edən qərarlar qəbul edirlər.

İdarəetmə və liderlik bacarıqları həm də konfliktlərin həllində mühüm rol oynayır. İş mühitində fikir ayrılıqları qaçılmazdır və onları səmərəli idarə etmək liderin əsas vəzifələrindən biridir. Peşəkar lider konfliktləri konstruktiv dialoq yolu ilə həll edir, hər iki tərəfin fikirlərini nəzərə alaraq ədalətli qərarlar qəbul edir. Bu yanaşma işçilərin liderə güvənini artırır və komanda daxilində daha güclü əməkdaşlıq yaradır.

Adaptivlik və dəyişikliklərə açıq olmaq peşəkar liderin ayrılmaz xüsusiyyətidir. Müasir biznes mühiti sürətlə dəyişir və liderlər bu dəyişikliklərə çevik yanaşmalıdır. Dəyişiklikləri qəbul etmək və yeni trendlərə uyğunlaşmaq həm liderin, həm də təşkilatın uğuruna müsbət təsir göstərir. Adaptiv liderlər komanda üzvlərini də çeviklik ruhunda tərbiyə edir və onları yeniliklərə hazır olmağa təşviq edirlər.

Liderlik həm də etika və dürüstlük tələb edir. Peşəkar liderlər şəxsi maraqları deyil, təşkilatın və komanda üzvlərinin maraqlarını üstün tutur, hər kəsə ədalətli yanaşır və öz nümunəsi ilə işçilərə düzgün davranış standartları göstərirlər. Bu dəyərlər komanda daxilində etimad mühiti yaradır və insanların təşkilata daha çox bağlı olmalarına səbəb olur.

Beləliklə, peşəkar idarəetmə bacarıqları və liderlik yalnız idarəetmə funksiyalarının yerinə yetirilməsi deyil, həm də komanda üzvlərinə dəstək olmaq, onları inkişaf etdirmək və motivasiya etmək deməkdir. Yaxşı liderlər təşkilatı davamlı uğura aparır, insanları bir araya gətirir və hər kəsin ümumi məqsədə çatmasına töhfə verirlər.

İdarəetmə bacarıqlarının inkişafı bütün peşəkarlar üçün vacibdir. Dünya İqtisadi Forumuna görə, insanların idarə edilməsi bugünkü işçi qüvvəsində inkişaf etmək üçün lazım olan 10 bacarıqdan biridir. Bundan əlavə, Gallup tərəfindən aparılan araşdırmalar göstərir ki, istedadlı menecerləri olan şirkətlər daha çox gəlir, artan məhsuldarlıq və daha peşəkar işçi cəlb etmə imkanları əldə edirlər. Bu faktor isə təşkilatın uğuru üçün çox vacibdir.

İstər istedadlı, istərsə də təcrübəli menecer olmağınızdan asılı olmayaraq, insanlara, məhsullara və layihələrə necə nəzarət etdiyinizi və onlara rəhbərlik etməyinizi təkmilləşdirmək üçün ata biləcəyiniz addımlar var. Gəlin daha yaxşı menecer olmaq və karyeranızı yüksəltmək üçün 6 yol strategiyasına nəzər salaq.

#### 1. Qərar vermə qabiliyyətini gücləndirmək.

Sağlam qərar qəbul etmək menecerlər üçün vacib bir bacarıqdır. Komandaya nəzarət etməkdən başlamış kritik situasiyalara rəhbərlik etməyə qədər, effektiv menecer olmaq mürəkkəb problemləri təhlil etməyə və yüksəliş üçün plan həyata keçirməyə imkan verir.

#### 2. Özünü dərk etməni inkişaf etdirmək

Emosional zəkanın bu əsas prinsipi introspeksiyanı və güclü və zəif tərəflərinizin dürüst qiymətləndirilməsini tələb edir. Etibarlı həmkarlarınıza müraciət etməklə, siz özünüzdə və başqalarında ən yaxşı cəhətləri aşkar etməklə, təkmilləşdirməli olduğunuz sahələrə diqqət yetirməklə peşəkar inkişafınız üçün bir yol təyin edə bilərsiniz.

### 3. Güvən yaratmaq

Güvən yaratmaq komanda da empatiyanı inkişaf etdirə bilər, bu da daha çox yoldaşlıq, aidiyyət və motivasiya hissi yarada bilər.

### 4. Ünsiyyətçi olmaq

Davamlı olaraq yeniliklər təqdim edin və işçilərinizin uyğunlaşmasını və iş amillərinin daha böyük korporativ məqsədlərə necə təsir etdiyini başa düşmək üçün irəliləmə planını təkrarlayın.

### 5. Daimi check-inlər qurmaq

İşçilərinizə rəy bildirərkən söhbəti qeyri-rəsmi saxlayın və diqqətinizi onun şəxsiyyətinə deyil, təşkilati məqsədlərə doğru irəliləməsinə yönəldin. Bundan əlavə, onlara inkişaf üçün fəaliyyət planı qurmağa kömək edin və onlar növbəti addımları atarkən etibarlı məsləhətçi rolunuzu təsdiqləyin.

### 6. Davamlı öyrənmək

Beynəlxalq təcrübələr göstərir ki, süni intellekt və rəqəmsal idarəetmə vasitələri liderlərin qərar qəbul etmə proseslərini sürətləndirir və məlumat əsaslı yanaşmaları gücləndirir. Məsələn, "Harvard Business Review" kimi nüfuzlu platformalarda göstərilir ki, analitiklərdən və rəqəmsal platformalardan istifadə komanda ilə ünsiyyətin keyfiyyətini artırır.

Digər tərəfdən, yerli təcrübədə sürətli dəyişikliklərə cavab olaraq çevik idarəetmə modellərinin tətbiqi vacib rol oynayır. Beynəlxalq səviyyədə isə "Agile Leadership" yanaşması geniş istifadə olunur və bu, sürətli uyğunlaşma qabiliyyəti ilə komanda məhsuldarlığını artırır.

Qlobal iqtisadiyyatda liderlər fərqli mədəni mühitlərdə fəaliyyət göstərməli və müxtəlif komandalara rəhbərlik etməlidirlər. Bu, liderin empatiya və fərqli perspektivləri anlaması kimi xüsusiyyətlərini ön plana çıxarır. Bu yanaşma yerli şəraitdə də tətbiq oluna bilər, çünki fərqli dəyərlərə və baxışlara malik işçilərin bir komandada cəmlənməsi liderlikdə həssaslığı artırır.

Beynəlxalq təcrübələrdə liderlərin münasibətləri həll etmək üçün motivasiya bacarıqlarından istifadə etməsi müsbət nəticələr verir. Yerli iş mühitində bu yanaşmanın tətbiqi daha sabit və harmonik iş mühiti yaradır.

Motivasiya baxımından "Gallup"-un araşdırmalarına istinadən işçilərin emosional bağlılığını artıran yanaşmalar təqdim edilə bilər. Qlobal liderlər arasında geniş istifadə olunan metodlardan biri də şəffaf liderlikdir – liderin açıq və şəffaf olması işçilərin güvənini artırır və onların daha çox təşəbbüs göstərməsinə səbəb olur.

"Gallup"-un apardığı tədqiqatlar həmçinin onu da göstərir ki, işçilərin işə bağlılığı və motivasiyası əsas ehtiyacların qarşılanması ilə əlaqədardır. Bu ehtiyaclar arasında aydın gözləntilər, lazım olan resursların mövcudluğu, onların bacarıqlarından istifadə və inkişaf üçün imkanların olmasıdır. Gallup-un Q12 işçi bağlılığı sorğusundan bu ehtiyacları ölçmək üçün istifadə edilir.

Beynəlxalq sertifikatlaşdırma proqramları (Project Management Professional – PMP və ya Certified Scrum Master – CSM) liderlərin bacarıqlarını təkmilləşdirmək üçün geniş imkanlar yaradır. Yerli təcrübədə isə belə sertifikat proqramlarına maraq artırılmalı və liderlərə bu istiqamətdə dəstək verilməlidir.

Son illərdə Süni intellekt (SI) liderliyin gələcəyində mühüm rol oynayaraq, idarəetmə proseslərini və liderlik üsullarını köklü şəkildə dəyişdirir. Liderlər artıq SI vasitələrinin köməyi ilə daha sürətli və məlumat əsaslı qərarlar qəbul edə, komanda üzvlərinin ehtiyaclarını daha dəqiq müəyyən edə və təşkilatın məhsuldarlığını artırmaq üçün yenilikçi strategiyalar hazırlaya bilərlər.

SI liderlərə xüsusilə məlumatların analizində və qərar qəbul etmədə böyük dəstək göstərir. SI vasitəsilə böyük məlumat dəstələri sürətlə təhlil olunur, bu da liderlərə riskləri və imkanları daha tez qiymətləndirmək imkanı yaradır. Məsələn, IBM Watson kimi platformalar, böyük verilənləri təhlil edərək liderlərə alternativ həll yollarını təqdim edir və təşkilatın məqsədlərinə uyğun strategiyalar qurur.

Süni intellekt liderlərin motivasiya və işçi əlaqələrində də effektivliyini artırır. SI əsaslı platformalar işçi performansını izləyərək hər bir komanda üzvünün fərdi ehtiyaclarını təyin edir və

onların inkişafı üçün fərdi yanaşmalar təklif edir. Məsələn, SAP SuccessFactors və ya Workday kimi SI əsaslı HR sistemləri liderlərə işçi motivasiyasını və bağlılığını artırmağa kömək edir. Bu platformalar vasitəsilə liderlər hər bir işçinin məhsuldarlığını analiz edir, zəif və güclü tərəfləri müəyyənləşdirir və işçilərin inkişafına dəstək olur.

Kommunikasiyanın keyfiyyətinin artırılması da SI-nin liderliyə təsirinin əhəmiyyətli sahələrindən biridir. SI əsaslı chatbotlar və kommunikasiya vasitələri komanda üzvləri ilə operativ və dəqiq əlaqə qurmağa imkan yaradır. Məsələn, Slack və ya Microsoft Teams kimi platformalar SI vasitəsilə müzakirələri prioritetləşdirir, avtomatik cavablar yaradır və liderlərə vaxt qənaəti ilə yanaşı daha effektiv idarəetmə imkanı təqdim edir.

Süni intellektin liderlikdə tətbiqi təşkilatların adaptivliyini və çevikliyini də artırır. Agile Leadership modelində SI əsaslı alətlər liderlərin dəyişən mühitə daha sürətli uyğunlaşmasına kömək edir. Məsələn, proqnozlaşdırıcı analiz vasitəsilə liderlər bazar trendlərini öncədən təxmin edə və bu məlumatlar əsasında strategiyalarını yeniləyə bilirlər.

Bununla yanaşı, SI etik liderlikdə də mühüm rol oynayır. Şəffaflıq və qərar qəbul etmədə qərəzsizlik təmin edən SI vasitələri liderlərin işçilər və müştərilərlə daha etibarlı münasibətlər qurmasına şərait yaradır. Məsələn, işçi təyin etmə proseslərində SI diskriminasiyanı minimuma endirərək, obyektiv qərarların qəbul edilməsinə dəstək verir.

Süni intellekt liderlərin daha strateji və uzunmüddətli düşünməsinə şərait yaradır. Onlar rutin işləri avtomatlaşdıraraq daha çox yaradıcı və strateji vəzifələrə fokuslanırlar. Bununla belə, SI-nin liderlikdə tətbiqi etik məsələlərə də diqqət yetirilməsini tələb edir. İnsan-makina qarşılıqlı əlaqəsinin tarazlığı qorunmalı və liderlər SI-nin nəticələrini daim izləyərək onun qərarlarının təşkilata təsirini qiymətləndirməlidirlər.

Nəticə etibarilə, süni intellekt liderlikdə məhsuldarlığı artırmaq, daha dəqiq və məlumat əsaslı qərarlar qəbul etmək və insan resurslarını effektiv idarə etmək üçün geniş imkanlar yaradır. Müasir liderlər SI-nin imkanlarından istifadə edərək həm təşkilatın rəqabət gücünü artırmalı, həm də etik və şəffaf liderlik prinsiplərinə sadıq qalmalıdırlar.

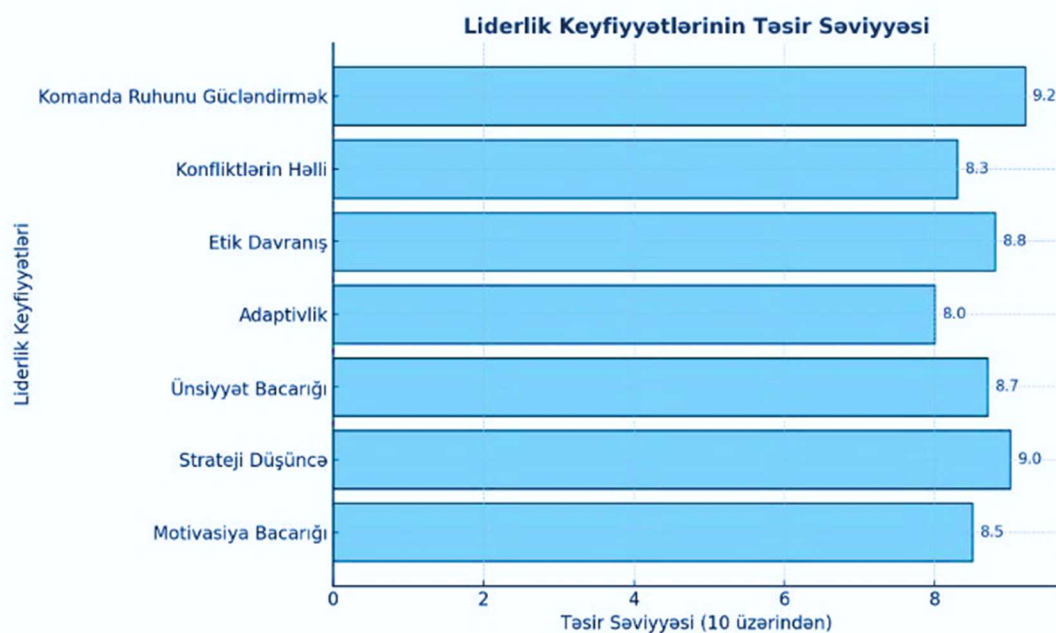
Eləcə də, startap rəhbərləri innovativ düşüncə tərzini və çevik idarəetmə üsulları ilə seçilirlər. Onlar demokratik liderlik üslubuna üstünlük verən komandanın dəyişikliklərini dinləyir və qərar qəbul etmə prosesinə onları da cəlb edirlər. Bu yanaşma işçilərin motivasiyasını artırır və yaradıcı həllərin ortaya çıxmasına şərait yaradır. Komandada startap liderləri açıq şəkildə əməkdaşlığa önəm verirlər. Onlar komanda üzvləri arasında güclü birləşmələr üçün yardım və təlimlər təşkil edirlər. Məsələn, "Bir Könüllü" tələbə təşkilatında liderlik, inkişaf və komanda quruculuğu bacarıqlarını inkişaf etdirmək üçün xüsusi proqramlar təqdim olunur.

Həmçinin "NextStep" və "StartUp Azerbaijan" kimi layihələrdə liderlərin rolu əvəzsizdir. Bu liderlər gənc sahibkarlara dəstək verərək onların ideyalarını reallaşdırmağa kömək edirlər. Onlar mentorluğa uyğun startapların inkişaf strategiyalarını müəyyənləşdirir və bazar şəraitinə uyğunlaşmalarına yardımçı olurlar. Təhsil rəhbərləri idarəetmədə müasir modelləri tətbiq edərək təhsil müəssisələrinin effektivliyini artırmağa çalışırlar. Onlar müəssisədə təşkilati struktur və idarəetmə sistemlərini planlaşdırır və müəyyən edirlər. Bu işə resursların səmərəli istifadəsinə, hədəflərin idarə edilməsinə və strategiyaların hazırlanmasına səbəb olur. Bu cür yanaşmalar təhsilin keyfiyyətini yüksəltməklə yanaşı, həm də ona töhfə verir.

Yuxarıda qeyd etdiklərimizdən belə qənaətə gəlmək olar ki, işçilərin motivasiyası hər hansı bir təşkilatın uğurunun əsas amillərindənədir. İşçilərin motivasiyasını artırmağın bir çox yolu var və konkret metodların seçilməsi şirkətin və işçilərin xüsusiyyətlərindən asılıdır. Motivasiyanın əsas üsullarına maddi motivasiya (əmək haqqı, mükafatlar, sosial paketlər) və qeyri-maddi motivasiya (ləyaqətin tanınması, karyera inkişafı, müsbət iş mühitinin yaradılması) daxildir. Hər bir işçinin unikal olduğunu və fərdi yanaşma tələb etdiyini xatırlamaq vacibdir. Motivasiya sistemi şəffaf, ədalətli olmalı və performansla mükafatlarla əlaqələndirməlidir. Daimi rəylər işçilərə güclü və zəif tərəflərini anlamağa və onların inkişafı üzərində işləməyə kömək edir.

İdarəetmə bacarıqları həm də konfliktlərin həllində mühüm rol oynayır. İş mühitində fikir ayrılıqları qaçılmazdır və onları səmərəli idarə etmək liderin əsas vəzifələrindən biridir. Peşəkar lider konfliktləri konstruktiv dialoq yolu ilə həll edir, hər iki tərəfin fikirlərini nəzərə alaraq ədalətli qərarlar qəbul edir. Bu yanaşma işçilərin liderə inamını artırır və komanda daxilində daha güclü əməkdaşlıq yaradır.

Komandada münaqişələr rastlanan bir hadisədir. Sağlam iş mühitini qorumaq və məhsuldarlığı artırmaq üçün onları effektiv şəkildə həll edə bilmək vacibdir. Münaqişənin həlli prosesinə problemin müəyyən edilməsi, səbəblərin təhlili, kompromisin tapılması, fəaliyyət planının hazırlanması və onun icrasına nəzarət daxildir. Münaqişələrin həlli strategiyalarına birbaşa ünsiyyət, vasitəçilik və arbitraj daxil ola bilər. Sakit qalmaq, rəqibinizi aktiv şəkildə dinləmək, empatiya göstərmək və ümumi maraqlar axtarmaq vacibdir. Münaqişələrin qarşısını almaq üçün kollektivdə inam və əməkdaşlıq mühiti yaratmaq, işçilərin ünsiyyət bacarıqlarını inkişaf etdirmək və münaqişələrin həlli üzrə təlimlər keçirmək lazımdır.



Bu qrafik liderlik gücünün yüksək təsirini (10 üzərindən) göstərir. Hər bir keyfiyyətin effektivliyinin önəmi vurğulanır və prioritet sahələr müəyyən edilir.

İdarəetmə praktikasında geniş istifadə olunan metodlardan biri də fəal-işgüzar oyunlardır. Burada oyun elementləri ilə bərabər, diaqnostik-təlim məqsədləri də güdülür. Fəal-işgüzar oyunların əsas xüsusiyyəti və əhəmiyyəti onun nəticəsindən daha çox, bu nəticələrin əldə olunma üsullarının, onun prosessual cəhətlərini müəyyən etməsidir. Oyun prosesinə qatılan iştirakçılar, oyunda əldə olunmuş hər hansı bir təcrübəni, oyun və davranış qaydalarını, sosial rolları, bacarıq və vərdisləri ifa edir, mənimsəyir və daha da təkmilləşdirir. Ümumiyyətlə, oyunlar, bütün canlılara xas olan kollektiv təcrübənin toplanması və yeni nəsllə ötürülməsi mexanizmidir.

İşçilərin motivasiyasını artırmaq üçün şəffaf və ədalətli motivasiya sistemləri qurulmalıdır. Maddi motivasiya yanaşmaları ilə yanaşı, şəxsi inkişaf proqramları və təşəkkür platformaları kimi qeyri-maddi vasitələrə üstünlük verilməsi tövsiyə olunur. Konfliktlərin həlli üçün əməkdaşlıq yanaşmaları və problemlərin həlli üçün rəşional-intuitiv metodların tətbiqi liderlərin effektivliyini artırır. Komanda inkişafı üçün təlimlər və işgüzar oyunlar təşkil edilərək beynəlxalq sertifikatlaşdırma proqramlarına rəhbərlərin cəlb olunması təmin edilməlidir.

Personalın idarə olunmasında və ümumiyyətlə, idarəetmədə funksiyalarına və təyinatı məqsədlərinə görə işgüzar oyunlar əsasən aşağıdakı qruplara bölünür:

- təlim məqsədli öyrədən oyunlar (bunlara treninqlər də aiddir);
- kadrların hazırlanması, öyrədilməsi, təhsili və ixtisaslarının artırılması və təkmilləşdirilməsi üçün;
- praktiki vəzifələrin həlli üçün (məs. hər hansı optimal idarəetmə qərarlarının qəbul olunmasına nail olmaq);
- proekt-işgüzar oyunlar - təşkilati sistemin qurulması, yaradılması, təkmilləşdirilməsi və ya struktur dəyişikliklərinin aparılması və yoxlanması;
- tədqiqat məqsədli işgüzar oyunlar - daxili və xarici şəraitin dəyişməsinə uyğun ayn-ayrı işçilərin və kollektivin bütövlükdə davranışının və fəaliyyətinin necə dəyişməsi (məs. yeni sosial-iqtisadi münasibətlərin, yeni əmək haqqı sisteminin tətbiqinin, yeni iş metodlarının tətbiqinin fəaliyyətin məhsuldarlığına və keyfiyyətinə təsirinin öyrənilməsi). Bu oyunlarda yaranmış yeni şəraitə uyğun gələn, daha optimal davranış strategiyası, fəaliyyət modeli hazırlamaq mümkün olur.

Konflikt şəraitində rəhbərlərin istifadə etdikləri strategiyalar sırasına qarşıdurma, əməkdaşlıq, kompromiss, konfliktdən çıxmaq və uyğunlaşmaq aiddir.

- Qarşıdurma strategiyasında rəhbər işgüzar ünsiyyət və münasibətlərdə qarşı tərəfin üzərində üstünlük qazanmaq və qarşı tərəfin etirazına baxmayaraq öz mövqeyini təsdiq etməyə çalışır, o cümlədən maksimum fəallıq və əməkdaşlıq etmək əzmi nümayiş etdirir, başqalarının marağına məhəl qoymur.
- Əməkdaşlıq strategiyasında rəhbər əvvəlki strategiyada olduğu kimi yüksək fəallıq göstərir. Ancaq o öz maraqlarını deyil, həm də işgüzar partnyorunun maraqlarını da nəzərə alaraq, konflikt vəziyyətdən uzaqlaşmağa səy edir.
- Kompromiss strategiyası rəhbərin partnyorla münasibətlərinin normallaşmasına səy etməsi və onun maraqları ilə hesablaşması, onu öz tərəfinə çəkməyə səy göstərməsidir.
- Konfliktdən uzaqlaşma strategiyası rəhbərin özünü məsuliyyətdən uzaqlaşdırmasında, cəzalanmaqdan və ya baş verə biləcək arzuolunmaz nəticələrdən çəkinməsində və müstəqil qərar qəbul etmək istəməməsində göstərir.
- Uyğunlaşma strategiyası rəhbərin fəallıq göstərməməsində, idarəetmə məqsədlərinə nail olmasına maraqlı olmamasında ifadə olunur. Bu strategiyaya insanlarla konflikt münasibətlərdən çəkinmək və məsuliyyətdən yaxa qurtarmaq xasdır.

Tam konfliktsiz mühit yaratmaq qeyri-mümkündür. Konfliktlərin həllində insanlara fərdi yanaşılsa da, səriştəli rəhbər idarəetmə vəzifələrini yerinə yetirmək və konfliktləri tənzimləmək üçün, bu təsirləri ayrı-ayrı fərdlərə deyil, qrupa və qrupdakı münasibətlərin tənzimlənməsinə yönəldərək şəxsiyyətə, onun münasibətinə, sosial yönəlişinə, dəyərlər sistemə və motivlərinə təsir edə bilər.

Dj.Q.Skott konfliktlərin səbəblərini analiz etmək üçün bəzi üsullar təklif etmişdir:

- Yaradıcı vizualizasiya metodu. Bu metodla insanın konfliktin səbəbini müəyyən etməsi ilə konfliktin üzdə, aşkarda görünən səbəbi ilə bərabər, onun əsl, dərinə olan səbəbini müəyyən etmək mümkün olur.
- Konfliktin rəşional-intuitiv metodla həlli daha arzu olunandır. Belə ki, bu halda real situasiya, insanların mövqeyi, onların motivləri və şəxsi keyfiyyətləri əsas götürülür. İşin uğurla yerinə yetirilməsi üçün motivləşdirici şərtlərin olması vacibdir:
- Hər bir hərəkət dərk olunmalıdır. Bu idarəedənlərə və ya başqalarından iş tələb edən insanlara aiddir.
- İşdən zövq alınması, işin nəticəsi və insanlarla aparılan işin keyfiyyətindən asılıdır. İcraçılar istəyirlər ki, onların gördükləri iş, başqaları üçün önəmli olsun. Hər bir işçi qabiliyyətini göstərmək istəyir.

- Hər bir işçi işdə özünü təsdiq və ifadə etmək, nəyə sahib olduğunu göstərmək istəyir.
- Hər bir işçinin işin yaxşılaşdırılması haqqında özünün fikri vardır. O, məqsədlərinə çatmaq istəyir və cəzadan qorxmur.
- İdarəetmənin yüksək səviyyədə olmadığı yerdə işçiyə önəm verilmir. O isə öz gərəkliliyini hiss etmək istəyir.
- Hər bir insan uğur qazanmağa çalışır. Uğur isə məqsədlərin həyata keçirilməsidir.
- Əgər işçinin uğurları yetərinə qiymətləndirilmirsə, işçilərdə məyusluq və peşmançılıq hissi yaranır. Hər bir qabaqcıl işçi rəhbərlikdən onun layiqincə qiymətləndirilməsini və mükafatlandırılmasını gözləyir.
- İşçilərin informasiya ilə tanış olmaları, rəhbər üçün onların önəminin ölçüsüdür. Informasiya təminatının yaxşı qurulmaması, onların işə hazır olmalarına maneçilik törədir.
- İşçilər onların iştirakı və xəbəri olmadan edilən dəyişikliklərə mənfi yanaşırlar.
- Hər bir işçi işinin keyfiyyəti haqqında fikirləri almağa çalışır ki, işində lazımi düzəlişlər etsin.
- Bütün işlər özünənəzarət olan zaman daha yaxşı görülür. İşçinin kənardan nəzarət olunması və izlənməsi onun xoşuna gəlmir.
- İşçilərin çoxu iş prosesində daha çox məlumat, yeni biliklər əldə etməyə çalışırlar. İşçilər yüksək tələbkarlığa daha yaxşı yanaşırlar, nəinki zəif tələbkarlığa.
- İşçilər yaxşı işin qarşılığında daha çox və ağır işlərlə yüklənmələrinə mənfi yanaşırlar.
- İşçilər üçün önəmli problem onların təşəbbüsünü və imkanlarını reallaşdırmaq üçün şəraitin və fərdi məsuliyyətin olmasıdır.

**Məqalənin aktuallığı.** Müasir iş mühitində sürətlə dəyişən şərtlər və rəqabət şəraiti peşəkar idarəetmə bacarıqları və liderliyin əhəmiyyətini artırır. Beynəlxalq təcrübələrin və müasir texnologiyaların yerli kontekstdə tətbiqi bu mövzunun aktuallığını daha da yüksəldir.

**Məqalənin elmi yeniliyi.** Bu tədqiqat liderliyin müasir aspektlərini, o cümlədən süni intellektin liderlikdə tətbiqini, beynəlxalq təcrübələri və yerli idarəetmə modellərini araşdırır. İlk dəfə olaraq, Azərbaycanda startap ekosistemində və təhsil sahəsində tətbiq olunan liderlik yanaşmaları təhlil edilir.

**Məqalənin praktik əhəmiyyəti və tətbiqi.** Tədqiqat nəticələri liderlər və menecerlər üçün konkret tövsiyələr təqdim edir. Komanda motivasiyasını artırmaq, konfliktlərin həllini asanlaşdırmaq və strategiya qurma bacarıqlarını təkmilləşdirmək məqsədilə nəzəri və praktiki yanaşmalar göstərilir. Bu yanaşmalar həm iş yerlərində, həm də təhsil müəssisələrində tətbiq oluna bilər.

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# How to integrate social emotional learning to instructional leadership team of schools?

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**Keywords:** Social emotional learning (SEL), school environment, education system, school leadership

School leaders play a key role in building positive school culture, and social-emotional learning is an important key of those efforts. Instructional leadership teams (ILTs) at school are the main part of management. According to international practice it can be mentioned that leadership team provide a systemic way to practice distributed leadership, a shared approach to leadership where decision-making is spread from one person—usually a school leader—to a collective group. These groups are tasked with addressing schoolwide instructional quality and are typically comprised of the school principal, assistant principal, grade-level team leaders, and content-area department heads.

New leaders' educational group in the USA mentioned that academics and social-emotional learning go hand-in-hand. For example, school counselors are serving on ILTs to ensure that schools are keeping this learning top of mind in tandem with curriculum and instruction. With the right people around the table, ILTs can strengthen school-wide SEL instruction by ensuring it's always front and center in their work to develop teacher capacity and improve school climate (New leaders educational group, 2024).

This kind of team, with the diverse perspectives it brings, is critical to driving a coordinated approach to SEL implementation. They can set goals, set communication methods with school stakeholders, identify partnerships and resources that might be needed, and determine how to collect data to measure SEL efforts.

The group has developed some of recommendation related to leadership and SEL opportunity. The first of them is measuring efforts if the SEL programming at school is working. To begin, it would be need to establish a baseline. One of the first tasks of the ILT can be to perform a school-wide SEL needs assessment, where the team collects feedback on what's working, what's not, and any gaps that are uncovered.

According to these details some of the points can be collected as part of SEL efforts:

- Observational data from the teachers as they observe behaviors among students;
- Academic indicators, such as outcomes on formative and summative assessments;
- Behavioral data, such as attendance and behavioral disruptions;
- Self-perceptions of how students see their own SEL competence, and
- Teacher and staff-specific data on their comprehension of SEL and whether they have the tools and strategies needed to integrate it into their daily classroom practices.

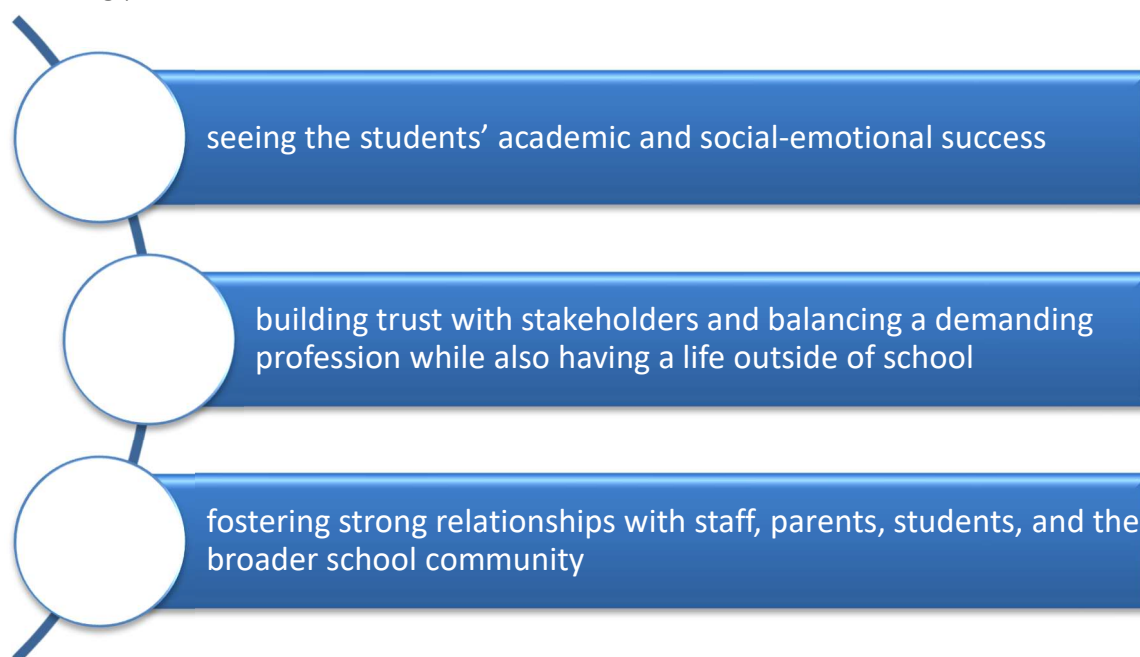
Having this data is not only critical for improving SEL as a whole, but it's also useful for helping school community understand what SEL is, why it's needed, and what the positive outcomes are. The next question of this approach is how create social-emotional supports and development for teachers and staff? - For all the discussion about the importance of social-emotional learning for children, there's a clear need to support professional learning for educators. Teachers and school

staff who further develop their SEL skills not only improve their own well-being but the well-being and success of their students (New Leaders, 2024; Bailey, 2022).

There are some of the ways to create these social emotional supports:

- At the individual level, this might look like developing peer mentorship programs or other opportunities that allow teachers and staff to establish supportive relationships at school or offer self-care and wellness programs.
- At the building level, consider surveying educators at the beginning of the school year to determine which SEL supports and programs would be most helpful for them—and conduct regular check-ins to ensure those programs are working.
- At the professional development level, provide educators with ongoing SEL skill development through professional learning, specifically learning focused on transferring the skills they learn to their students (New leaders educational group, 2024) .

School leaders' responsibility items that related to social emotional skills are described in the following picture:



School leaders practice SEL every day, and it's important that continue to build on those skills—for their own well-being.

SEL-focused professional development not only helps leaders better understand the outcomes they are driving toward for their students and educators, but it also ensures prioritizing their own self-care—increasing their effectiveness. Focusing on the bigger picture—ensuring that SEL is able to be implemented, measured, and taught school-wide—is the best way to support these efforts for the students. Investing upfront by building a solid foundation is the best way to set educators and students up for collective success (Gomez et al.,2022).

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## Architecture

# Plasticity of Kazakh Ornament in Bionic Principles of Architectural Form Formation

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**Abstract:** This article analyzes traditional Kazakh ornaments and their influence on contemporary architectural creativity. We propose a new approach to using these ornaments based on bionic principles, which allows for the creation of unique and functional architectural forms. The article provides examples of the implementation of this approach in modern architecture and concludes with its potential for the development of contemporary architectural art.

**Keywords:** architecture, Kazakh ornament, architectural bionics, ethnocultural heritage, national identity, parametrics, innovative concept of Kazakhstan's architecture.

### Introduction

In the modern world, where traditional and contemporary artificial structures merge into a unified choreographic rhythm, attention to cultural heritage becomes an integral part of architectural aesthetics. In this context, Kazakh ornament, deeply rooted in history, serves as an unparalleled source of inspiration for contemporary architectural form creation. The plasticity of Kazakh ornament, with its elegant patterns and symbolic meanings, represents a rich source of creative possibilities. It not only reflects the cultural traditions and identity of the people but also possesses tremendous potential for integration into modern architectural practice. This article examines the use of bionic principles in architectural form creation based on Kazakh ornament. Bionics, as a scientific discipline studying natural models to create innovative solutions, provides a unique approach to synthesizing traditional cultural aesthetics with modern technological capabilities. By analyzing the forms and structures of Kazakh ornament through the lens of bionic principles, we can identify the potential for creating innovative architectural forms that are not only visually striking but also resource-efficient, environmentally sustainable, and functional in a contemporary urban context.

The art of ornament has ancient roots, akin to the art of architecture. According to the current views of architects, the practice of construction dates back approximately four thousand years [1, p. 23]. Ornament began as a sign through which ancient humans expressed feelings of order, stability, and rhythm [2, p. 84]. Over time, these signs became more complex, forming intricate combinations and systems of ornamental shapes. As time passed, ornament transitioned into the category of decoration and embellishment, as the surrounding reality changed and architectural structures became dominant [3, p. 42, 43]. A turning point came in the 20th century when ornament became a secondary element of architectural form and ceased to play a key role in construction practices.

To date, there is no consensus among scholars regarding the historical origin of ornament. Let us summarize the existing viewpoints and highlight two main ones: the first emphasizes the priority of semiotic mechanisms that form the ornament, while the second understands ornament as a phenomenon of form based on aesthetics, simple linear signs, geometric shapes, and archetypes [4, 5].

The main goal of our research is to determine the direction of architectural development, taking into account the cultural context and individual language. Historical science shows that the roots of Kazakh identity trace back to the times of the Kipchak Khanate and the ancient Turkic civilization, even before the Scythian-Saka period. The analysis of the interconnection between culture and architecture reveals that the aesthetics of Kazakhstan's architecture requires a specific semantics that reflects ethnocultural information. Our primary scientific concept lies in studying the semantics of the Scythian-Saka culture and transforming the language of world masterpieces into a new aesthetic for our architecture. We strive to create a holistic worldview that meets the aesthetic needs of our people's habitat, grounded in a cultural context. The development of the intellectual potential of our country requires an understanding of historical roots, culture, and the formation of ethnocultural self-awareness. Architecture, as the language of culture and the pinnacle of art, plays a key role in this process [6].

Let us consider the terminological definition of ornament. We will conduct an analytical procedure to highlight and clarify the characteristics of this term within the context of our study. Therefore, let us begin a brief analysis of the definition of ornament from the "Apollo" terminological dictionary: "Ornament (from Latin ornamentum - decoration) - a pattern based on a regular rhythmic alternation and organized arrangement of abstract-geometric or figurative elements. Ornament is used for decorating buildings, structures, and objects" [7, p. 412]. Looking at this definition, it can be said that ornament is not just decoration; it also defines form and space, influencing the aesthetic result. Ornament not only adds beauty but also shapes the spatial organization of form, making it an important element in art [8, p. 93].

Let us extract and list the key aspects of ornament formation: construction, regularity, rhythm, alternation, organization, placement, and elements of abstract/geometric/figurative plans. The specificity of the concept of ornament is linked to its formal plan, which defines both its composition and its interaction with the environment [9, p. 239]. Moreover, the definition of ornament includes the contexts of its use (on objects, in architecture, in structures), where the size and scale of "form" play an important role [10, p. 90]. Therefore, considering these aspects is key to understanding ornament.

**Methodology.** The primary methodology of the research is based on the study of architecture as a phenomenon closely linked to the formation of national culture. The study employs a structural-analytical method consisting of interconnected components unified by a common concept. The main priority of the research is to identify the artistic-graphic semantics of ancient art and its connection with the contemporary artistic worldview.

The work intersects various fields of science, relying on interdisciplinary research and closely related to archaeology, ethnography, cultural studies, engineering, and technology. This specificity of the research suggests a comparative analysis, consideration, and systematization of initial facts to form conceptual ideas. The proposed methodology is more characteristic of natural rather than humanities sciences, where establishing connections between facts based on statistical probability and the internal logic of phenomena is considered the primary way to build reliable empirical generalizations [11].

As is known, culture is a complex and multifaceted phenomenon. The heritage of our ancestors, which we see as the culture of the Great Steppe, is perceived as a language of art, a way of constructing and understanding architectural forms that carry ethnocultural information and serve as the foundation for the development of a special semantics of Kazakhstan's architecture. In this study, a deductive method is used, starting from the general and moving toward the specific, to explore the influence of the phenomenon "artistic worldview" on the integrity of humanities research in architectural aesthetics [6]. The results of the study showed how creative mastery of cultural and historical heritage and the genesis of culture in the spatial-temporal context are key to achieving the set goals. Various methods were used in the work,

including computer modeling, gathering primary data from various sources, and conducting surveys with specialists from different fields.

**Discussion.** During our work, we conducted an analysis of contemporary conceptual systems to identify the priority directions for the development of new architecture in Kazakhstan. When studying the international theoretical discourse in architecture, it was found that architecture should reflect the driving force of civilization, and contemporary architects strive for harmony between artificial and natural environments. The concept of "architectural bionics," associated with leading architects around the world, plays an important role in the modern cultural paradigm [6].

A historical analysis of the development of architecture shows that different styles and epochs are interconnected and flow into each other. With the emergence of new concepts and directions in architecture, such as parametrics, the role of architecture today is to model the spatial and cultural environment of post-industrial society. It becomes not only a synthesis of art and technology but also a means of transforming reality and expressing human worldview.

**Conclusion.** Modern architecture carries the cultural heritage of the people throughout long historical periods, sometimes spanning millennia. Its artistic language must not only be a carrier but also a historical continuer of the culture of the people. The distinction lies in the fact that the idea of creating architecture is formed not only from existing models but also from the systematic use of the heritage of ancestors.

The blending of cultural heritage with modern achievements in digital technologies opens new creative opportunities for creating a unique artistic appearance in architecture based on contemporary aesthetics. This could lead to an enhancement of the public's artistic perception, an enrichment of the quality of life through the aesthetic comfort of the surrounding environment, and the creation of unique architectural forms in cities that reflect ethnocultural heritage. This symbiosis could become a starting point for solving national cultural tasks in architecture and contribute to the development of an innovative concept for the architecture of Kazakhstan [12].

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## Pedagogical Sciences

УДК 81-22

# Лингвокультурология фразеологических единиц в разрезе трех языков

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**Аннотация:** актуальность данной работы определяется ценностью пословиц и фразеологизмов в жизни каждого народа, поскольку они используются во всех сферах деятельности человека. Изучение пословиц и фразеологизмов, их анализ и сравнение с аналогами в родном языке помогает формировать у ребят познавательный интерес к изучаемому предмету и культуре русскоязычных стран, расширять кругозор, развивать образное мышление, творческие задатки, языковую догадку, а также внимание, память и логику.

**Abstract:** the relevance of this work is determined by the value of proverbs and phraseological units in the life of every nation, since they are used in all spheres of human activity. The study of proverbs and phraseological units, their analysis and comparison with analogues in their native language helps to form in children a cognitive interest in the subject being studied and the culture of Russian-speaking countries, broaden their horizons, develop imaginative thinking, creative inclinations, linguistic conjecture, as well as attention, memory and logic.

**Ключевые слова:** этнограф, миропонимание, семантика, лингвокультура, компонент, фразеологизм, иноязычие, интерпретации, эквивалент.

**Key words:** ethnographer, worldview, semantics, linguistic culture, component, phraseological unit, foreign language, interpretation, equivalent.

Для обозначения возникающих понятий об окружающей действительности в системе языка возникают устойчивые комбинации слов, состоящие из нескольких прочно сросшихся слов с единым значением. По мере развития общества возникают десятки тысяч новых единиц в языковой системе – устойчивых сочетаний слов.

Они стабильно используются носителями данного языка в той или иной номинативной или экспрессивной функции для наиболее полного удовлетворения потребностей общения.

В отличие от слов, которые возникают в лексике в результате различных способов словообразования, устойчивые сочетания слов образуются в системе языка благодаря процессам фразеологии тех или иных свободных словосочетаний.

Культурно-национальное миропонимание народа стоит в центре внимания исследований этнографов, историков, психологов, лингвистов. Особенно актуальными при этом становятся исследования в сопоставительном плане, которые дают возможность выявить общее и специфическое, в частности, в языковых системах. Фразеологизмы, являясь результатом длительного развития, фиксируют и передают от одного поколения к другому

общественный опыт, поэтому они важны не только как средство коммуникации, но и как источник общественно-значимых различных сведений.

Можно утверждать, что национально-культурная семантика языка – это результат истории, включающий в себя также и прошлое культуры, и чем богаче история народа, тем ярче и содержательнее строевые единицы языка. Для общей теории языкознания значимым оказывается рассмотрение с точки зрения лингвокультурологии фразеологических единиц (в дальнейшем ФЕ) языка, поскольку именно лингвокультурология открывает перспективные возможности следования фразеологизма как экспонента культурного знания, через который осуществляется взаимодействие[1,с.120].

Процесс современного языкознания показывает яркую палитру народных пословиц и фразеологизмов. Развитие фольклорного творчества непрерывен. В быстром темпе XXI века механизм этого культурного явления принципиально не изменился.

В последние годы фразеологический состав различных языков часто становился объектом внимания исследователей. Наиболее многочисленными являются работы, в которых сравнивают конкретные эквиваленты фразеологизмов из трех и более языков[2,с.180].

Одной из важных причин превращения свободных сочетаний слов в устойчивые - является постоянство, повторяемость употребления данных словосочетаний, но не в прямом, а в обобщенно-метафорическом значении. Например: “Намылить голову” – сильно отругать кого-либо (ср. Намылить голову – натереть голову мылом).

Другая причина, вызывающая переход свободного словосочетания в устойчивое – это появление в его структуре одного или нескольких слов с “несвободным”, фразеологическим связанным значением или ограниченным употреблением. Например: “Красная девица”, “Один как перст”, “Бить челом”. Они из свободных постепенно превращались в устойчивые в силу того, что в их составе у отдельных слов сформировались фразеологически связанные значения на основе их устаревшей семантики. Например: красная – красивая, хорошая; чело – лоб; перст – палец – с другими словами не сочетаются[3,с. 230].

Отмечаются следующие тенденции в образовании устойчивых оборотов речи:

1. Появление устойчивых сочетаний слов, характерное для данной исторической эпохи. Например: Совет экономической взаимопомощи, педагогическая практика.

2. Образование фразеологических единиц уже по существующим образцам и моделям. Будучи фразеологизмами аналогичного происхождения, они всегда связаны со стремлением людей более ярко назвать то, что уже было выражено другими средствами. Это стремление к обновлению наименований приводит к появлению как новых слов, так и новых фразеологизмов. Например: Задать пару - задать жару - задать баню – задать головоломку.

3. Заимствование фразеологических единиц из других языков. Это могут быть прямые заимствования, то есть использование иноязычных фразеологизмов без перевода. Например: из лат. яз.: homo sapiens – “разумный человек”; hohores mutant mores – “почти меняют нравы”.

Источником культурно-национальной интерпретации является характерная для данной лингвокультурной общности система образов - эталонов, запечатлённых в устойчивых ходячих сравнениях типа: с гуся вода - сужұқпас - like water off a duck's back.

В образах-эталонах имеющих прямое отношение к условиям жизни носителей данного языка, к их культуре, обычаям и традициям, язык несёт в себе отпечаток духовной и

материальной культуры народа. Например, эталоном здоровья в английской ментальности выступает лошадь: *as a strong as a horse*, а в русском и казахском – бык: здоров как бык, өгіздей мықты.

Известно, что у каждого народа, помимо эталонов, общих с другими народами (типа толстый как бочка – *fat how barrel* – бөшкедей семіз, как пень – *how free stump* – кескен томардай), существуют особое представление о «соизмеримости» человека и животных, человека и растений, человека и вещей. То есть глупости для русской ментальности является – осёл – (глуп как осёл), для казахской – курица – (тауықтың миындай ми жоқ), а для английской ментальности – пробка (*stupid as a cork* – глуп, как пробка).

Рассмотрим ещё несколько примеров полной эквивалентности ФЕ в английском, русском и казахском языках: *retire into one's shell* – уходить в свою скорлупу, замкнуться в себе, становиться необщительным – өзімен-өзі болу (өзімен-өзі болып, өзекке түсіп кетті); *grease (oil) the wheels* – подмазывать колёса, давать взятку, подмазать – майлау, пара беру; *timed as a hare* – трусливый как заяц – қояндай қорқақ.

Английский фразеологизм: *(as) obstinate (stubborn) as a mule* вступает в отношение частичной эквивалентности с русским фразеологизмом упрямый как осёл и казахским фразеологизмом есектей қиқар, қырсық. Эти фразеологизмы являются нейтральными или межстилевыми, имеют схожую структурно – грамматическую организацию. Схожи и компоненты *mule* и осёл, есек, обозначающие животное одного вида.

В русском языке существует немало ФЕ, которые не отличаются ни по семантике, ни по семантической структуре от их казахских и английских эквивалентов.

- Активное участие – *take active part* – белсене қатысу
- Брать пример – *to take example* – үлгі алу
- Выполнять план – *Carry out plan* – жоспарды орындау
- Наблюдается, когда при совпадении семантики компонентов ФЕ в казахском эквиваленте имеются грамматические отклонения, например единственное число вместо множественного
  - Получать голоса – *to receive voice* – дауыс алу
  - Говорить в открытую – *to speak open* – ашық айту
  - Взять себя свои руки – *to take something to hand* – өзін-өзі қолына алу
  - Или различия в глагольном управлении:
  - Добиться успехов – *achieve success* – табысқа жету
  - Встречаются случаи, когда казахский эквивалент одного – двух компонентов русского фразеосочетания находится в соответствующей словарной статье не на первой, а на втором, третьем или четвертом месте
    - Садиться на коней – *to ride on a horseback* – атқа міну
    - Тяжелая рука – *hard hand* – қолы ауыр
    - Твердые знания – *hard knowledge* – тұрақты білім
    - Как небо от земли – *how sky from earth* – жер мен көктей
    - Иногда между русским, английским и казахским ФЕ соответствиями нет семантических совпадений в компонентах или наблюдается большие структурные различия:
      - Сдержанность – *to take a word* – сөзінде тұру
      - Уложить на месте – *to lay on place* – жермен жексен ету
      - Дар речи – *gift speech* – сөзшешендік
      - Дальний родственник – *further relative* – жамағат
      - Есть в казахском языке фразеосочетания, своеобразные по формальной или семантической структуре, но тем не менее зависимые от русских ФЕ, специально

созданные в связи с необходимостью обозначить, новые явления в сфере быта или общественных отношений;

- Быть /находиться на передовых позициях – алдыңғы шепте болу –to be in editorial position

- Живые цветы – табиғи гүлдер – natural flowers
- Животный мир – жануарлар әлемі –animals world
- Английский фразеологизм: fishing in troubled water - ловить рыбу в мутной воде – лай судан балық аулау со значением «выискивать свою выгоду в несчастьи других». При совпадении функционально-стилистической, эмоционально-экспрессивной коннотации и схожести структурной организации, эти фразеологизмы отличаются категорией числа существительных water - вода, су, компонентами смежной семантики troubled и мутной, лай выражением одного и того значения в английском языке лишь при помощи глагола fishing , в русском и казахском языках – сочетанием глагола и существительного ловить рыбу, балық аулау[4,с.88].

- Английский фразеологизм: give away the shirt off one's back русский фразеологизм снять с себя последнюю рубашку, казахский фразеологизм соңғы жейдесін шешіп беру обладают общим значением, и субъективно-оценочной коннотацией. Они относятся к межстилевым единицам, имеют в основе яркий, живописующий образ. В компонентном составе имеют одну общую лексему shirt, рубашка, жейде. К этой же подгруппе относятся фразеологизмы: spend money – ақша шашу – сорить деньгами.

Фразеологические аналоги с приблизительным сходством структурно-грамматической организации и разным компонентным составом. Например: a beggar on horseback - ворона в павлиньих перьях – қой терісін жамылған қасқыр, (as) quiet as a lamb – тише воды, ниже травы, бөтегеден биік, жусаннан аласа близки по лексическим значениям[5,с.135].

Оценка человека

- Утопающий за соломинку хватается - a drowning man will catch at straw - суға кеткен тал қармайды.
- «Сахар медович» - all sugar and honey - бал шекердей
- Родиться под счастливой звездой- be born with silver spoon in one's mouth – жұлдызы жарқырап туған

- В пределах городских стен; в пределах (Европы) – within the walls – шет жерде.

- Спустить все карты; нарушить чье-либо планы – upset somebody's apple-cart – мүмкіндікті жоғалту

- Водить за нос – to lead nose - мұрнынан тесіп жетелеу

Сфера межличностных отношений

- Быть пришитым к юбке – be tied to one's wife's \ mother's – етеріне байлану

- Между молотом и наковальней – between hammer and anvil – от пен ерттің ортасында

- Попасться на удачку – jump at the bait – қармаққа ілінді

- Ломиться в открытую дверь – knock at an open door – баса көктеп кіру

Физическая деятельность человека

- Игла с стог сена попала - пиши, пропало – like a needle in a haystack – бір шөмеле шөптен ине іздегенмен бірдей

- Душа в пятки ушла - to afraid – жаны мұрнының ұшына тірелді

- Находиться в поле зрения – to be on field of vision – көз алдында болу

- Работать в поте лица – sweat of face - терін төгіп еңбек ету
- Засучив рукава – to set to work with zeal - білегін сыбанып кірісу

На основании исследования мы сможем сделать вывод, что фразеологические обороты тесно связаны с культурой, обычаями, традициями народов. В них передаются особенности быта народа, его наблюдения и особенности проживания.

Полноценное изучение ФЕ невозможно без опоры на глубокие внутрисистемные связи лексики и фразеологии. Эти связи с небольшой очевидностью проявляются в сфере языковой номинации; лексемы объединяются, составляя новые номинации; разъединяются, унося с собой новые семемы, родившиеся в сочетаниях.

В силу этого в системе языка всегда обнаруживаются разнообразные семантические отношения между лексемами и ФЕ (синонимические, антонимические, варианты, отношения дополнительности ).

Без учета этих отношений невозможно построить полноценное контрастивное изучение лексики разных языков; ведь оно обязательно будет лексико-фразеологическим, ибо Семемы, выражаемые в одном языке лексемой, в другом языке выражаются фразеосочетанием и наоборот

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# PROJECT METHOD IN CHINESE LANGUAGE LESSONS

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**Annotation:** This article examines the features and effectiveness of using the project method in Chinese language lessons. The project method focuses on developing students' creative potential, improving their communication skills, and achieving a deeper understanding of the Chinese language. The article discusses practical examples and ways to implement this method in the educational process.

Project method in Chinese language lessons Chinese language is becoming more and more in demand in the modern world, which requires the search for innovative teaching methods. One of such methods is the project method, which allows students to develop skills of independent study, creative thinking and teamwork. The project method is successfully applied in teaching foreign languages, but its integration in Chinese language classes remains insufficiently studied, which makes this topic particularly relevant.

The project method was developed in the early 20th century by the American educator John Dewey. The main idea was to actively involve students in the learning process by performing practical tasks related to real-life situations. The project method was introduced in the USSR in the 1920s, where it found application in school education, especially in technical disciplines [1].

The project method is one of the teaching approaches that focuses on students' research or creative tasks within the framework of specific projects. This method is actively applied in different educational systems, including foreign language teaching, including Chinese. The method is based on the idea that students should work on a project that has practical value and allows them to apply their knowledge in real life. It can be both group work and individual activity aimed at solving a specific problem. The application of the project method in Chinese language lessons involves the use of different types of projects, such as:

1. Research projects: students can investigate different aspects of Chinese culture, history, geography or traditions. For example, a project about Chinese holidays or the peculiarities of Chinese writing.

2. Creative projects: students can create various cultural products, such as movies, presentations, crafts, which use Chinese to express knowledge about the culture and language.

3. Interactive projects: during such projects, learners can work on creating dialogues, role-plays or practical tasks in Chinese, which helps to activate speaking and improve language skills.

4. Project with real results: for example, creating a blog or video blog in Chinese in which learners share their achievements and knowledge, which helps to develop their writing and speaking skills. The project method in Chinese language teaching contributes not only to the improvement of language skills, but also to the development of critical thinking, intercultural communication and social engagement of learners. Modern pedagogy has actively adapted this approach to foreign language teaching. The project method has become not only a way to integrate theoretical and practical knowledge, but also an important tool for the formation of critical thinking and teamwork.

The project method in Kazakhstan is being studied and actively implemented in the educational process, especially in the context of teaching foreign languages.

- Nartova O.V. in her research emphasized the importance of the project method for the development of students' communicative competence in English language classes [2].

- Evdakimova.E.S. considered the introduction of the project method in the universities of Kazakhstan, noting its effectiveness for the training of linguistics students [3].

- Bekhteva.N.N. in her works emphasized that project activity helps students to apply language knowledge in practice [4].

Despite the active study in the context of English language teaching, the project method has not yet been sufficiently widespread in Chinese language classes, which opens up opportunities for its integration.

The project method is one of the effective and modern teaching methods actively used in Chinese language teaching. In the conditions of globalization and rapid development of intercultural communication, knowledge of Chinese language becomes an important skill for professional growth and personal development. Using the project method in Chinese language classes allows students not only to improve their language skills, but also to develop critical thinking, creative imagination, and the ability to work in a team. Project activities are oriented to real-life. This helps to build speaking, writing, reading and listening skills in the context of real-life situations, making learning more focused and interesting. It helps to build speaking, writing, reading and listening skills in the context of real-life situations, which makes learning more focused and interesting. In addition, the project method promotes the development of independence and responsibility in students. Each project participant realizes that his/her contribution is important for the common goal, which stimulates active involvement in the learning process. Unlike the traditional approach, when students receive knowledge exclusively from the teacher, the project method allows them to become active participants in the educational process, developing research and analytical skills. This is especially important in the context of Chinese language learning, which requires a systematic approach and mastery of multiple aspects such as culture, history and modern trends in China. The Chinese language is characterized by a complex grammar and character system, which requires teachers to introduce new approaches to teaching. The project method, which has been successfully used to teach English and other foreign languages, can be an effective tool for teaching Chinese. At the moment, the project method remains understudied in the context of Chinese language, which makes this study relevant. Its application can enhance students' motivation, language skills and immersion in Chinese culture.[5]

The project method involves performing tasks that are related to real-life situations. Here are some examples that can be integrated into Chinese lessons:

1. Cultural exchange. Creating a virtual tourist route to historical places in China using Chinese terms.

2. Exploring Chinese cuisine. Students learn the names of dishes and ingredients, prepare presentations and videos presenting Chinese restaurant menus [6]

3. Dialogs in real-life situations. Creating scenarios for communication in everyday life, such as buying goods at the market or ordering food at a café.

4. Calligraphy and art. Projects devoted to the study of Chinese calligraphy allow students not only to learn characters but also to immerse themselves in the art of writing. [7]

5. Holidays and Traditions. Groups of students prepare projects about holidays such as Chinese New Year or Lantern Festival, including the use of Chinese terms and cultural features.

Using project-based learning to develop language competence, which involves active use of language in real-life situations. Project activities help learners to master not only grammar and vocabulary, but also the culture of the language, which is especially important when teaching Chinese.[8]

The description of effective approaches to foreign language teaching includes the use of the project method, which allows students to work on real-life tasks, developing practical literacy. This is especially important for Chinese language, which requires regular use in context to consolidate knowledge.]

Implementing the project method in foreign language teaching, helps to integrate theoretical knowledge with practical skills. In the context of Chinese, it helps learners to develop communicative skills through real-life situations and projects, encouraging their participation in the learning process.[9].

The use of innovative methods, including project-based learning, helps to energize learners by developing their skills in dealing with language material in real and creative contexts. Project activities promote a deeper understanding of Chinese language and Chinese cultural characteristics.[10]

The project method in Chinese language classes is an important and effective tool for developing students' skills. It not only helps to improve language competence, but also builds important personal qualities such as teamwork skills, the ability to solve problems independently, and the active use of language in real life. Implementing projects in Chinese helps learners gain a deeper understanding of Chinese culture, reveals opportunities to broaden their horizons, and enriches the educational process. In addition, project-based the method stimulates students' interest in language learning as they work with topics that are interesting to them and that have practical relevance. Modern teaching materials and methods, including digital technologies, open new horizons for the realization of projects, allowing students to apply knowledge in real practice. It is important to note that the success of the implementation of the project method depends on the activity and involvement of both teachers and students. This requires teachers to be able to guide project activities, motivate students, and create conditions for the realization of their ideas and creative ideas. Thus, the use of the project method in Chinese language classes promotes not only language acquisition, but also a deeper understanding of its cultural context, which makes this approach an integral part of effective teaching. Integrating the project method into Chinese language teaching has great potential. This method makes the learning process fun and allows students to explore not only the language but also the Chinese culture in greater depth. As part of further research, it is planned to test the proposed projects in classes at the university. It is expected that the implementation of the project method will improve the quality of learning and motivation of students.

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## Philological Sciences

# FEATURES OF PHRASEOLOGICAL SYSTEMS OF ENGLISH AND KAZAKH LANGUAGES

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Phraseology, as a separate linguistic subject, classifies and groups phraseological units in the country according to their structure and meaning, and studies ways of creation and development patterns. The problems of fixed phrases are currently being studied as one of the topical problems in linguistics. Because phraseology is the noble art of speech that improves language culture and teaches mastery. At the same time, it improves the technique of translation from one language to another, explains the formation and enrichment of new phraseological units in the socialist era.

Under what conditions and on what basis are phrases in the phraseological structure stabilized - phraseologized, which phrases form stable phrases in the Kazakh language. None of the thousands and countless words of our language are remembered, only those chosen for stability. In other words, what are the reasons why phrases become fixed phrases. During the analysis of regular phrases in the phraseological fund in use in the Kazakh language, the following features are observed.

- The visibility and expressiveness of commonly used words in conveying thoughts should be valuable for the listener and the speaker.
- Commonly used expressions tend to be short in speech. , The terminology of registrations is found.
- The existence of a summary of thought in common phrases.
- Meeting of phraseological limitations in phrases.
- Disappearance of the internal meanings of commonly used expressions.
- Phrases with a nominative element. [1]

Since the origins of phraseological similes in the English and Kazakh languages are closely related to the history, material and spiritual culture, and life of the people, it is possible to reveal the historical and etymological sources of their meaning by analyzing it from a linguistic, cultural and cognitive point of view. Language and culture are a single system that complements each other in close connection with each other.

In phraseological equations, the linguistic image of the world is formed on the basis of an anthropocentric position. A person can evaluate and recognize the environment only through himself, through objects and phenomena familiar to him. Phraseological similes are depicted in each language with its own national pattern and reflect the features of the national worldview.

Worldview values form the system of concepts of each nation. Features of meaning formation of phraseological equations in different languages allow to group them conceptually.

Individual expressions in phraseological similes are characterized by peculiarities unique to that language and are depicted with a national motif. Discovering their linguistic and cultural character helps to learn the secrets and features of the national worldview. The national-cultural components in the composition reveal the national-cultural nature of phraseological similes. [2]

The motivation of phraseological similes in English and Kazakh languages is expressed at different levels. Phraseological similes comprehensively describe the values and features of the nation's existence, creating a significant, meaningful and systematic layer of the vocabulary and phraseological fund of both languages-Kaidarov, O. Bolganbaev, G. Kaliyev, S. Isabekov, G. Smagulova, S. Satenova are studying the theoretical and practical problems of phraseology in the Kazakh soil; stylistic features - M. Sergaliyev, G. Kusimova, G. Boranbayeva, use in artistic works - H. Kozhakmetova, B. Shalabay, M. Zhanibekov; translation - A. Aldasheva, O. Aitbaev, Aitzhanova studied, grouping phraseological units from a thematic and semantic point of view - R. Zaysakova, A. Elshova; with the grouping of foreign language phraseological units - R. Zaysakova, A. Elshova; P. Dauletova, M. Abdigalieva, M. Argyngazina deal with the problems of analyzing foreign language phraseology by comparing it with Kazakh language phraseology. Phraseology is mainly closely connected with psychology, philosophy, history, ethnography.

Phraseological systems of English and Kazakh languages are an important aspect that reflects the culture and thinking features of a certain language. Phraseological units of each language contain its own national, historical and cultural features. Let's focus on some main features of phraseological systems of English and Kazakh languages: [3]

#### 1. Cultural and historical differences

In English: Many idioms are based on historical events, national traditions, literature, legends and myths. For example, the phrase "to bite the bullet" (to experience a difficult situation) came from wartime experiences in Great Britain. [4]

Phraseologisms reflect historical events, traditions and individual features of English culture. For example, the phrase "to spill the beans" (құпияны ашу) is associated with fairy tales and history.

In Kazakh language: Kazakh idioms are often closely related to nomadic lifestyle, nature, animal husbandry. For example, the phrase "follow the back of the sheep" «ат ізін құрғатпады», (жиі келіп тұры) describes the domestic situation related to Kazakh cattle breeding. [5]

Kazakh idioms are often based on nomadic lifestyle and natural images. For example, the concept of "walking slowly" "жылқымдап бару" (баяу жүру) is directly related to the traditions of sheep and cattle herding.

#### 2. The difference between illustrations and metaphors

In English: Metaphors are often concrete and logical. For example, the phrase "break the ice" is used in the sense of breaking the ice or taking the first step.

In Kazakh: Metaphors are closely related to nature, animals or everyday usage. For example, the phrase "like a comet" (something short and bright) is taken from Kazakh folklore.

#### 3. The structure of phraseological phrases

In English: Most idioms consist of two or three words, but their composition often remains constant. For example, phrases like "kick the bucket" (to die) or "let the cat out of the bag" (құпияны ашу), (to reveal a secret) are structurally stable.

In Kazakh language: Kazakh idioms are also formed by phrases, but they have additional meanings that describe national traditions and social relations. For example, the phrase «жанына жақын тарту» (біреуге қамқор болу), (to take care of someone) shows a Kazakh family relationship.

#### 4. Language intonation and tone

In English: Idioms in English are usually presented neutrally and openly. Intonation and tone often depend on the context of use.

In Kazakh: Idioms in Kazakh can often be closely associated with emotional tones, openness and mood. For example, the phrase "құтты болсын" (құттықтау), (congratulations) means a person's wish.

#### 5. Influence from a psychological point of view

In English: The psychological effect of each phraseology is formed according to English culture and national psychology. For example, "take it with a grain of salt" (acceptance with patience) - this shows the English habit of looking at things with caution and vigilance.

In Kazakh: Humanity, justice and cultural values are often reflected in Kazakh idioms. For example, the phrase "адам болу" (to be a good person) describes moral values in Kazakh society.

To sum up, the phraseological systems of the English and Kazakh languages consist of various expressions and figurative words expressing cultural, historical, and social features. The phraseological system of each language is a unique expression of the speech culture and thought process of that language.

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# TEXTOLGY ACTIVITY OF MAMMADAGHA SULTANOV

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**Summary.** Mammadagha Sultanov is one of the most outstanding representatives of 20th-century of Azerbaijani Orientalists. His scientific heritage includes monographs, scientific articles, lectures, and speeches related to the history of literature, literary theory, literary criticism and analysis, Textology, source studies, and archival studies. In the scholar's creativity, textological research has an important role.

**Key words:** textology, archival studies, literary criticism, history of liyerature

Mammadagha Sultanov, being distinguished expert of classical Azerbaijani literature, was also one of the known Textology. His activity in the field of researching and publishing Azerbaijani manuscripts has set an example for the follower scholars. He did not only organize efforts to preserve written heritage, but he was also deeply involved in studying them.

Azerbaijani Orientalists consider M. Sultanov to be one of the pioneers of modern Azerbaijani textual criticism. So, while working with manuscripts, he engaged in textology researches in the directions of deciphering ancient written texts, determining the history of texts, autographs, copies, and variants, identifying differences between versions, establishing the author based on observations of the manuscript, correcting errors on primary texts, annotations, and commentaries, and other issue, and he established a school of textual criticism in the country that continued to preserve his traditions after him. That is why, his name has been mentioned alongside figures like Salman Mumtaz and Hamid Arasli. For instance, the prominent bibliographer Aziz Mir Ahmadov characterized him as *“one of the key figures in the Azerbaijani textual scholars’ family.”* [1, s. 17]

M.Sultanov is one of the manuscript sciences who presents the heritage of several Azerbaijani classics to the scientific and literary community for the first time. Textology applied directly to the first sources and worked on the autographed copies, involved the min the first scientific research. Among the autographed copies being the research object of the researcher there are not only poems of Azerbaijanian writers, but also, “Khamsa” written by Zeynalabdin Abdi Shirazi in 1561, “Divan” finished in 1726 by the Turkish poet Ahmad Nadimi lived and worked in the first half of XVIII century, “Divan” by Aladdin Sabit in 1721, “Cheshm and rukh” poem written by Asinin – poet of XIX century in 1845 to “Bangu Bada” of Genius Fuzuli. M.Sultanov presented the wide information about this in his article named “Autographs of Eastern classics”. In his article named “Autographs of Eastern classics” prepared based on lecture submitted in the XXV World Congress of Orientalists of in Moscow held in 1960, there is wide information about the works written by Azerbaijanian classics such as, Kh. Natavan, G. Zakir, M. F. Akhundzada, A. A. Bakikhanov, Nakam, J. Mammadguluzada, M.S. Ordubadi, Jabbarli, addition to those above-mentioned authors. [5]

One of the notable articles on textual studies of M. Sultanov is “A Rare Manuscript”. This is about the manuscript of the poem “Servu Gul” by the poet Taskin, a follower of the Nizami Ganjavi literary school. Until Sultanov, no information about the author of this work had been available. This manuscript, kept under the M-393 code at the National Manuscripts Institute of the ANAS, is

the only known copy of this poem for now. Sultanov was the first to identify the short information about the author selected from the work and present it to the scholarly community:

*"I am a son of an Arab from the city of Qatif,  
I am a poor soul, stranded in a foreign land.  
My father is from Ibri, my mother is from Qatif,  
Grief has placed the burden of misery on my shoulders.  
My fate, through a ship from Ibri,  
Brought me to Shiraz with resentment.  
If one of my friends seeks me,  
Let them know that now my homeland is a corner of Shahcheragh".* [6, s. 132].

The scholar determined that the poet from Garif, a small port city located in north-east coast of Arabian Peninsula came to Southern Iran, lived in Shahchirag town nearby Shiraz, and finished his masnavi "Servu Gul" in 1189 (AD 1774) here, under the native-speaker judge Mirza Sharif. The researcher, through the citation in the work, shows that the author considers himself the successor of the great Nizami Ganjavi, and the "Khosrow and Shirin" s influence in masnavi is clearly seen:

*"I arranged the words in a completely orderly manner,  
But how can I be like Nizami?"* [6, s. 139].

M.Sultanov shows that the only copy of "Sarvu Gul" epos written with high craftsmanship in Persian reached to us has been copy in 1796 (Hijri 1210) after nearly twenty years from the written date in fine Nastalik script by the calligrapher Hasan Khan Sultan, son of Mustafa Bey. According to the available manuscript catalogues it is considered that the second copy of the work is kept in Tabriz National Library.

In his other article named "Unique "Sarvu Gul" epos" related to the same theme, M. Sultanov narrates that this large-scale poem (216 pages) has a very complex plot, consisting of two-plots. The work tells the story of the events that befall the daughters of the king of Ferehabad – two sisters named Sarv and Gul and provides a summary of the plot [4].

In his article "On the Ancient Manuscripts of Fuzuli's Works", M. Sultanov provides brief information about the oldest copies of the great poet's works preserved in famous libraries of Western and Eastern countries. The scholar, whose main goal is to introduce the Fuzuli manuscripts in the Manuscripts Institute currently bearing the poet's name, highlights that nearly all the poet's written works exist in the holdings of this scientific-research institution. He notes that there are more than thirty manuscript copies of the poet's *Divan*, copied in various cities, in different years, and by different calligraphers. While speaking about the manuscripts that are of special significance in turn of their artistic design, decoration with miniatures, and greater age, he focuses more on the poet's *Divan* with native language, which was copied just 16 years after the poet's death. He points out that the secretary Mahmud ibn Davud Said notes that he completed it in the year 980 Hijri (1572 AD in the end of the manuscript. In contrast to this manuscript, another more finely decorated copy of the *Divan* also includes the poem "Bangu Bada". Although the exact date of copying for this manuscript is unknown, the scholar determines, based on the seal at the end of the manuscript, that it was written by the year 1083 Hijri (1628 AD)

M. Sultanov says that another perfect copy of Fuzuli's "Divan" with native language belonged to 1838 and writes that this manuscript is distinguished by containing the scene of the meeting of Majnun and Layla.

M. Sultanov, noting that there are also separate copies of Fuzuli's works "Hadigatus-Suada", "Leyli and Majnun", "Bangu Bada" and "Sahhat and Maraz", with finely decorated, specifically mentions that the manuscript copied by the Baku poet Azer (Mashadi Azar Imamaliyev from Buzovna – T.M.) with his own hand, and gifted to Jalil Mammadguluzada in 1929, has been protected. [2].

In his article named "Joint manuscript of Fuzuli and Navai divan" M. Sultanov gave information about an unequal manuscript copy. The author says that this manuscript, registered under inventory number 14181, contains selections from the four diwans of Alishir Navai, a pride of the Uzbek people and the Turkic world, as well as his famous work "Vagfiya" also includes the divan of Muhammad Fuzuli. The author of article Evaluated the fact that the manuscript was written in the city of Merv by the Uzbek calligrapher, Dovlat Shah ibn Hasan, as an important indicator of the literary and cultural relations between the two brotherly nations. While study the manuscript M. Sultanov determined that the secretary transferred Fuzuli's work to double divan in 1644 (Hijri 1054), and Navai's work in 1645 (Hijri 1055). The text critic who conducted the initial research on the manuscript concludes: *"Thus, while writing these divans Fuzuli's poems had previously attracted the scribe's attention"*. [3, s. 311].

The author of article gives information that, the secretary who entered the ghazals selected from Fuzuli's divan and "Leyli and Majnun" masnavi to the divan according to the Arabian alphabet did not enter some ghazals of the great poet to this copy. Another secretary who worked on this manuscript later wrote those ghazals in relevant pages in margin note and completed the divan. That secretary determined that some couplets of ghazals by Navai and Fuzuli were not available in collection and wrote also them in margin note and corrected his colleague's mistake. [3, s. 311].

M. Sultanov conducted textual research on the mentioned manuscript, determined its "biography" based on the notes and seals on its pages: *"It seems from the notes made in its margins and blank spaces that this manuscript travelled from Merv, through Central Asia and India, and finally entered Azerbaijan"*. [3, s. 312].

In general, it is impossible to imagine M. Sultanov's activity in the fields of Textology and source study out of the Republic Manuscript Fund of the Azerbaijan SSR Academy of Sciences, where he once held leadership. While describing the materials here, the scholar discovered many new copies that were previously unknown to the academic community and brought them to the scientific stage through the media.

So, M. Sultanov's articles related to the study of ancient written monuments, which contain important information about the ancient history, culture, and literature of our nation, allow us to characterize him as a talented textologist. Carefully considering manuscripts written in difficult-to-read scripts, paying attention to every fine detail, he was one of the first textologist scholars created a database for complex scientific research, based on the facts he meticulously gathered, successfully leading our literary history towards earlier periods in different fields, wrote his name in golden letters in the history of manuscript studies as the author of numerous discoveries.

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# IRONIC DISCOURSE IN THE WORKS OF ABISH KEKILBAEV

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In the works of an outstanding representative of Kazakh prose A.Kekilbaev often found elements of satire, especially humor and ironic narrative skills. In the works of the writer humorous pathos, ironic approach, satirical malt, sincere laughter prevail. Especially in the stories "Competition", "Peripheral house" and "Yesbolay", "The right man", "Here is a miracle!", "Final stop", "Mouth" clearly recognizable own style of Kekilbaev-humorist. The narrative style of the writer, humorous coloring in the work, parable, expressed by irony, playful language are some of the ways that emphasize the unique character of the writer's style.

Usually, the goal of criticism in literature is always tolerance. Tolerance since ancient times has been developing together with society. In any society, both social characteristics and moral and psychological features of human consciousness are diverse. The social identity, ideological positions of each time change some features of personality.

Different manifestations of hearing loss at different stages is akiuual in the works of Kekilbaev. In the stories "Necessary Man" and "Aot he, a miracle" the writer draws pictures of true life in a humorous rhythm. Both works are devoted to the life of intellectuals. Social reality, embodied in humorous energy, includes realistic pictures of its period.

These two stories are thematic, actual works with each other. In the story "Here it is, a miracle!" we see the peculiar character of human behavior- internal competition, mental rivalry, external jealousy. And in "The Necessary Man" an exploration is made in the internal mechanisms of such a situation, glorifying the liveliness of the representatives of the intellectual environment in the city, mixing some contradictory phenomena with humor with inner irony. In this work, flattery in relationships, imitation of activities, everyday life in behavior are clearly seen.

"Here it is, a miracle!" – a short story. The construction and plot expressions of the work are characterized by originality. The author expresses internal nuances of inner mood, replacing envy, jealousy, replacing benevolence with artistic observation. An event frequently encountered in life reflects human nature with its own cheerfulness in an original way. Absurd-comic world in the work is warmly perceived with its own artistic rhythm, light humor. The author combines social assessment and psychological analysis, revealing the inner world of the characters, which leads to an independent decision.

A.Kekilbaev is a master of embodiment of human emotions. His creative signature intertwines various methods and techniques of diving into the deep turns of the soul system, contemplative nature, and human cognition. Both touching humor and tactful mingle in a story of instant speculation, mood problems, and the sensual feelings of the characters.

The very title of the story "Here it is, a miracle!" is embroidered with an ironic character, sarcastically hinting at the artistic content of the text. The thoughts of the two children, who look out into the field and regret not eating melons, seem to reveal this contradiction: "great! Great! What's great? Hugged, kissed, shook hands. Smiled, ducked. What's there worth?" [1,339- 340]. This is only an external impression. And taking into account the inner world of our two heroes- mental peripeteia and inner sensual peripeteia, the truthfulness of the opinion of the two children becomes even clearer.

The character of each of the characters in the story "The Needful Man" is characterized by its own facet. Yeranov, who spoke in a hurry, laughed with laughter, Akhmetov, who worked in the

ministry, then this or that high position Aleke from Mangistau, a type of man with golden glasses, who never tires of laughing Mrs. Zhamila, Alma- all of them warms the soul as if old acquaintances. Even Sarsenov himself gives the impression of your beer-swilling relative. Although the story is told in the third person, the author's intent and reader's connection are intertwined with this Sarsenov's point of view.

The artist realistically depicts the ordinary simplicities of family life. Fine observation, life fantasy, lively dialog- these are integral components of the writer's skill in the stories. If the exposition of the work traces an idyllic scene in Semyezhanov, the finale glorifies his imitative character, traces the hidden gait and intricacies of the spouses, and thus passes into a satirical parody. The author clearly achieves the disclosure of the contradictions of human character, comprehension of feelings with the help of reader's intuition, with the help of individual details, strokes, delving into the sartorial properties of consciousness.- I don't know," I said.- I don't know what it is. The laughter here is a subtle and powerful laughter, when you read, when you laugh, when you cry, when you open your soul to one of the characters, when you pity, blame and punish the other-all the same you sign that all these are pictures of the truth of life, you realize that to fix life is first of all to change yourself.

Thoughtful humor and parable irony, recognizable from the author's intention in the writer's story "peripheral house" and the story "final stop", are also focused on specific situations, mainly on the actions and reflections of the characters, on the general result arising from them, on the artistically justified conclusion of the lesson of life framed in the mind. The ironic style associated with such social reasoning requires the ability to constantly critically evaluate the real-world phenomenon described by the author and, if necessary, to use language turns playfully. V.E.Khalizev writes about such irony: "Along with universal irony directed at the world and human life in general, there is (and is very productive for art and literature) irony generated by the perception and comprehension of specific, local and at the same time deeply significant contradictions of people's lives and their historical existence" [6,79]. [6,79].

In the story "Peripheral House", Zuhra reflects on the memories of the old woman's past through a lyrical digression. Although the words of the central character do not appear directly in overt monologic or dialogic forms, the author's narration itself is mostly interwoven with thoughts, memories, and perceptions of the character. One of the features of such a two-channel, intertwined style is that here, in addition to describing the unyielding inner world, the psychological state of the hero, the author's view in the rhythm of the narrative is traced, accentually - the intonation of the quotation is manifested mainly in the humorous picture-expressions and undertones of sarcasm.

The writer, remembering the simple principle of the struggle of the individual for his own happiness, agreed with the fate of the woman who did not think about the future and the future of her life, comprehending the real situation, showing signs of socio-psychological syphilis occurring in our life today, such as alienation of the family, indifference to the fate of offspring, isolation, selfishness, alienation from society. Egocentric, intoxicated by the deceptive flame of youth, intoxicated by life's fun, a woman who nevertheless fell into life, the fate of Zuhra does not leave the reader indifferent.

The writer's novella "final stop" is also a psychological work. Analyzing the life path of the main character, one aspect of his character is psychologically analyzed, including the one that negatively affected the tendencies of his whole life, boldly aspires to lofty dreams, spends his strength on his place and takes his place in life-extreme meekness, fearless character, caused by shyness, hopelessness.

"The worst thing in Bisenov's world is the laughter in people's mouths. Six streets go far away from the place where conversation takes place, laughter is born." This very detail marks the

most vulnerable link in the character of the protagonist. The story being told and the character of the character reveal the mystery and reveal the essence of this detail.

"This Smiling Laughter" is a doomed Hope, a silent reading of unfulfilled dreams. In this world, failing to become a life goal, failing to find a risk for oneself, dumbfounded by good dreams! ...The blackest face in the world appears as betrayal to the virtuous dream that has condensed in the breast of betrayal "[1,368].

From the beginning to the end of the conversation, clownish laughter-self-irony pulls the net. The lyricism in the prose intertwines with this self-irony, extending an analytical approach that sarcastically reveals the inner psychology of the man. "Smiling laughter" in the story is an image-symbol that carries the conceptual baggage of the work. There is a deep meaning behind this "smiling laughter". In revealing the cause-and-effect essence of many desires, fates on the life path of a person, this symbol acquires a special energetic force and fulfills a "human" function. A beautiful symbol that proves that there is nothing insignificant in human nature, that, seriously, underlies every phenomenon, even every "laughter phenomenon". And it is a special use, which not only as a detail, but as an instant "merit" in the plot of the work, but also leads to a deeper delivery to the reader, to feel the artistic energy of the most urgent issue in the whole compositional and content basis of the story!

The conceptual essence of the work is contained in the instructive phrase: "I am a dream realized in life". The writer explores the psychological aspect of the social phenomenon, love for man, his inability to repeat his mistakes and faith in the future is the central theme of the writer's work. While reading them, he makes his readers think about the time, about themselves.

The writer rationalizes the universal function of irony in his work. Irony harmonizes perfectly with images, images, as well as reasoning, is spent on optimal activity in philosophical, psychological, social analysis. The ironic evaluation, often manifested in the author's narrative from the writer's intention, is confined to the conceptual core of the artistic text and is recognized as one of the techniques of analytical, evaluative skill of the author. And this fact also finds a response in the reader's consciousness, is impressively perceived and oriented to the subject of critical study. At the same time, expressions of laughter, which come in a variety of shades, are one of the unique phenomena in the writer's style.

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# THE CASE STUDY METHOD IN TEACHING FOREIGN LITERATURE

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## **Abstract:**

This article is devoted to the analysis of the specifics of the case study method and its role in teaching a course of foreign literature. Based on the works of P. Merime, the authors of the article describe the main stages of work on the case. Special emphasis is placed on the results that can be achieved by implementing the case study method in the study of literature and, in particular, literary text.

**Keywords:** innovative technologies, the case study method, Prosper Merimet, exotic and modern novels.

One of the important goals of education today is the formation of a comprehensively developed personality with an active lifestyle, with a creative view of the learning process, striving for self-improvement and able to independently acquire knowledge.

The distinctive features of a creative personality are developed imagination and associative-creative thinking, an original approach to solving educational problems and understanding the world around them, and the desire to create something new and unusual. The use of innovative interactive technologies helps students to discover and improve these qualities.

Today, many researchers emphasize that the use of innovative technologies contributes to the creation of comfortable conditions for both teachers and students. At the same time, a number of authors remind that innovations should not be limited only to technical innovations: first of all, we are talking about updating the content of education and developing students' creative analytical thinking [1, p.68].

At the present stage, such methods as case studies, discussion, problem-based learning, the project method, and many others are very relevant and in high demand. In this article, we will look at a more detailed description of the case study method, which has recently attracted particularly close attention from researchers.

Thus, S.Y. Gruzskova and A.R. Kamaleeva turn to the history of the development of the case study method [2]. A. Dolgorukov considers the features of case study as a modern technology of professionally oriented learning and calls the case method the method of active problem-situational analysis [3, p.37-38]. G.A. Pichugina analyzes the role of cases in the development of key competencies [4, pp.31-34]. G.A. Pichugina and A.I. Bondarchuk study the structure of the teaching case, and also emphasize that case study technology plays an important role in the formation of students' value, social, educational, cognitive, communicative and information competencies [5, p.5]. M.H. Uzakova and G.M. Sarimsakova reveal the educational possibilities of this method and characterize the sources of the cases [6, p.91].

A case study is otherwise called a method of specific situations. The term is formed from two English words: case – "case, situation", study – "to study".

The English term case means the following:

- 1) an innovative teaching method based on the principle of "from examples to the rule", and not vice versa. This is an active teaching method, a description of a specific practical situation.;
- 2) a case is a set of special teaching materials on various media. These may be printouts of scientific articles or works of art, audio recordings or video materials on the topic being studied (for example, a feature film based on the work being studied), given to students for self-study.

As you know, the case study method was first used in 1870 at Harvard. Then it spread to other European countries and to the USA. Initially, only managers and lawyers were trained using this method. Recently, it has been very actively used in teaching humanities, in particular, Russian language and literature.

The essence of the method boils down to the fact that the teacher selects material on a particular topic in advance. Then students are offered a theoretical part of the material being studied, after reviewing which they are given a specific situation to reflect on and discuss. During the analysis of this situation, the participants in the discussion process have the opportunity to put forward their own solutions.

The case study method is action learning. The essence of the method is that the formation of knowledge, skills and abilities is the result of students' independent work on solving a problem. When using it, the main thing is not the assimilation of knowledge presented by the teacher in a ready-made form, but the independent development of this knowledge by students.

The main advantage of the case is to provide students with the opportunity to work in groups within a single problem field. Applying the principles of problem-based learning allows students to gain not only knowledge, but also independent work skills in studying, analyzing and summarizing information.

The case method is aimed not only at obtaining a specific amount of knowledge and developing certain skills, but also at expanding the general cultural horizons of students and forming their intellectual and communicative potential.

This method allows you to solve a number of educational tasks: it is working with various literary sources in order to obtain educational information; analyzing and evaluating a specific situation; making a presentation on the analyzed material and demonstrating the ability to solve a problem situation.

At the initial stage of working on the case, the teacher introduces the group to the rules of work. You can immediately determine who is responsible for collecting information, preparing a presentation, and acting as a coordinator in the group. All points of view are put forward only by students. Until the moment of summing up, the teacher performs only organizing and corrective functions.

There is a significant difference between the case study method and the problem situation. A case study does not provide students with an already formulated problem in a ready-made open form. In the course of self-study of the case material, students should isolate this problem from the entire amount of information provided in the case description.

The use of the case study method in teaching literature has a number of advantages. First of all, specialists who possess not only a certain amount of knowledge, but also know how to analyze, make decisions and justify their point of view are in high demand today, and these skills are very successfully developed by case study technology.

As you know, the study of a literary work is not limited only to understanding its plot basis. Students should be able to analyze the images of the characters, the features of the architectonics of the work, the specifics of its symbolism, the originality of all levels of poetics of the literary text being studied. This is the only way to get closer to understanding the author's intention. The case study method helps to create an atmosphere of discussion and creative search, when a true solution is born in the exchange of points of view and in the dispute.

The case study method allows you not only to understand the author's idea and the ways of its artistic embodiment. Students are given the opportunity to connect a literary work with their era and a real-life situation, which expands their understanding of the cultural and historical significance of the literary text being studied.

For example, studying the typology of the heroes of Russian literature of the 19th century allows us to draw analogies with the heroes of the works of a later era, with modern reality. So, despite the fact that the topic of the superfluous person was developed by literature a century and a half ago, it has not lost its relevance today. Russian literature. Working on a case study related to this image in the works of A.S.Pushkin and M.Y.Lermontov will allow students to go beyond the classical age of Russian literature and find similar images in the literature of the 20th century – and not only in Russian literature. A kind of analogue of the classic image of an overweight person is Meursault, the main character in the novel "The Outsider" by Albert Camus, a prominent representative of French existentialism.

In literature classes, the teacher offers the audience a case study that can be worked on both collectively, as a team, and individually. This case includes a text that provides a detailed description of the problem situation and a list of issues that need to be resolved.

When working with a case, the following stages are distinguished:

- 1) dividing the student body into small groups;
- 2) familiarization of the participants of small groups with the content of the case;
- 3) study of case materials;
- 4) analysis and critical understanding of case materials;
- 5) collective discussion in a group of possible solutions to a problematic situation; consideration of alternatives;
- 6) selection of demonstration methods and materials; presentation of decisions made during the discussion;
- 7) discussion (comparative analysis; discussion of various solutions to the problem);
- 8) development of a common solution to a problematic situation and its argumentation.

The result of the lesson using the case method will be not only new knowledge gained in the course of solving a problem situation, but also those competencies that will be formed during the study of case materials, comprehension and critical analysis of a specific situation and resolution of the problem.

The use of the case study method will help the teacher in checking the quality of the formed competencies at various levels:

- 1) cognitive level (knowledge, understanding, reflection);
- 2) behavioral level (the ability to make decisions, make choices based on various options for solving a problem);
- 3) emotional level (the ability to listen, the ability to control one's emotions during the discussion of an alternative solution, etc.).

The case study method promotes the development of diverse skills.

1) First of all, these are analytical skills. Using the case study method teaches you to analyze information, identify the main and secondary in it, classify and systematize the data obtained.

2) Practical skills. By studying the problem presented in the case, students learn to use the information they receive in practice.

3) Creative skills. Unexpected solutions are always interesting, which are achieved not through logical reasoning, but in the course of a creative search for alternatives to what cannot be achieved through logical reasoning.

4) Communication skills. Working on a case teaches you to choose the right arguments to convince your opponents and to competently and reasonably conduct a discussion on the issue

under consideration. Students develop dialogue skills. They learn not only to formulate their point of view, but also to defend it in a reasoned manner, and master the art of communication.

5) Social skills. In the course of the work, the social activity of the students develops. Students learn to listen to each other, perceive a different opinion, control their emotions while discussing different points of view, and work in a group to solve a common problem.

A case study is a very effective method of developing students' abstract thinking. By considering a particular problem related to the analysis of a literary work, for example, recreating the image of a literary hero in our days, students develop an artistic perception of reality and abstract imaginative thinking.

The case study method is widely used by us in teaching the history of foreign literature. Thus, when studying the topic of "French existentialism", an appeal to the analysis of Albert Camus's novella "The Outsider" allows us to examine in detail the image of the main character of Meursault's work. The author himself calls him a black sheep. The hero behaves differently from the people around him, thinks differently from others, and is guided by other principles. But he does not express open hostility to a society whose norms he does not accept. He just doesn't live like everyone else. In fact, that's exactly what he's being tried for. Because he's an outsider.

It should also be noted that when studying the work of A. Camus, it is important to determine the difference between the translation options of the title of the work into Russian – "Stranger" and "Alien" (this is how the title sounded in one of the first translations from French). Which of the variants of the title more adequately reflects the writer's idea? Students should find the answer to this question in the course of self-study of the case materials. At the same time, the teacher should not give students a ready-made formulated problem. This problem will gradually take shape in the process of students working on the case and will become one of the results of the analysis undertaken. It is in this independent identification of the problem and its formulation that the main difference between the case method and the problem situation lies. Moreover, classes using the case method are very attractive for students who immerse themselves in solving a problem with interest and passion, and this increases their motivation to study.

When studying the course of foreign literature of the 19th century, students worked on a case study on the work of the German romantic E.T.A.Hoffmann brings them to the key idea of why the writer considered music to be the highest art form, and why he paid so much attention to the theme of music and the image of a musician. An analysis of the case materials on D.N.G.Byron's "Oriental poems" will help to understand the meaning of the rebellious poems of the English romantic and the features of the structure of the romantic poem. A discussion in a small group of the specifics of the image of the "Byronic hero" will allow us to draw parallels with Russian literature and include in the field of analysis the images of romantic heroes A.S.Pushkin and M.Y.Lermontov.

When analyzing the text of a work of art, it is especially important to understand the rich inner world of the characters, the peculiarities of their spiritual quest, the moral and ethical reasons for certain actions, the ability to make a certain choice, which they face the fate and intention of the author. The moral issues of the work, the psychology of the characters, and the background of their moral choices cannot always be interpreted unambiguously. Such contradictory characters and the complexity of the life situations portrayed by the writers provide ample opportunities for creating cases based on works of Russian and foreign literature. For example, the image of the protagonist of P.Merime's novella "Mateo Falcone", whose act at the end of the work seems unexpected to students at first glance, and gives rise to very contradictory emotions and interpretations. But a deeper analysis of Corsican mores and the harsh laws of honor makes this image more understandable. The image of Mateo Falcone gives rise to associations with the work of Nikolai Gogol "Taras Bulba", where the name of the main character is also included in the title. In the course of analyzing the image of P.Merime, analogies can be drawn

with the hero of N.V.Gogol, identifying similarities and elements of difference between the two characters and the two works. Based on the results of the analysis, you can collectively create a Venn diagram.

The case may include not only printouts of scientific articles and works of art, but also excerpts from feature films, in this case, various film adaptations of P.Merime's novella and N.V.Gogol's novella.

The analysis of Prosper Merimet's novelistic case study will allow us to see the specifics of the writer's artistic method, combining elements of romantic and realistic poetics, as well as to understand the uniqueness of two types of his novels – "exotic" and "modern". In the exotic novels, events take place outside of France in an unusual setting. In short stories of this type, there are bright characters, in whose soul strong passions are raging. In modern novels, the writer turns to the life of French society. Both the portrait characteristics of the characters, the landscape, and the features of the conflict speak to the romantic nature of the works of the first group (the "exotic" novels "Carmen", "Colomba", "Tamango", "Mateo Falcone") and the realistic principle of representation in the works of the second group (the "modern" novels "Arsene Guillot", "Double mistake", "Abbe Aubin" and others).

At the beginning of the lesson, the teacher makes a short introduction, introduces the purpose of the lesson, its tasks and the main stages of work. Then there is individual case work: students get acquainted with the theoretical material, read the text of a certain novel by the author being studied and analyze its ideological and artistic features. The next stage of the work is to analyze the case in a small group. In this case, there may be two of them (the participants of the first consider the specifics of P.Merime's exotic novels, the members of the second work on the uniqueness of modern novels). In addition to highlighting the elements of poetics of romanticism and realism, students will have to answer a number of questions in a reasoned manner:

- 1) Why did the hero do exactly that in the specific situation described by the author?
- 2) Could he have done otherwise? If he could, how could he? If he couldn't, then why?
- 3) What are the causes of the conflict depicted?

After discussing the case materials and the ideas put forward by the students, a general discussion based on the presentations of small groups follows. Students can compare the features of the conflict between exotic and modern novels, the features of the portrait and speech characteristics of the characters, the motives of their actions, the role of descriptions in the text, the uniqueness of the denouement, the poetics of the titles of the works. At the end of the lesson, the overall results are summed up. As feedback at the stage of reflection, students can be invited to collectively compile a comparison table that reflects the specifics of each type of novel. And also to formulate a general conclusion about the uniqueness of the writer's artistic method, combining elements of romanticism and critical realism.

Thus, the case study method has proven itself very successfully in teaching literature. Although traditionally, the most effective use of this method is considered to be in economics and business classes, law or history. In the works of art of classical Russian and foreign literature, the ideological content never lies on the surface. To understand the true meaning of the author's ideas, it is necessary to turn to the analysis of all levels of the poetics of the work, to study the features of the inner world of the characters, the true reasons for their actions, their philosophical and ethical pursuits. Often, the characters' images are ambiguous, their mental lives are contradictory, and their characters and actions are interpreted in different ways. It is the presence of such contradictions that can be the basis for the formulation of a problem situation and the creation of practical tasks offered to students for discussion and finding solutions.

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## Medical Sciences

# MODERN CONCEPTS OF THE ETIOLOGY AND PATHOGENESIS OF ATHEROSCLEROSIS OF CENTRAL VESSELS

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### Annotation

Arterial thrombotic and thromboembolic complications remain one of the most pressing issues in modern cardiology. Mortality from CVD has been a leader in statistics for many years in European countries, as well as in Kazakhstan and neighboring countries. The most important problem in cardiology today, as it was a hundred years ago, is atherosclerosis of the central arteries. To date, this issue has been studied many times and comprehensively, theories of the origin and development of atherosclerosis of the main arteries have been described, risk factors have been identified, and principles of treatment and prevention have been developed. However, any practicing physician periodically encounters a discrepancy when a patient, against the background of a normal lipid profile, develops and rapidly progresses atherosclerotic lesions of arterial vessels, and, conversely, there are no signs of atherosclerosis with constantly high levels of blood lipids. Recently, the main areas of scientific research have been devoted mainly to the study of additional biochemical markers, their role in the pathogenesis of atheromatosis.

**Keywords.** Cardiovascular diseases, therapy, cardiology, atherosclerosis.

### **Etiology and pathogenesis of atherosclerosis of central vessels.**

Atherosclerosis is a systemic disease in which atheromatous plaques form in arteries of the elastic and muscular-elastic types, which is accompanied by progressive narrowing of the lumen of the vessels up to their complete occlusion.

WHO has formulated a definition of atherosclerosis of blood vessels, defining this concept as a different combination of changes in the intima of arteries, accompanied by the accumulation of certain types of lipids, cells of hematological origin, as well as fibrous tissue and carbohydrates, with further signs of calcification. The abdominal aorta, coronary, popliteal arteries, descending thoracic aorta, internal carotid arteries, and vessels of the Willis circle are most often affected.

Atherosclerosis is the main cause of morbidity and mortality in Kazakhstan, Russia, the USA and most Western countries. Thus, the incidence of atherosclerosis is about 150 per 100 thousand people aged 50, more often among men. With age, the frequency and severity of atherosclerosis increases. Atherosclerosis is a disease of adults. There are various theories of atherosclerosis development. Thus, the inflammatory, cholesterol theories have become widespread, atherosclerosis is also considered as a unified mechanism for the reparation of damaged tissues, as a "natural cellular therapy" of the arterial wall, as well as a pathophysiological symptom complex in the development of metabolic syndrome. It is important that a number of studies have shown that the first signs of arterial atherosclerosis can be determined even in children under 10 years of age, and atheromas are formed by the age of 15.

Among the traditional risk factors for atherosclerosis are hereditary predisposition, smoking, diabetes, hypertension, obesity, hypercholesterolemia, hypertriglyceridemia, physical inactivity, and the use of certain medications. It is important to note that rhythm disturbances, in particular, ES and AF, are not yet included among the risk factors. Despite numerous studies, the issue of the etiology of atherosclerosis remains a subject of active discussion in the cardiology community.

The role of inflammation in the development of atherosclerosis has been discussed in scientific circles for almost 200 years. The relationship between atherosclerosis and inflammation was first mentioned in the works of Rayer and R. Virchow. The latter, in turn, laid the principle of inflammation in the basis of his theory of the formation and progression of atheromatosis. In modern science, the stages of inflammation, as well as various cellular and humoral mechanisms, have been studied quite well. It is important that both inflammation and atherosclerosis have similar pathophysiological mechanisms. They involve human connective tissue cells: endothelium, myocytes, platelets, fibroblasts, macrophages, lymphocytes, neutrophils. Both of these processes lead to increased synthesis and secretion of acute phase proteins (CRP, fibrinogen, lipoproteins A, haptoglobin and others) by hepatocytes. The inflammation process is nonspecific: it is similar to the response to a bacterial or viral infection. As a result of the inflammation that has arisen, lipid spots are formed in the intima of the arteries, the level of cholesterol inside and outside the cells increases, and proliferation of smooth muscle cells is observed. Thus, the mechanism of inflammation is an integral and important part of the pathogenesis of atherosclerosis.

In the etiology of atherosclerosis, the main theory over the past 20 years has been the "cholesterol theory" of atherosclerosis. Cholesterol is a steroid by structure, an organic substance of animal origin. It is a natural lipophilic alcohol, which is an integral component of the cell membranes of animal cells. It is insoluble in blood plasma in water, in the blood it is in a lipid-bound state, with the help of albumin or lipoproteins it is transported from tissues and to tissues. At the same time, only 20% of cholesterol is of exogenous origin and comes with food. The main part - 80% - is endogenous cholesterol, which is produced in the liver, as well as in the intestines and kidneys in small quantities. In cholesterol metabolism in the liver, its main part is used for the synthesis of bile acids. LDL, which are considered atherogenic, and HDL - non-atherogenic play a role in atheromatosis. Cholesterol is excreted from the body in the form of bile acids. In pathophysiological mechanisms, LDL is involved in the movement of cholesterol into tissues from the liver or gastrointestinal tract, and, on the contrary, HDL does the opposite. Cholesterol in the human body performs other vital functions, such as: participation in the synthesis of vitamin D, steroid hormones of the adrenal glands and sex glands, it is necessary for the normal functioning of the immune system.

Cholesterol is an integral structural part of the brain, being a part of the white matter (14%), myelin fibers (22%) and making up almost a quarter of all its lipids. Sufficient cholesterol content is necessary for the normal functioning of adrenergic and serotonin receptors. Studies have shown that it is the lack of cholesterol in serotonin receptors that leads to the development of Alzheimer's disease. Low cholesterol levels in the body can lead to a number of mental disorders, such as depression, aggressive behavior, decreased intelligence, and suicidal tendencies.

The fight against cholesterol has been going on since the beginning of the twentieth century. At the same time, in addition to the hypocholesterol diet, lipid-lowering drugs have found wide application, making up a significant share of the world market of cardiological drugs, having entered the number of some of the most prescribed drugs in cardiological practice. Higher and higher doses of statins are used, combined lipid-lowering therapy is carried out, aimed at achieving target blood lipid indicators, which are becoming more stringent every year. Despite the general trend, in the last few years a number of works have appeared, which present evidence that allows

doubting the main leading role of cholesterol as the primary predetermining factor in vascular damage in atherosclerosis. Also, a number of studies have shown that cholesterol in food and cholesterol in plaques are different cholesterol, and there is no direct relationship between high-cholesterol food and the development of atherosclerosis. At the same time, clinical observations show that, despite achieving the target lipidogram indicators, the development and progression of atherosclerosis of the main arteries still occurs. There are frequent cases when even constant, with good compliance, long-term use of lipid-lowering agents is accompanied by the progression of atherosclerosis, which is an indicator of the lack of effectiveness of such treatment. Moreover, there is an acceleration of the progression of atherosclerosis with an unbalanced diet with a low protein content, with prolonged fasting, with mental and physical stress.

In our opinion, the above-mentioned discrepancy is evidence of the important, and sometimes primary, significance of hereditary factors. More and more genetic studies prove this fact. Thus, mutations in genes encoding enzymes involved in cholesterol metabolism lead to disruption of the entire cholesterol metabolism. Mutations in genes responsible for encoding LDL receptors may be associated with hypercholesterolemia. In this regard, genetic studies and development of prognostic test systems are promising areas in the study of this disease.

The "cholesterol theory" is supported by the fact that cholesterol is the predominant component of atheroma lipids, and hypercholesterolemia has been diagnosed in 50% of patients with atherosclerosis. However, given that hypercholesterolemia is not a mandatory sign of atherosclerosis, a natural question arises - what is the trigger mechanism in the chain of pathophysiological processes in the formation and progression of atheromas? And is it possible that there is an additional risk factor that has not been taken into account previously, which under certain circumstances can play a decisive role and become a trigger in the pathogenesis of atherosclerosis? Some authors interpret the disruption of cholesterol metabolism in atherosclerosis as one of the non-primary and optional mechanisms in the etiology and pathophysiology of this disease.

A number of works published in recent years have proven the role of sortilin and PCSK9 in the development and progression of atherosclerosis of the main arteries of various localizations (in particular, coronary, carotid arteries). The pathology of essential polyene fatty acids is also included in one of the theories of atherosclerosis development, which also gives a significant place to inflammation. In the development of this process, oxidative stress plays a major role, according to most researchers. Blockade of apoB-100, according to this theory, is the biochemical basis of atherosclerosis. An increase in the level of LDL and peroxidized fatty acids leads to their capture by macrophages. Inflammatory mechanisms are activated, leading to the production of biologically active substances such as CRP, fibrinogen, haptoglobin, serum amylase A and others. Neutrophils and monocytes actively enter the site of inflammation. Platelets aggregate on the endothelial surface, which occurs as a result of increased synthesis of platelet activating factor by macrophages. This process can lead to the development of complicated atheromas and the formation of atherothrombosis. A number of studies have proven the importance of cystatin C as a marker of active atherosclerosis.

Other studies have shown that individuals with metabolic syndrome have an increased risk of atherosclerosis. Numerous studies have proven the relationship between the development and progression of atherosclerosis and metabolic syndrome. According to various multicenter international studies, its prevalence among the adult population is 10-40%, the rates vary depending on the geographic region and dietary habits. At the same time, each of the signs included in the metabolic syndrome is a proven risk factor for CVD. Metabolic syndrome is not a specific disease; it combines a number of pathological signs: hypertension, increased abdominal circumference, dyslipidemia (decreased HDL levels, increased triglycerides), hyperglycemia. In the presence of 3 factors, metabolic syndrome is confirmed.

Patients with metabolic syndrome are diagnosed with changes in liver and pancreas function, as well as histological changes in the aorta, as in atherosclerosis. It has been shown that metabolic syndrome is characterized by oxidative damage to mitochondrial DNA and lipoproteins, stress activation of macrophages, which activates their apoptosis. These pathophysiological processes lead to the proliferation of smooth muscle cells in the intima and the formation of unstable atheromas in the arteries. However, it has not yet been clarified what plays a primary role and what is the trigger in pathogenesis - genomic damage to mitochondrial DNA or their secondary damage.

It should be noted that many authors pay much attention to oxidative stress and its impact when studying risk factors in the pathogenesis of atherosclerosis. Thus, a number of publications show the role of xanthine oxidase. Xanthine oxidase is one of the main enzymes involved in the synthesis of uric acid and catalyzing the degradation of purine compounds. Xanthine oxidase is necessary for the synthesis of active forms of oxygen in various diseases.

Continuing the study of oxidative stress as the leading pathogenetic mechanism of atherosclerosis development, a number of authors have shown the importance of myeloperoxidase, a protein of the peroxidase class, the role of which is important in the pathogenesis and progression of atherosclerosis of the main arteries. This enzyme is one of the proven markers of atherosclerosis of the main arteries. In the body, myeloperoxidase performs the function of forming active forms of oxygen entering the blood, is an important protein of neutrophil cells and has bactericidal properties. That is why in this case neutrophil and the oxidants they contain are an integral link in the pathogenesis of the inflammatory syndrome in atherosclerosis of the main arteries. The studies conducted have proven a direct relationship between an increase in the number of neutrophils and an increased risk of developing atherosclerosis, as well as its complications. Thus, in patients with CVD pathology, an increase in the level of neutrophils in the blood serum was observed, as well as an increased concentration of them in the foci of inflammation directly in the arterial vascular wall. It was shown that an increase in the level of myeloperoxidase activity is associated with the severity of clinical manifestations of atherosclerosis (direct correlation). And, conversely, a decrease in the risk of CVD occurred with a decrease in myeloperoxidase activity and a decrease in the activity of cellular immunity.

The pathophysiological role of myeloperoxidase participation in other pathological mechanisms associated with cardiovascular damage is also described: with coronary artery stenosis, with decreased LV contractility, progression of CHF, influencing the level of natriuretic peptide in the brain.

Thus, thanks to the above studies, it was established that inflammation is an integral part of pathogenetic mechanisms at all stages of the development and progression of atherosclerosis. The significance of individual inflammation mediators is still being clarified and specified.

In addition, the "iron" theory of atherosclerosis pathogenesis serves as a supplement to the inflammatory theory. It was proposed due to the fact that an excessive amount of iron was found in atheromas during a pathological study. In experimental studies on animals, an excessive accumulation of trace elements - iron, as well as zinc in the heart and main vessels during the progression of atherosclerosis was revealed. One of the functions of iron in the body is the activation of the lipid peroxidation process, due to which an increase in the synthesis of inflammation mediators occurs. Thus, there is data on the correlation between a decrease in iron content in the body of humans or animals (for example, with anemia) and a decrease in the risk of developing atherosclerosis. A number of studies have demonstrated opposite results, including anemia among the risk factors for the development of CVD.

Another theory of atherosclerosis development and progression is the theory of endogenous intoxications. Oxidative stress products are the most common endogenous toxins.

The term "endogenous intoxication" includes a polypathogenic polyetiological syndrome accompanied by the accumulation of endotoxins - metabolic products in tissues and biological fluids, which is a consequence of the pathology of their detoxification mechanisms or their biotransformation. As a result of their long-term presence in the body, chronic intoxication is observed. Most often, endogenous intoxication can be associated with an increase in the products of normal or altered metabolism (for example, bilirubin, lactate, creatinine, urea, uric acid, ketone bodies, ammonia). In addition, intoxication may develop during the absorption of toxic cell decay products from the gastrointestinal tract (for example, phenol, cationic proteins, myoglobin, etc.).

In case of intoxication, tissue damage manifests itself in the form of necrosis and apoptosis, with further development of fibrosis. Carcinogenesis, mutagenesis, photoallergy, hemolysis of erythrocytes are the pathological conditions that result from activation of free radical processes in cells. The activity and structure of many important enzymes are disrupted. All of the above changes can lead to the development of a chain of pathogenetic mechanisms leading to atheromatosis. However, the theory of endogenous intoxications does not provide an answer to the fundamental question about the root cause of the development of atherosclerosis of the main arteries.

Among all the various theories of atherosclerosis development, where the identified pathogenetic mechanisms are described in detail, illustrated by experiments, a legitimate question arises during the analysis: is it possible that there is an additional factor, not previously taken into account, which also takes part in the chain of pathogenetic mechanisms leading to the development and progression of atherosclerosis? And if so, which one? It should be noted that in all the currently existing theories of atherosclerosis development there is no mention of the possible impact of mechanical factors on the wall of arterial vessels (additional stretching by an increased pulse wave). There are no references in the literature to the impact of mechanical factors on the wall of arteries that occur during the passage of the 1PES wave or after a long RR interval of the ECG during AF. The analysis of intra-arterial hemodynamics using the methods of ultrasound dopplerography, cardiac biomechanics and kinetics of the main arteries using digital ACG and SG was not performed for these rhythm disturbances, and the relationship with the development and progression of atherosclerosis of the main arteries was not revealed. This was previously described in our works.

As the plaque grows, it undergoes vascularization, calcification, and plasma impregnation. Hemorrhage into the plaque is possible, which is accompanied by an increase in its size. In this case, local thrombus formation increases, up to the destruction of the plaque and the release of its contents into the lumen of the vessel. The occurrence of thrombotic occlusion leads to the development of an infarction in the area supplied by this artery. In case of plaque rupture, embolization by its parts of the distal parts of the artery is possible. This pathogenetic mechanism has been studied quite thoroughly. However, there are no data in the literature on the assessment of the hemodynamics of the main arteries in case of rhythm disturbances in the area of the intact artery or on the already formed plaque. The influence of mechanical factors on the damage to the increased pulse wave that occurs in the 1PES or after a long pause between cardiac cycles in AF is not described.

Clinical manifestations of atherosclerosis depend on its localization. Thus, with atherosclerosis of the coronary arteries, coronary heart disease develops, with damage to the cerebral arteries - discirculatory encephalopathy, TIA, with atherosclerosis of the arteries of the lower extremities - intermittent claudication, with damage to the renal arteries - secondary arterial hypertension (vasorenal).

Recommendations for the diagnosis of atherosclerosis include determining the lipid spectrum of the blood (pay attention to the increase in the level of cholesterol, LDL, VLDL and triglycerides, decrease in HDL), ultrasound Doppler imaging of the main arteries (pay attention to

the thickening of the IMC, the localization and structure of plaques, determine the percentage of stenosis), angiography and radionuclide research methods. It should be noted that the examination plan for atherosclerosis does not include determining the presence of rhythm disturbances (ES, AF), since they are still not risk factors for the development and progression of atherosclerosis of the main arteries.

To sum up all of the above, it still remains unclear what is the additional trigger for the development of atherosclerosis? And why, given the same traditional risk factors for the development of atherosclerosis of the main arteries, does this process develop in one person, but not in another? Or why, with all other things being equal, does atherosclerosis progress faster in one patient, leading to the development of hemodynamically significant stenosis of various localizations? And in another, the process is slow, and in control studies, the percentage of stenosis does not progress over the years. The answer to this question, from our point of view, is as follows. There is an additional risk factor that has not been taken into account previously. Moreover, this additional factor, under certain conditions, can become precisely the trigger for the development and progression of atherosclerosis. In addition, this same factor can become a direct cause of complications of atherosclerotic vascular lesions, leading to ruptures, fragmentation of existing plaques, followed by thromboembolism of the distal sections.

# PROBLEMS AND PROSPECTS OF DEVELOPMENT OF MEDICAL CARE FOR PATIENTS WITH RESPIRATORY DISEASES

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## **Annotation**

Respiratory diseases have become a major medical and social problem worldwide in recent decades. The relevance of this problem is due to the significant prevalence of this pathology among the entire population, the high level of disability, including among people of working age. Disabled people due to respiratory diseases require constant dispensary observation and increased effectiveness. With the increase in the volume of treatment and diagnostic measures, the need for drug provision for patients also grows.

**Keywords.** Respiratory diseases, therapy, prevention.

## **Development of organizational measures for medical care in respiratory diseases.**

The accumulation of knowledge in the field of etiology and pathogenesis of respiratory diseases has led to a significant complication of diagnostic and treatment methods for these diseases, to an understanding of the need to develop and organize the use of a set of measures to prevent their occurrence and progression. In this regard, the focus of the health care system as a whole and pulmonology in particular should now shift from treatment to disease prevention. Prevention of acute and chronic lung diseases is the most important task of health care, the successful solution of which determines the reduction of morbidity, disability and mortality of the population. Many scientific studies have been devoted to the prevention of acute and chronic lung diseases, a number of comprehensive and regional programs have been developed for their primary prevention in rural areas and at industrial enterprises, including using a program-targeted approach to organizing preventive measures. The prevention of bronchopulmonary pathology should be based on primary prevention, the essence of which is to identify and eliminate risk factors for diseases. Medical and social measures (government measures aimed at optimizing environmental health, improving working and living conditions, creating adequate sanitary and hygienic conditions in preschool institutions and schools, and promoting a healthy lifestyle) are of primary importance in developing comprehensive social, hygienic, and medical and biological measures to prevent chronic respiratory diseases. In this regard, improving the economy and transforming the social sphere are the path to reducing morbidity and mortality. A promising and practical approach in the concept of preventing respiratory diseases is to focus on identifying individuals with a high level of individual risk due to biological defects caused by external factors. Given the nature of the relationship between the human respiratory system and the environment, it becomes especially clear how important the state of its protection is and what place environmental health plays in preventing chronic respiratory diseases.

Disease prevention through environmental impact is the most important factor in reducing morbidity and mortality among the population. Issues of protection and improvement of the production environment are of great importance in the complex of preventive measures among the working population. Primary prevention should be carried out mainly at the workplace,

and health measures should be aimed at eliminating the influence of harmful production factors. Improving sanitary and hygienic working conditions at enterprises is the main way to prevent disability from respiratory diseases. One of the main social problems of our time and the main risk factor for many, including the most common diseases, is tobacco smoking and, consequently, the emergence of tobacco addiction, the size of which is increasing at an alarming rate. No means can reduce morbidity as much as reducing the impact of tobacco smoke, so the fight against smoking should be the most important link in the prevention of chronic non-specific and malignant lung diseases.

It is necessary to create medical and advisory centers for the treatment of tobacco addiction, which are scientific and methodological centers for solving these problems and providing specialized assistance to people with tobacco addiction.

The socio-demographic characteristics of the contingent of patients with respiratory diseases require changes in the system of hygienic education and upbringing of certain age and professional groups of the population, creation of conditions for a healthy lifestyle of different generations, as a basis for disease prevention. However, studies indicate a low level of awareness of the population about their health status, and of doctors - about the forms, methods and content of preventive work.

Development of organizational forms of prevention is one of the most urgent tasks facing preventive medicine and pulmonology, in particular, which should be aimed at mitigating the impact of negative social factors on human health, taking into account climatic and production conditions and the adaptive and protective capabilities of the body, the degree of expression of the polygenic predisposition of a particular person to a certain form of bronchopulmonary pathology. Successful prevention of respiratory diseases is real only under the condition of a comprehensive assessment of the combined impact of social and biological factors on human health. In this regard, the development of the preventive direction of modern medicine requires a constant and deep analysis of the real possibilities of science and practice in order to radically change the situation, and the choice of directions - a quantitative analysis of the volume of work and its results.

According to GARD experts (2006), step-by-step comprehensive prevention programs are needed to overcome duplication and inconsistency in the health care system. This will allow the following results to be achieved: reducing the incidence of individual diseases and paying attention to common risk factors for their occurrence; implementing disease prevention and control strategies; ensuring links with other state programs and measures taken at the regional level. Regional and municipal pulmonology programs play a major role in this process.

The strategic goal of developing pulmonological care is to meet the needs of the population for specialized preventive, medical, social and drug care. The main principles of organizing such care in modern conditions are: - continuity of medical care at various stages of its organization; - timeliness and rational use of modern diagnostic methods at all stages; - timely and rational use of the most effective methods of prevention and treatment; - dispensary observation; - implementation of social, hygienic and sanitary and health-improving measures.

In organizing the treatment of patients with bronchopulmonary pathology, it is necessary to use intensive tactics consisting of preventive work, active detection of diseases and their complications at an early stage of development, introduce modern standards of examination and treatment of patients with respiratory diseases into the daily practice of a pulmonologist, close interaction with doctors of related specialties. In organizing medical care for patients with bronchopulmonary pathology, it is important to cooperate with outpatient and hospital doctors, close ties between specialized clinics and the general network, integration of various services (pulmonology, occupational pathology, allergology, oncology, phthysiology), interaction between therapists and pediatricians. The flow of patients to see doctors of specialized departments of

second-level institutions should be formed mainly by referrals from first-level pulmonologists and district therapists. One of the areas of development of the pulmonology service is the creation of a register of patients with respiratory diseases. The register allows studying the prevalence of respiratory diseases, building algorithms for their timely detection and dynamic monitoring, and making a forecast of financial and drug provision. Constant monitoring of epidemiological indicators allows timely management decisions to be made to ensure efficient operation of the specialized service and expand the types and volumes of medical care. Organizational and methodological measures to improve pulmonary care should include: - selection of risk groups among various population groups; - use of a standardized model of differentiated examination of patients; - assessment of the quality of pulmonary care; - improvement of the dispensary observation system; - organization of a system of statistical information and assessment of the effectiveness of pulmonary care; - improvement of personnel training.

In order to develop the pulmonology service, it is necessary to staff pulmonology offices with specialist doctors, introduce new methods of monitoring and active prevention, diagnosis and treatment of acute and chronic forms of respiratory diseases and their complications into everyday practice. Scientific and practical potential in modern conditions should be aimed at developing and implementing programs for the prevention of respiratory diseases, creating a system of dispensary observation of patients with a pulmonology profile. Targeted programs play an important role in implementing the tasks facing pulmonology. It is necessary to create regional programs for the development of the pulmonology service, providing for the creation of intensive pulmonology units, increasing the efficiency of pulmonology beds, increasing the provision of drugs to pulmonology patients in need. Participation of the territory in the implementation of federal target programs for the development of healthcare allows creating a basis for the introduction of effective methods of prevention, diagnosis and treatment of diseases into healthcare practice and providing the population with affordable qualified specialized medical care. In order to improve the management of pulmonary care to the population, it is necessary to focus efforts on the joint and coordinated work of health care authorities, municipal and state health care institutions and scientific institutions, ensuring effective interaction and continuity in the provision of pulmonary care to the population, rational use of hospital beds, material and technical resources and financial resources.

The key mechanism for improving and increasing the effectiveness of medical care for patients with pulmonological problems is the modernization of healthcare, the main goal of which is to improve the quality and ensure the availability of medical care to the population.

Thus, targeted work on improving the organization of pulmonary care for the population, modernization of the management of the system of medical care for patients with respiratory diseases is the basis for predicting and achieving positive results in improving the quality and effectiveness of specialized highly qualified care for patients with respiratory diseases, aimed at reducing the incidence rate and improving the quality and life expectancy of patients.

The immune system plays a special role in human adaptation to the environment. A person's immunological passport should be considered as a risk factor for a possible infectious disease. New generation vaccines should ensure the maintenance of innate immunity activity, which is especially important among the elderly.

As noted by Shurgaya M.A., disability due to a class of respiratory diseases is more common among elderly citizens. In this regard, it is desirable to provide elderly patients with information on the treatment plan and prevention, which is preferably provided in writing, or provide information online and conduct classes via electronic communication.

Elderly patients with cognitive impairment should be provided with caregiver assistance in the use of medications to control asthma. The course and outcome of asthma are improved by conducting treatment and diagnostic measures in accordance with evidence-based

recommendations. The Global Strategy for the Treatment and Prevention of Bronchial Asthma is a basic document for health workers to justify the main goals of asthma treatment and actions. Taking into account the morphofunctional characteristics of old age allows for the provision of medical and social care and the achievement of quality standards in the treatment of asthma in the geriatric population.

An increase in the number of pulmonologists and district therapists, strict implementation of treatment standards and clinical recommendations, an increase in the provision of institutions with instruments and equipment, an improvement in the technical condition of premises, and an increase in methodological work to control the quality of medical care led to a decrease in mortality from respiratory diseases and an increase in patient satisfaction with the organization of medical care.

## Biological Sciences

# АЛМАТЫ ҚАЛАСЫНДАҒЫ АВТОКӨЛІКТІҢ ТОПЫРАҚҚА, ӨСІМДІККЕ ЖӘНЕ ТОПЫРАҚ ОМЫРТҚАСЫЗДАРЫНА ӘСЕРІ

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**Аннотация.** Бұл мақалада Қазақстанның өзекті мәселелерінің бірі болып табылатын Алматы қаласының экологиясы мәселелері қарастырылады. Алматыда атмосфералық ауаның, топырақтың, өсімдіктердің ластануының негізгі себептері автомобиль көлігімен ластанушы заттардың шығарындылары болып табылады. Атмосфералық ауаның ластануына байланысты көміртегі оксидінің болуы жиналады, ауадағы азот диоксидінің болуы пайдаланылған газдардың көміртегімен әрекеттескенде фотохимиялық тұман - түтіннің пайда болуына ықпал етеді. Сәтбаев пен Брусиловский көшелерінің қиылыстарында өтетін автокөліктердің саны туралы деректер, сондай-ақ осы ауданда өсетін өсімдіктердегі ауыр металдардың мөлшері және топырақтың ластануының индикаторы ретінде топырақ зоофаунасының сандық және сапалық құрамын зерттеу деректері келтіріледі. Алматы қаласының зерттеу нысандарынан алған өсімдік үлгілерінде мырыш, қорғасын, мыс, кадмийдің мөлшерлері анықталды. Бұл анықталған ауыр металдардың ішінде мырыш пен қорғасынның мөлшері өте жоғары. Терек өсімдігі жапырағына да, бұтағына да ауыр металдарды көп мөлшерде жинақтайды. Бұлар санитар болып табылады. Себебі жапырағына және бұтағына ауыр металдарды жинақтай отырып, топырақты, қоршаған ортаны тазартады. Микроартроподтар мен мезофауна да топырақтың ластануының индикаторлары болып табылады. Жол маңынан алынған топырақтарда микроартроподтар мүлдем кездеспейді. Ал жол бойынан алыстаған сайын олардың мөлшері де арта түседі. Шұбалшаңдар машина аз жүретін жерлерде және бақылау ретінде алынған ботаника бағында өте көп мөлшерде кездеседі.

**Түйінді сөздер:** топырақ, автокөлік, топырақ омыртқасыздары, эклектор, ластану, ауыр металдар

## IMPACT OF MOTOR TRANSPORT ON SOIL, VEGETATION AND SOIL INVERTEBRATES IN ALMATY

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**Abstract.** This article discusses the ecology of the city of Almaty, which is one of the pressing problems of Kazakhstan. The main causes of pollution of atmospheric air, soil, plants in Almaty are emissions of pollutants by road. Due to pollution of atmospheric air, the content of carbon monoxide accumulates, the content of nitrogen dioxide in the air contributes to the formation of a photochemical fog - smoke when interacting with exhaust gases. Data are provided on the number of passing cars at the intersection of Satpayev and Brusilovsky streets, as well as data from a survey of the quantitative and qualitative composition of soil zoofauna as an indicator of soil pollution and the content of heavy metals in plants growing in the area. The samples of plants obtained at the research facilities of the city of Almaty determined the content of zinc, lead, copper, cadmium. Of the heavy metals identified, zinc and lead are very high. The poplar plant collects large amounts of heavy metals on both leaves and branches. They are orderlies. Because by collecting heavy metals in leaves and branches, they cleanse the soil and the environment. Indicators of soil contamination are also microarthropods and mesofauna. Microarthropods are practically not found in soils of roadside origin. And the farther from the road, the greater their number. Shubalchans are found in large quantities in low-mobility areas and in the botanical garden, taken under observation.

Keywords: soil, motor transport, soil invertebrates, eclector, pollution, heavy metals

**Өзектілігі.** Ірі қалалардың экологиялық проблемалары халықтың, көліктің және өнеркәсіптік кәсіпорындардың шамадан тыс шоғырлануымен байланысты, бұл табиғи ортаның экологиялық тепе-теңдігінің бұзылуына әкеледі. Алматы - Қазақстанның ең ірі қаласы, бірақ оның экологиялық жай-күйіне кешенді зерттеулер жүргізілмеген.

Урбоэкология-белгілі бір сипаттамалары бар антропогендік түрлендірілген табиғи кешендер болып табылатын қалалардың табиғи ортасын зерттеуге байланысты қарқынды дамып келе жатқан экологиялық зерттеулердің ғылыми-практикалық бағыттарының бірі. Қалалық ортаны зерттеуді жүзеге асыру қиын, өйткені зерттеулер ластанумен байланысты және бірқатар аспектілерді қамтиды: биологиялық, әлеуметтік, технологиялық және т.б. Қала ішінде болып жатқан экологиялық үрдістер жоғары қарқындылық пен динамизммен сипатталады, бұл қалалық табиғи ортаның одан да көп ластануына әкеледі. Үлкен қалаларда антропогендік жүктеменің жоғары болуына байланысты олардың атмосферасының, су көздері мен топырақтарының ауыр металдарымен айтарлықтай ластануы байқалады, бұл биота мен адамның тіршілік ету ортасының теріс өзгеруіне әкеледі [1, 2]. Сайып келгенде, табиғи топырақтың орнына мегаполистерде урбаноземалар деп аталатын ерекше түзілімдер пайда болады [3]. Осы уақытқа дейін Алматы қаласының табиғи ортасының негізгі компоненттерінің: ауаның, жер үсті суларының және әсіресе топырақтың ауыр металдармен ластануына жүйелі зерттеулер жүргізілген жоқ. Ауыр металдардың әсерінен Алматы қаласының топырақтарының физика-химиялық қасиеттерінің өзгеруі зерттелмеген. Қоршаған ортаның экологиялық жай-күйін бағалау әдетте экологиялық нормативтерді, атап айтқанда ластаушы заттардың шекті рұқсат етілген концентрациясын қолдану арқылы жүзеге асырылады. Зертханалық жағдайларда айқындалатын химиялық-талдамалық мониторингтің бұл нормативтері өңірлік сипаттамаларды есепке алмай, елдің бүкіл аумағы үшін бірыңғай көрсеткіштер ретінде қабылданады. Рұқсат етілген шекті концентрациялардың жалпы қабылданған стандарттарынан басқа, топырақтың табиғи микробтық қауымдастықтарының құрылымдық және функционалдық сипаттамалары, олардың ферментативті және биологиялық белсенділігі, микрофауна мен өсімдік нысандарының өкілдері биологиялық мониторингтің неғұрлым экологиялық негізделген көрсеткіштері болуы мүмкін [4].

Қаладағы атмосфералық ауаны ластаудың негізгі проблемасы автомобиль көлігінен ластаушы заттардың шығарындыларының үнемі ұлғаюы болып табылады, бұл жеңіл және жүк көліктерінің санының көбеюімен, қалалық магистральдарда тиімді қозғалысты

қамтамасыз етудегі объективті қиындықтармен, көлік кептелістерімен байланысты. Алматы қаласының қоршаған ортаны қорғау қызметі қабылдаған ауа сынақтары автокөліктердің пайдаланылған газдарының құрамында канцерогенді полициклді көмірсутектерді қоса алғанда, 200-ге жуық химиялық қосылыстардың бар екенін көрсетті [5].

Экологиялық жағдайды ескі жеңіл автокөліктердің қолданыстағы паркінің техникалық жай-күйі қиындатып отыр (құрылғанына 10 жылдан астам), олардың саны тіркелген жеңіл автокөліктердің 80,8%-ын құрайды. Қазіргі уақытта қолданыстағы 115 мыңнан астам техникалық ескірген көліктер бар, олардың үлесіне автокөліктердің жалпы шығарындыларының 70%-ға дейіні келеді. Оның үстіне тіркелген жеңіл көліктердің 99 пайызы жанармай ретінде бензин пайдаланады. Көлік құралдарынан атмосфераға зиянды заттардың шығарындыларының артуына сапасыз жанар-жағармай материалдарын қолдану ықпал етеді [6].

Б.М. Куровтың (2008) [7] деректері бойынша, Алматы қаласындағы жылжымалы көздерден (автокөліктен) ластану 96% - 5 құрайды, бұл ретте жеке автокөліктер саны 5 жыл ішінде 383-тен 524 мың бірлікке дейін ұлғайған. Шығарылатын ластаушы заттардың сапалық құрамын талдаудан ауыр металдардың көлемі, тікелей және ықтимал қауіптілігі бойынша неғұрлым маңызды екендігі анықталды. Соңғы жылдары атмосфераның ластану индексі 12-14 бірлікті құрады [8]. Осылайша, Алматы қаласының ауасын, топырағын автокөлікпен ластау аса қауіпті.

Атмосфералық ауаның жай-күйін бақылау барысында Алматы қаласын күн сайын қалың тұман – түтін басып жатқанын байқадық (1-сурет). Бұл ауаның өте күшті ластануы, ол түтін мен газ қалдықтарының қоспалары бар қалың тұман немесе жоғары концентрациядағы каустикалық газдар мен аэрозольдер перделері. Бұл үлкен қалада адам денсаулығына кері әсер ететін үлкен мәселе. Смог әсіресе денелері әлсіреген, жүрек-қан тамырлары және тыныс алу жүйесі ауруларымен ауыратын балалар мен қарт адамдар үшін қауіпті. Ол тыныс алуды қиындатады немесе тіпті оны тоқтатуы мүмкін, шырышты қабықтың қабынуын тудырады. Жер бетіндегі ауадағы зиянды заттардың ең жоғары концентрациясы күндізгі уақытта байқалады, ауа ағындарының көтерілуінің әсерінен түтін көтеріледі; Ауа массаларының әлсіз табиғи желдету жағдайында атмосфералық ауаның ластануы халықтың денсаулығына тікелей кері әсерін тигізеді. Тыныс алу мүшелерінің алғашқы сырқаттанушылық деңгейі бойынша Алматы Қазақстан облыстары арасында бірінші орында тұр.



Сурет 1- Алматы қаласының үстіндегі түтін

Соңғы жылдары көлік түрлерінің тез дамуына байланысты жүк және жеңіл автокөліктердің, тракторлардың, тепловоздардың және самолеттердің бөліп шығарған ұлы заттарынан атмосфераға түсетін қалдықтардың үлесі біршама арта түсті. Жалпы шығарылған ластағыш заттардың 30-дан 70%-ы қаладағы автокөліктің үлесіне (осы қаладағы өнеркәсіп пен автокөліктің санының өсуіне қарай) тиеді екен. Қалада тек жеңіл автокөлік қана жүріп

қоймайды, сондай-ақ жүк тасушы автокөліктер, тепловоздар, ұшақтар, тракторлар да жүреді. Олардың бірі бензинмен жүретін болса, екінші біреуі дизельді отынмен жүреді. Қазіргі кездегі автокөліктен пайдаланатын жанармайлаының сапасы әртүрлі. Сапасы төмен жанармайдың арзандығына қызығып, пайдаланатын автокөлік иелері қоршаған ортаға қаншама зиян келтіріп жатқанын біле бермейді.

Осы атмосфераға бөлініп шыққан улы заттар өсімдіктер мен топырақ жабынын да ластайды. Фотосинтез есебінен органикалық зат жоғары сатылы өсімдіктер арқылы жүзеге асады, ал органикалық заттардың ыдырауы омыртқасыз жануарлар мен микроорганизмдер арқылы жүзеге асады. Топырақтың түзілуінде омыртқасыз жануарлар ең маңызды рөл атқарады, себебі, олар топырақтағы, оның үстіңгі қабатындағы өсімдік және жануарлар қалдықтарының шіріп-ыдырауы үрдістеріне белсенді түрде қатысады, топырақтың ауа алмасуын арттырады, терең ін қаза отырып, топырақтың кеуектілігін арттырады, өсімдік тамырларына ауа, су өтуін жеңілдетеді, жануарлардың экскременттері (бөлінеді) азотқа, биогенді кальцийге өте бай болғандықтан топырақтың қышқылдығын азайтады да, оның құрылымдылығын жақсартады. Сөйтіп жануарлардың әрекеті топырақтың құнарлығын арттырады [9].

Топырақ пен оны мекендейтін жануарлар арасындағы заңды байланыс топырақ жануарларының кешенін топырақ жағдайының және оларды өзгерістерінің, адамның іс-әрекеті нәтижесінде топырақ түзілуі үрдісінің көрсеткіші ретінде кең түрде пайдалануға мүмкіндік береді. Қазіргі кезде табиғатқа әсер ету күшеюде. Мұның жағымды жақтарымен қатар жағымсыз жақтары да бар. Табиғи ландшафтар бүлінеді, санитарлық-гигиеналық жағдай нашарлайды, топырақ уланады, жануарлар мен өсімдіктердің пайдалы түрлерінің саны азаяды. Сөйтіп адамның іс-әрекеті нәтижесінде бүлінген, ластанған жерлер жарамсыз болып қалады, топырақ жануарларды топырақ режимнің өзгеруінің ең негізгі биоиндикаторлары болып табылады. Олардың сол топырақтағы мөлшеріне, әр түрлілігіне, топырақ түзудегі маңызына және олардың әр түрлі факторларға сезімталдығына қарап, топырақтың жағдайын білуге болады. Автокөлік ауаға тәулігіне 500 тоннаға жуық улы заттарды бөледі екен. Тіптен автомобильдің резінке үгінділерінің өзі ластағыш заттарға жатады. Автокөліктің бөліп шығарған түтінінде қорғасын болады [10].

Біздің әсем қала – Алматымыз Іле Алатауының баурайында орналасқан. Алматы қаласында 1132,8 мың адам тұрады. Жер көлемі 287,6 шаршы километрді құрайды. Қалада 7,5 мыңнан аса өндірістік мекемелер, оның ішінде 164 ірі кәсіпорын жұмыс істейді. Шаруашылық түрінен қала мекемелерінің 90 проценті жекеменшік, қалғанын мемлекеттік емес мекемелер құрайды. Бүгінгі күні қалада жалпы республика көлемінің өндірістік өнімдерінің 5 пайызы өндіріледі. Алматыда әрбір 1000 тұрғыннан 21 мекеме, республика бойынша 5,5- тен келеді. Қалада құрылыс жылдам дамып келеді [11].

Қаланың экологиялық жағдайын жақсартудың арнайы бағдарламасы 2000 жылдың наурыз айынан бастап жұмыс істейді, атмосфералық ауаның ластануын тексеретін үш бекет бар. Бұл күндері Алматыда 210 мыңнан астам автокөлік бар. Қалаға келіп кететіндерді қоссақ 250 мыңнан асады. Оған үлкенді-кішілі жылу құбырлары мен өндіріс орындарының мұражайларынан будақтаған қою түтіні мен улы газдарын қосыңыз. Алматыда соңғы жылдары жанар май құю станциялары да көбейіп кетті. Мәселен, бір ғана Алматы мен Каскеленнің арасында 40 шақты жағар-жанар станциялары бар. Егер бір автокөлік күніне 7-10 текше метрге дейін улы газ шығарады десек, жоғарыда айтқан бензин және дизель отынымен жүретін 250 мыңдай автокөлік қала арқылы өтетін 70 мыңдай көліктің ауаға қанша тонна улы қоспалар шығарып жатқаны белгілі болады [12].

Алматы қаласының ластану деңгейі өзінің шырқау шегіне (ИЗА-13,1) жеткен. Көбінесе Алматы ауасын ластайтындар: көмірқышқыл газы, күкірттің қосоксиді, көмірсутектер, көмір оксиді, азоттың оксиді мен түтін шаңдар. Ал тұрақты жылу көздерінің қатарына жататын АПК,

ТЭЦ,-1 жүйесі 8253 тонна зиянды қалдықтар ауада химиялық реакцияға түсіп, бұрынғыдан да қауіпті жаңа қосылыстар түзеді. Әсіресе жаздың аптап ыстық күндері қаланың үстін автокөліктер шығарған шығарылымдардың нәтижесінде қара түтін басады (сурет 1). Егер ауа азоттың және күкірттің тотықтарымен ластанса, егер ол ауада 0,2-0,5 м-ға болса, адамның тыныс алу жүйелеріне, көздің қабықшасына әсер етеді, өкпе ауруларын тудырады. Сонымен қатар өсімдіктердің жапырақтарында жүретін фотосинтезді тежейді және хлороз кеселімен зақымдануына әкеліп соқтырады. Ал көмір тегі тотығы қанның құрамын бұзады, нерв жүйелеріне зиянды әсерін тигізеді. Қан арқылы оттегінің ұлпаларға баруына бөгет жасайды [13].

Сұлу Алатаудың бауырында жатқан көркем қала шұқырға орналасқандықтан ауа алмасуы қиын. Оңтүстік Астананың ауасының нашарлай түсуіне ең басты техникалық ақаулар бар автокөліктер кінәлі. Ал мамандар автокөліктердің моторларында жанар май толық жаңа алмайтындықтан көмір сутегілерінің басым бөлігі қара күйге айналатынын, әсіресе техникалық ақаулы автокөліктерде қара түтін көп бөлініп, ондай түтіндерге өте улы бензапирин деген көмірсутегі болатындығын, егер ауа осы затпен ластанса адамдардың өкпедегі қатерлі ісікпен аурулары жиілейтінін айтады [14].

Алматы секілді ірі қалаларда метро, троллейбус, трамвай тәрізді көліктерді пайдаланған аса тиімді болар еді. Алайда он жылдам астам қаңтарылып тұрған метро құрлысын айтпағанда, қаланың тегіс жерге орналасуы да, троллейбус, трамвайды қаланың барлық аумағына бірдей жүргізіп қоюға мүмкіндік бермей отыр.

**Жұмысымыздың мақсаты:** Автокөліктің өсімдік, топырақ жамылғысы мен топырақ микрозоофаунасына әсерін анықтау.

Зерттеу жұмысы Ө.О.Оспанов атындағы Қазақ топырақтану және агрохимия ғылыми-зерттеу институтының Топырақ экологиясы бөлімінің қызметкерлерімен бірге орындалды.

**Зерттеу нысаны және әдістері.** Топырақ қабатына улы заттардың, әсіресе топырақтың жоғарғы қабатына түсу көздері көздері зерттелді. Ластану түрі: табиғи және техногендік. Ауыр металдардың құрамын дисперсиялық талдау металдардың жылжымалы және байланысқан формалары арасындағы байланысты анықтауға мүмкіндік берді.

Зерттеу үшін төменде көрсетілген жерлерден өсімдік және топырақ үлгілері және топырақ микроартроподтарын зерттеуге үлгілер алынады:

1. Түркебаев, Сәтбаев және Руднеева көшелерінің қилысының аралығынан топырақ, өсімдік үлгілері алынды

2.Бақылау нұсқасы ретінде топырақ, өсімдік үлгілері Алматы қалалық ботаника бағынан алынды. Топырақ жануарларын зерттеуге және өсімдіктерді зерттеуге үлгілер мына нұсқалар бойынша алынды.

1. Бақылау ботаника бағы
2. Жол бойы
3. Жолдан 10 м
4. Жолдан 50 м

Зерттеу жұмысы Алматы қаласы, Бостандық ауданына қарасты үш көшенің қиылысында аулада жүргізілді. Бақылау ретінде ботаника сая бағының алыну себебі ағаштардың көп шоғырланған жерінің бірі.(шырша, қарағай, тұя, емен, қайың жөке бұталардан сирен аршаның түрлері және раушангүлдер т.б.) және көліктер жүрмейді. Сондықтан экологиясы біршама таза деп есептеледі. Өсімдіктер арқылы барлық табиғи ортаға биодикация жүргізуге болады, сапалық баға береді. Сезімтал фитоиндикаторлар ауа, топырақ құрамындағы ластағыш заттардың әсерінен морфологиялық өзгеріске ерте ұшырайды: жапырақтың түсі өзгереді, дақ пайда болады сарғаяды жемістерінің пішіні де өзгеріске ұшырайды, бұтақтарының өсу бағыты өзгереді, өркендері азаяды. Немесе мұндай өзгерістерді деформацияға ұшырауы дейді.

Өсімдік мүшелерінің құрамындағы ауыр металдарды анықтау үшін қарапайым зертханалық әдісті пайдаландық және ауыр металдар **атомдық-адсорбциялық әдіс** бойынша Топырақтану Институтының зертханасында анықталады. Қарапайым зертханалық әдіс бойынша өсімдік материалын тигльге салып муфель пешінде күйдіреді. Күл тұздарының су ерітіндісінде калий хроматын немесе күкірттісутекті қосады. Күл массасындағы пайда болатын шөгіндінің мөлшерінің пайыздық қатынасын есептейді. Алынған нәтиже негізінде ластанудың түрлі жағдайындағы өсімдік мүшелеріндегі қорғасынның мөлшері туралы қорытынды жасалады. Жол жиегінде өсетін өсімдіктегі қорғасынның мөлшерімен қатар кадмийді де анықтадық. Кадмийді анықтау үшін күлдің су ерітіндісіне концентрленген NaOH қостық, бұл жағдайда ақ шөгінді пайда болады. Тәжірбиелік және қорытынды үлгілерді салыстыра отырып, өсімдіктегі кадмий мөлшерін анықтадық.

Ұсақ микроартроподтарды электр арқылы бөліп алдық. Электр фанерден жасалады. Оның үстіңгі бетінде диаметрі 120 мм 12 саңылау жасалынған. Саңылауға диаметрі 170мм пластмасса воронкалар салынады. Воронкаларға ұяшықтары 1,5x1,5 мм тесіктері бар елегіш орналастырылады. Осы елегішке алынған топырақ қабаттары бойынша абайлап топырақ саламыз. Воронканың ұшына Әл Фараби атындағы Қазақтың Ұлттық Университетінің омыртқасыздар зоологиясы кафедрасының профессоры Күләш Әділбаевна Дауытбаеваның әдісі бойынша таза спирт құйылған (5мм) ыдысқа жинадық. Микроартроподтарды тезірек жинау үшін әрбір воронканың үстінен 5-10 см қашықтықта электр лампочкасы орнатылады. Топырақ үлгісінің үстіндегі температура 35°C-тан аспауға тиіс, топырақ үстіңгі жағынан лампочка арқылы кептіріледі де, буынаяқтылардың жиналуы 2-3 тәулік ішінде аяқталады. Мезофаунаны есепке алу үшін 0,25 шаршы метр аудандағы топырақ үлгісін қолмен бөлшекте әдісін пайдаландық. Мезофауна өкілдерінің дернәсілдерін 70° С спирте жинадық. Ал, ересек бунақденелілерді қағаз қорапшалаға жинақтадық, әрқайсына жеке этикетка жазылды (2,3 сурет).



Эклектор арқылы микроартроподтарды бөліп алу



Эклектор арқылы бөліп алынған препараттар анықтауға дайын

2-сурет



3-сурет - Кездескен ірі мезофауналарды қолмен жинап, қорапқа салынды, этикетка жазылды

**Зерттеу жұмысының нәтижелері және оларды талқылау.** Ботаника бағындағы ағаштардың жапырақтары қою жасыл түсті, мүшелері деформацияға аз ұшыраған, раушангүлдерінің гүл шоғырлары ірі ашық түсті, ұзақ тұрады. Шыршаның бөрік басында бұтақтары жайыла өскен. Сая бақтың ішіндегі өсімдіктердің тіршілік формалары әр түрлі.

Ал, біздің зерттеуге алып отырған ауладағы ағаштардың мүшелері мүлдем басқаша, жапырақтарында дақтар көп, жасыл бояуы ашық емес, қара ыс қаптаған, сарғайып ерте түсуі білінеді (жаз мезгілдерінде). Ағаштардың бұтақтары қисайған, төмен жақтарында жапырақтары өте сирек. Жолдың бойында шөптер мүлдем жоқ.

Зерттеп бақылауға алынған аула, Сәтпаев көшесінің шығысында, Түркебаев көшесі, батысында Руднеев көшесінің қиылысында орналасқан, автокөліктердің ең көп жүретін жолдарының бірі. Пайдаланатын бензиннің құрамының сапасыз болуы, қара түтін шығаруы, өсімдіктер жабылғысына кері әсерін тигізеді. Ағаштардың мүшелерінің деформацияға ұшырауының басты себебі де сол.

Зерттеу жұмысы кезінде ең алдымен зерттелетін алаңшаңның өсімдігін анықтадық. Ол үшін осы нысандардан жинап әкелінген гербарийлерге қарап, зерттеу алаңшаларында өсетін өсімдіктерді анықтадық. Біз астық тұқымдастарының -15, бұршақтұқымдастарының - 6, раушангүлдердің -10, күрделігүлділердің -7 түрін, жалпы өсімдіктердің 49 түрі анықтадық. Ботаника бағының ғалымдары мен Топырақтану Институтының қызметкерлерінің ұсынысы бойынша жол жиегінде ағаш өсімдіктерінен: қайың, үйеңкі ағаштары ұсынылады. Ағаш өсімдіктерінің кейбір элементтерді жапырағында, бұтағында және тамырында жинақтау қабілеті бар. Өсімдік өскен кезде өз бойына топырақтан түрлі химиялық элементтерді жинайды, әсіресе ауыр металдар ( Cu, Zn , Pb, Cd) өсімдіктің әр бөліктеріне әр түрлі мөлшерде жинақталады.

Зерттеу алаңшаларында өсетін өсімдіктердің (қайың, үйеңкі) жапырақтарын, бұтақтарын алып, олардағы ауыр металдарды анықтадық. Оның нәтижелері мына 2- кестеде берілген.

Зерттеу нысандарының өсімдіктерінің құрамын салыстыратын болсақ, мына жағдайларды көруге болады.

Брусиловский көшесінің бойында өсетін үйеңкінің жапырағында мырыштың мөлшері бақылау алаңымен салыстырғанда жоғары болады және жолға жақын жерде өсетін үйеңкінің бұтағында мырыштың мөлшері бақылау алаңына қарағанда өте жоғары.

Жолға жақын өсетін қайыңның жапырағында, сабағында, мырыштың мөлшері жоғары, сондай-ақ 10 м қашықтықтағы алаңшада өсетін қайыңның жапырағында мыс, қорғасын, және кадмийдің мөлшері бақылаумен салыстырғанда жоғары. Міне, осы алынған нәтижелер өсімдіктің әр бөлігі ауыр металдарды әр түрлі мөлшерде жинақтайтыны көрсетеді. Ауыр металдардың жол бойында өсетін өсімдік мүшелерінде көп мөлшерде жинақталу себебі, автокөлік бөліп шығарған заттарында қорғасын буы, резина, үгінділері ауаға бөлініп шығып, өсімдік және топырақ бетіне шөгеді. өсімдік тамырына жинақталған ауыр металдар, тамыр шірігенде ешқайда жуылмай сол өсіп тұрған жеріне жинақталады. автокөліктің көбеюі және оның ауаға бөліп шығарған улы заттары, сондай-ақ топырақта мекендейтін жануарлардың мекенін бұзуға, экологиялық жағдайын күрт өзгеріске ұшырауына әкеледі. Соның нәтежесінде қоршаған орта су, ауа, ластанып, адамның денсаулығы бұзылады, зерттелген алаңшарда сауытты кенелер мен аяққұйрықтылар көп кездеседі. Сауытты кенелердің 6 туысы және аяққұрықтылардың 6 туысы табылды. Мезофаунадан жауын құрты, құмысқалар, ұзын мұрынды қоңыздар, көбелектердің жұлдызқұрттары табылды.

2-кесте Зерттеу алаңындағы ағаш өсімдіктердегі металдардың мөлшері (мг/кг)

Алаңша	Өсімдік мүшелері	Zn	Cu	Pb	Cd
Бақылау ботаника бағы	Үйеңкі				
	Жапырақ	29.0	6.25	10.5	0.25
	Бұтақ	45.0	7.75	22.0	0.25
Жол бойы	Үйеңкі				
	Жапырақ	83.75	12.5	25.0	2.0
	Бұтақ	97.5	5.0	8.75	2.0
10 м	Үйеңкі				
	Жапырақ	35.63	26.25	18.75	2.50
	Бұтақ	3.75	21.25	17.75	0.63
50м	Үйеңкі				
	Жапырақ	37.50	7.50	13.0	0.50
	Бұтақ	22.5	3.75	9.50	0.25
Бақылау ботаника бағы	Терек				
	Жапырақ	26.0	6.25	10.5	0.50
	Бұтақ	22.0	7.25	12.0	0.25
Жол бойы	Терек				
	Жапырақ	53.75	21.25	46.3	2.0
	Бұтақ	46.3	39.0	25.5	1.5
10м	Терек				
	Жапырақ	46.3	45.0	10.1	0.75
	Бұтақ	66.25	39.0	13.0	0.87
50м	Терек				
	Жапырақ	29.0	13.0	6.25	0.50
	Бұтақ	21.25	9.50	7.25	0.77

Ағаш өсімдіктерінің кейбір элементтерді жапырағында, бұтағында және тамырында жинақтау қабілеті бар. Өсімдік өскен кезде өз бойына топырақтан түрлі химиялық элементтерді жинақтайды, әсіресе ауыр металдар (Cu, Zn, Pb, Cd) өсімдіктің әр бөліктеріне әр түрлі мөлшерде жинақталады.

Зерттеу алаңшаларының өсімдіктерінің құрамын салыстырғанда мынандай жағдайларды көруге болады. Жол бойында өсетін үйеңкінің жапырағында мырыштың мөлшері жоғары болады. Қайыңның жапырағында, сабағында мыс, қорғасын, кадмийдің мөлшері бақылаумен салыстырғанда жоғары. Өсімдік мүшелерінде бұлай көп мөлшерде жинақталу себебі автокөлік бөліп шығаратын түтіндерінде қорғасын буы, резина үгінділері ауаға бөлініп шығып, өсімдік және топырақ бетіне шөгеді. Өсімдік тамырында жинақталған ауыр металдар тамыр шірігенде ешқайда жуылмай сол жерге жинақталады. Ауадағы шаңды, түтінің құрамындағы қорғасынды, топырақтанда ауыр металдарды әр түрлі бөліктеріне жинақтау қабілетіне байланысты қалалардың санитарлық-гигиеналық жағдайын жақсарту мақсатында, көше бойына ағаштарды көп отырғызу керек.

Автокөліктің қалада көбеюі оның ауаға бөліп шығарған улы заттары, топырақ өсімдік жамылғысын ғана бүлдіріп қоймайды ондағы мекендейтін жәндіктердің мекенін бұзуға, экологиялық жағдайдың күрт өзгеріске ұшыруына әкеледі. Соның нәтижесінде қоршаған орта су, ауа ластанып, оның зардабы адамның денсаулығына зиянды әсерін тигізеді.

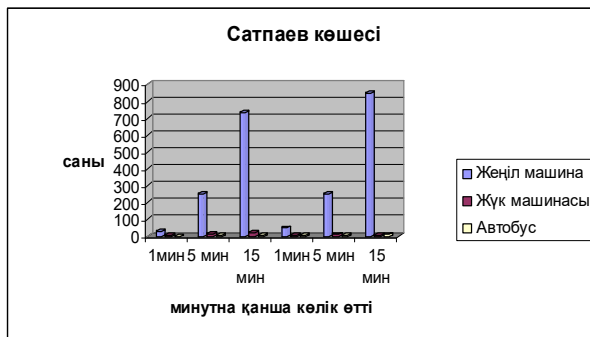
Аяққұйрықтылар (*Orbatidea*) ұсақ қанатсыз жәндіктер. әртүрлі жағдайларда кездеседі, алайда ылғал ортаны ұнатады, топырақтың беткі қабаттарында және өсімдік ішінде өте топырақтың беткі қабаттарында және өсімдік ішінде өте көп кездеседі. Аяққұйрықтылардың саны 1 шаршы метрде 10-50 миллионға дейін жетеді. Олар төменгі температураға төзімді келеді және тоңазыған топырақ қабаттарында да тіршілік етеді. Микроартроподтардың ішінде аяққұйрықтылар басым болып келеді. Олар бақылау алаңшасының да, барлық тәжірбие алаңшасының топырақтарында кездеседі [14].

3-кесте-Зерттеу алаңшарындағы микроартроподтардың сандық және сапалық құрамы

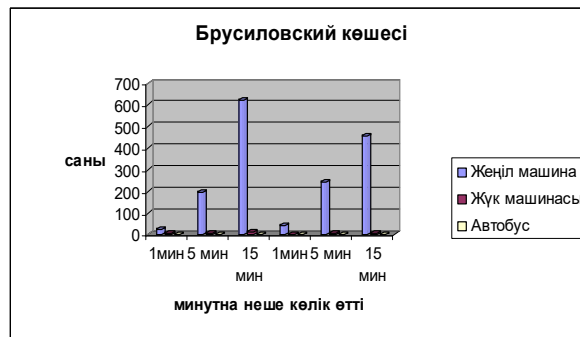
Құрамы	Қабат см	Жолдың маңы	Жолдан 10м	Жолдан 50м	Бақылау
<i>Collembola</i> Сауытты кенелер	0-5	- -	- ++	+ ++	++ +++
<i>Orbatidea</i> аяққұйрықтылар	5-10	- +	- ++	- ++	++ +++
Қоңыз дернәсілі	0-5	- -	- -	++ -	++ -
<i>Diptera</i>	5-10	-	-	-	++
Аяққұйрықтылар дернәсілі	5-10	- +	- ++	+ ++	++ +++

Аяққұйрықтылар ұсақ қанатсыз жәндіктер. Олар әртүрлі жағдайда кездеседі, алайда ылғал ортаны ұнатады. Топырақтың беткі қабаттарында және өсімдік ішінде көптеп кездеседі. Аяққұйрықтылардың саны 1 шаршы метрге 10-50 миллионға дейін жетеді. Олар төменгі температураға төзімді келеді және тоңазыған топырақ қабаттарында тіршілігін жоймайды, олар бақылау алаңшасында да, барлық тәжірбие алаңшасының топырақтарында кездеседі.

Бақылау жасаған Сатпаев және Бурсиловский көшелерінде отырып, өткен машиналарды, соның ішінде жүк, жеңіл машиналар және автобустарды санадық та, осы көліктердің қаншалықты қала ауасын ластауға қосатын үлесіне бақылау жасадық (2-3 суреттер). Көліктердің ішінде ең көп өткені жеңіл көліктер, одан кейінгі жүк көліктері болды. Осы бақылау жасау аралығында ең аз өткен автобустар болды.



2-сурет



3-сурет

**Қорытынды.** Ауаны тазартудың келешектегі проблемасын шешудің жолы - өндірістің технологиялық үрдістерін жетілдіру немесе түбегейлі жаңарту, ауаға шығатын зиянды заттардың көлемін азайту және қалдықтардың құрамындағы химиялық заттарды бөліп алып, оларды пайдаға асыру. Қазіргі кезде табиғи шикі заттардың 2-4 пайызы ғана қолданылады, ал қалған 96-98 пайызы әр түрлі қалдықтарға айналады. Бұл қалдықтар қоршаған ортаны ластайды. Сондықтан осы қалдықтарды өңдеп, пайдаға асырудың маңыздылығы айтарлықтай. Ол үшін өндіріске аз қалдықты немесе қалдықсыз технология енгізу керек.

Алматы қаласының зерттеу нысандарынан алған өсімдік үлгілерінде мырыш, қорғасын, мыс, кадмийдің мөлшерлері анықталды. Бұл анықталған ауыр металдардың ішінде мырыш пен қорғасынның мөлшері өте жоғары. Қорғасынның мөлшерінің жоғары болу себебі, қалада көліктің мөлшері өте көп. Ғалымдардың зерттеуі бойынша автокөліктің резіңкесінің ұнтақтарының өзіндегі қорғасынның мөлшері жоғары екен. Қаланы жан-жақтан тау қоршап тұр және де қала шұңқырда орналасқан. Жел соғып тазартпайды да барлық ластаушы заттар топыраққа, өсімдікке және су бетіне шөгіп ластайды.

Терек өсімдігі жапырағына да, бұтағына да ауыр металдарды көп мөлшерде жинақтайды. Көптеген ғалымдардың алған мәліметтері де біздің алған нәтижелерімізді растайды. Қалада терек өте көп отырғызылған. Бұлар санитар болып табылады. Себебі жапырағына және бұтағына ауыр металдарды жинақтай отырып, топырақты, қоршаған ортаны тазартады.

Микроартроподтар мен мезофауна да топырақтың ластануының индикаторлары болып табылады. Жол маңынан алынған топырақтарда микроартроподтар мүлдем кездеспейді. Ал жол бойынан алыстаған сайын олардың мөлшері де арта түседі. Шұбалшаңдар машина аз жүретін жерлерде және бақылау ретінде алынған ботаника бағында өте көп мөлшерде кездеседі. Жол бойынан алынған топырақ үлгілерінде шұбалшаң аз, тіптен кейде мүлдем кездеспейді де.

Қаладағы көлік санының көп болуы Алматы қаласының топырағын, өсімдіктерін ластай отырып, қоршаған ортаның жағдайына кері әсер етеді.

Біз Алматы қаласының экологиялық жағдайын жақсарту мақсатында мына төмендегідей ұсыныстар ұсынамыз.

- 1) Ауаны көп ластай қоймайтын газды қолдану. Бұл да қала экологиясын тазартуға өз көмегін берер еді;
- 2) Салтанатты шаралар уақытында ағаш отырғызу;

- 3) Қаланы көгалдандыру мақсатында терек өсімдігін көбірек отырғызу;
- 4) Жаңа жыл және басқа салтанатты мерекелерді тойлаған кезде қытайдың оташуларын пайдалануға тыйым салуды ұсынамыз.
- 5) Өндіріс орындарының мұржаларынан ауаға зиянды әсерін көп мөлшерде тигізетін түтіндер шығып жатады. Осындай меккемелерге шаң ұстағыштарды орнату;
- 6) Айына 1 күнді жаяу жүру күні деп белгілеу (бұл күні қала тұрғындары велосипедпен және жаяу жүреді);
- 7) Қаладағы метро құрылысын тезірек аяқтауды қолға алу;
- 8) Ауыр жүк машиналарын қаланың ішімен аз жүруін қадағалау;
- 9) Бір маршрутпен бірнеше автобустардың шоғарланбауын қадағалау;
- 10) Қаладағы жеке арзан және сапасыз жанармай станцияларын жауып орнына газ құю станцияларын орнату керек.

Экологиялық мәселе – ғаламдық мәселе. Сондықтан да қаланың, ауланың экологиялық жағдайын жақсарту - сауаттылық пен мәдениетті көтеру. Сондықтан да табиғатты ластамауға, экологиялық жағдайымызды жақсартуға тырысайық!

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***Ғылыми кеңесші: ауыл шаруашылығы ғылымдарының докторы, Бейсеева Гульжан Бейсеевна***

UOT 57.

# THE IMPACT OF GENE THERAPY ON TREATING GENETIC DISORDERS

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**Summary.** Gene therapy represents a groundbreaking approach to the treatment of genetic disorders by directly addressing the root causes embedded in an individual's DNA. This article explores the scientific principles, methodologies, and advancements in gene therapy, highlighting its transformative impact on diseases such as cystic fibrosis, sickle cell anemia, and Duchenne muscular dystrophy. By employing techniques such as gene editing, viral vector delivery, and CRISPR-Cas9 technology, gene therapy has shown remarkable potential in correcting genetic mutations and restoring normal cellular function. Despite its promise, the field faces challenges, including ethical considerations, delivery system limitations, and potential off-target effects. This study examines the current landscape of gene therapy, analyzing its clinical applications, ongoing trials, and future prospects in combating genetic disorders.

**Keywords:** Genetic disorders, DNA modification, Clinical applications, Ethical considerations, Genetic mutations, Medical advancements, Personalized medicine

## Introduction

Gene therapy represents a revolutionary advancement in medical science, aiming to treat or prevent genetic disorders by altering an individual's genetic material. This innovative approach offers hope for conditions previously deemed untreatable, such as cystic fibrosis, sickle cell anemia, and Huntington's disease. Gene therapy operates on the principle of correcting, replacing, or silencing defective genes that lead to disease manifestations. Despite its transformative potential, gene therapy presents unique challenges, including ethical concerns, technical limitations, and high costs.

Gene therapy can be categorized into two main types: somatic and germline therapies.

- › **Somatic Gene Therapy** targets non-reproductive cells, meaning the genetic modifications affect only the treated individual and are not passed on to offspring. Techniques include introducing functional genes into cells using viral vectors, such as adenoviruses and lentiviruses, or non-viral methods like liposomes or electroporation (Ginn et al., 2018).
- › **Germline Gene Therapy** targets reproductive cells, allowing changes to be inherited by future generations. While this method holds the potential to eliminate genetic disorders from family lines, it raises significant ethical and societal concerns (Baltimore et al., 2015).
- › **CRISPR-Cas9 Technology** has revolutionized gene editing by enabling precise alterations to the DNA sequence. This tool's simplicity, cost-effectiveness, and accuracy have accelerated research into therapeutic applications (Doudna & Charpentier, 2014).

Cystic fibrosis is a genetic disorder caused by mutations in the CFTR gene, leading to defective ion transport and respiratory issues. Gene therapy trials have shown promise by delivering functional CFTR genes to lung epithelial cells (Griesenbach et al., 2015). Sickle cell anemia results from a mutation in the HBB gene, causing abnormal hemoglobin production. Gene-editing tools like CRISPR-Cas9 have been used to reactivate fetal hemoglobin production, alleviating disease symptoms (Esrick et al., 2021). DMD is caused by mutations in the dystrophin gene, leading to muscle degeneration. Gene therapy approaches, such as exon skipping and microdystrophin delivery, have shown significant improvements in preclinical and early clinical trials (Mendell et

al., 2020). Huntington's disease, a neurodegenerative disorder caused by expanded CAG repeats in the HTT gene, has been targeted with gene-silencing techniques. RNA interference (RNAi) and antisense oligonucleotides (ASOs) have demonstrated potential in reducing mutant HTT protein levels.

Several gene therapies have received FDA approval, marking milestones in the field. For example:

- › Luxturna treats Leber congenital amaurosis, a rare inherited retinal disease, by delivering a functional RPE65 gene.
- › Zolgensma, a gene therapy for spinal muscular atrophy (SMA), replaces the faulty SMN1 gene, significantly improving motor function in infants (Mendell et al., 2017).
- › Broadening Horizons

Gene therapy's scope has expanded beyond monogenic disorders to complex diseases like cancer and infectious diseases, using strategies such as CAR-T cell therapy and gene-based vaccines.

**Fig.1.** Visual Representation of Gene Therapy



**Resource:** Piccolo, P., et al. (2021). Gene therapy: Costs, ethical issues, and future perspectives. *Frontiers in Medicine*, 8, 661217

Efficient and safe delivery of therapeutic genes to target cells remains a significant hurdle. Viral vectors, though effective, can trigger immune responses or integrate into unintended genomic sites, causing potential mutagenesis. Gene-editing tools like CRISPR-Cas9 carry the risk of unintended edits, which could lead to unpredictable consequences (Fu et al., 2013). Gene therapy treatments are exorbitantly expensive, often costing millions of dollars per patient, limiting accessibility for many (Piccolo et al., 2021). Developing cost-effective manufacturing processes is crucial for wider adoption. The possibility of inheritable genetic changes raises moral questions about altering human evolution. Ensuring equitable access to gene therapy across socio-economic strata and regions is a pressing concern.

The future of gene therapy lies in addressing its current limitations and expanding its applications. Advances in delivery systems, such as nanoparticle-based methods and improved viral vectors, hold promise for safer and more efficient therapies. Moreover, ongoing research aims to refine gene-editing tools to minimize off-target effects and enhance specificity.

Collaboration among governments, private entities, and academic institutions will be vital to making gene therapy accessible and affordable. Ethical frameworks and international guidelines

must evolve alongside technological advancements to ensure responsible and equitable implementation.

### Conclusion

Gene therapy represents a paradigm shift in treating genetic disorders, offering unprecedented opportunities to correct underlying causes of disease. Its success in treating conditions like SMA and Leber congenital amaurosis highlights its transformative potential. However, addressing technical, financial, and ethical challenges is crucial for its widespread adoption. As research progresses, gene therapy holds the promise of a future where genetic disorders are no longer a burden, paving the way for personalized medicine and improved quality of life.

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### ВЛИЯНИЕ ГЕННОЙ ТЕРАПИИ НА ЛЕЧЕНИЕ ГЕНЕТИЧЕСКИХ ЗАБОЛЕВАНИЙ

**Аннотация.** Генная терапия представляет собой новаторский подход к лечению генетических заболеваний, основанный на непосредственном воздействии на первопричины, заложенные в ДНК человека. В этой статье рассматриваются научные принципы, методологии и достижения генной терапии, а также подчеркивается ее преобразующее влияние на такие заболевания, как муковисцидоз, серповидноклеточная анемия и мышечная дистрофия Дюшенна. Генная терапия, использующая такие методы, как редактирование генов, доставка вирусных векторов и технология CRISPR-Cas9, продемонстрировала значительный потенциал в исправлении генетических мутаций и восстановлении нормальной функции клеток. Несмотря на свою многообещающую перспективность, эта область сталкивается с трудностями, включая этические соображения, ограничения систем доставки и потенциальные побочные эффекты. В этом исследовании рассматривается современное состояние генной терапии, анализируются ее клиническое применение, текущие испытания и будущие перспективы борьбы с генетическими заболеваниями.

**Ключевые слова:** Генетические нарушения, Модификация ДНК, Клиническое применение, Этические соображения, Генетические мутации, Медицинские достижения, Персонализированная медицина

## Chemical Sciences

# Synthesis and Study of a novel supramolecular 'host-guest' complex based on cucurbit[6]uril and 1,4-bis(2-hydroxyethyl)piperazine dihydrochloride

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A novel supramolecular complex  $C_{44}H_{71}Cl_2N_{26}O_{22}$  (**CB[6]@Pipa·2HCl**) of the "host-guest" type has been synthesized. It is based on cucurbit[6]uril (**CB[6]**) with dihydrochloride 1,4-bis(2-hydroxyethyl)piperazine (**Pipa·2HCl**) localized within the portals of the macrocycle. Based on  $^1H$  NMR and X-ray crystallography, the host-guest ratio in the complex under the specified conditions was determined to be 1:1. Further evidence of complex formation was observed through IR spectroscopy, where a splitting and shift in the absorption band of carbonyl vibrational frequencies of cucurbit[6]uril by  $36\text{ cm}^{-1}$  and  $12\text{ cm}^{-1}$  towards the side of smaller wave numbers was detected in **CB[6]@Pipa·2HCl** compared to the original **CB[6]**. TGA/DSC analysis results indicated an increase in thermal stability by  $55^\circ\text{C}$  for the obtained **CB[6]@Pipa·2HCl** complex compared to the initial 1,4-bis(2-hydroxyethyl)piperazine dihydrochloride. The structure of the synthesized **CB[6]@Pipa·2HCl** complex was confirmed using single-crystal XRD

## Historical Sciences

# THE AGREEMENT OF THE CENTURY – AN INTERNATIONAL PROJECT THAT TURNS AZERBAIJAN INTO AN INTEGRAL PART OF THE GLOBAL WORLD ECONOMY

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### Abstract

The "Contract of the Century," signed on September 20, 1994, between the Republic of Azerbaijan and international oil companies, is one of the most significant steps taken in the early years of Azerbaijan's independence in terms of its economy. This agreement marked a crucial stage in the development of Azerbaijan's economy, as it enabled the country to bring its energy resources to the global market and played a key role in its economic growth. The contract is referred to as the "Contract of the Century" because of its substantial significance and the opportunities it created for Azerbaijan. With the signing of this document, Azerbaijan began to introduce its rich oil and gas reserves to the global market and attract international investors to the country. Azerbaijan's oil and gas reserves, particularly the large Azeri-Chirag-Gunashli (ACG) and Shah Deniz fields in the Caspian Sea, held the potential to occupy a significant place in the world oil market. However, developing these resources required advanced technology and substantial financial investments.

The agreement signed in 1994 was a critical step for Azerbaijan to collaborate with international oil companies and attract foreign investments for this purpose. The contract was related to the development of one of Azerbaijan's largest oil and gas projects, the Azeri-Chirag-Gunashli fields, and aimed to organize an international oil consortium for the project. Prominent global oil companies, including BP (British Petroleum), Amoco, Unocal, ExxonMobil, and Lukoil, participated in this consortium. With the signing of this contract, Azerbaijan began to introduce its rich energy resources to the global market, showcasing the energy reserves of the Caspian Sea to a broader international audience. The agreement also became a vital mechanism for accelerating Azerbaijan's economic development and attracting foreign capital.

The "Contract of the Century" was of great importance not only for the oil and gas sector but also for the development of the country's infrastructure, strengthening social services, applying technological innovations, and improving the skills of the local workforce. Moreover, the "Contract of the Century" was a fundamental step in strengthening Azerbaijan's position in the global energy market and increasing its significance in world politics. In addition to its oil and gas reserves, Azerbaijan began to play an important role in the global transit of energy carriers, thus becoming a new actor in the regional and international power balance.

The "Contract of the Century" was a document with both economic and geopolitical importance and gave a significant boost to the development of Azerbaijan's energy sector. The contract not only ensured Azerbaijan's energy independence but also provided the country with the opportunity to take a more active role in the world economy. This document remains a decisive stage in determining Azerbaijan's future energy development and foreign policy.

Key words: Azerbaijan, oil, contract of the century, independence, Caspian Sea

### Introduction

The path leading to the "Contract of the Century" passed through various difficulties and obstacles, and its realization was the result of the iron will and firm state-building determination of the national leader of the Azerbaijani people, the prominent political and statesman, President Heydar Aliyev, as well as his decisive and consistent policies. After regaining independence in the early 1990s, one of the main issues facing Azerbaijan was to acquire financial resources—initial capital, which was as essential as air and water—for the country's future development. The exploitation of the Caspian Sea's rich hydrocarbon resources and their export to global markets, as well as directing the obtained funds towards the country's current needs and future socio-economic development, was considered at the time as perhaps the only way out. However, between 1991 and 1993, regional conflicts in the Caspian-Black Sea basin and the South Caucasus, an unstable environment, chaos and anarchy inside the republic, the ineffective and incompetent policies of the ruling political forces, and other factors made it difficult to attract the leading oil companies of the world to develop and export Azerbaijan's rich energy resources and overcome the obstacles in this field. In fact, some analysts at the time considered the involvement of an international consortium in oil and gas projects in the Azerbaijani sector of the Caspian Sea to be a myth and deemed it impossible [8].

To transform independent Azerbaijan into a modern, powerful state with sustainable economic development, national leader Heydar Aliyev defined the oil strategy that would lay the foundation for radical political and economic reforms in the future. This strategy involved attracting foreign investors to develop Azerbaijan's oil fields, diversifying the transportation routes of crude oil, efficiently managing oil revenues, and moving the country to a new stage of development. The cornerstone of Azerbaijan's strategic development concept was laid by the "Contract of the Century." This agreement was not easily realized. After returning to political leadership in 1993 at the insistence of the people, the national leader first stabilized the political situation in the country, saved the republic from inevitable disasters, and initiated significant economic changes. He also achieved the signing of the first international agreement reflecting the economic sovereignty of independent Azerbaijan—the "Contract of the Century." In this process, including the negotiations, the development and successful implementation of the new oil strategy, Mr. Ilham Aliyev, who was then the first vice-president of SOCAR (State Oil Company of Azerbaijan Republic) and a member of the National Assembly, actively participated. Notably, during the meetings, some disagreements arose, and at certain stages, there was a threat of the negotiations being halted. Later, President Ilham Aliyev stated: "We told the foreign companies: you are defending the interests of separate companies. We are defending the interests of the country and the people of Azerbaijan. If you make a mistake, it will affect only one of your company's projects, but if we make a mistake, it will harm the interests of the entire Azerbaijani people. In other words, we absolutely cannot afford to make any mistake." Despite these challenges, the contract was signed, and it was developed in accordance with Azerbaijan's national interests.

Under the leadership of national leader Heydar Aliyev, on September 20, 1994, one of the most significant agreements in Azerbaijan's 20th-century history—politically, economically, and strategically—was signed. This agreement, known as the "Contract of the Century," concerned the joint development of the "Azeri," "Chirag" oil fields, and a portion of the "Gunashli" oil field in the Azerbaijani sector of the Caspian Sea, and was a production-sharing agreement. The contract amounted to 7.4 billion USD and involved 11 international oil companies from seven countries (Azerbaijan, the USA, the UK, Russia, Turkey, Norway, and Saudi Arabia), including companies such as Amoco, BP, McDermott, UNOCAL, SOCAR, Lukoil, Statoil, Turkish Petroleum, Pennzoil, Ramco,

and Delta. The companies quickly established operational structures, such as the Steering Committee, the Azerbaijan International Operating Company (AIOC), and the Advisory Council. The agreement was ratified by the Azerbaijani parliament on December 12, 1994 [7].

According to initial calculations, the recoverable oil reserves of the "Azeri-Chirag-Gunashli" field block were estimated at 511 million tons, which later increased to 730 million tons following the results of appraisal wells. The required investment for the development of these fields was 11.5 billion USD. Of the total net revenue, 80% was allocated to Azerbaijan, and 20% to the investors. From the very first days of the "Contract of the Century," the Azerbaijan International Operating Company was created, and joint work with SOCAR commenced. This contract paved the way for more than 30 agreements with 41 oil companies from 19 countries [2].

The "Contract of the Century" is one of the largest agreements in the world in terms of both the volume of hydrocarbon reserves and the scale of investments. Over 64 billion USD were invested in Azerbaijan's oil sector through signed agreements, with 57.6 billion USD allocated for the development of offshore fields and exploration activities in prospective structures. The production of oil necessitated its export to global markets, which required new pipelines. National leader Heydar Aliyev determined the route of these pipelines, taking into account geopolitical interests, and the Baku-Tbilisi-Ceyhan oil pipeline, followed by the Baku-Tbilisi-Erzurum gas pipeline, were built and put into operation. As a result of the implementation of the activities outlined in the "Contract of the Century," production, output, and revenue-sharing increased. Azerbaijan had to gain access to global markets and offer its oil for sale on the stock exchanges. Consequently, the Trans-Anatolian (TANAP) and Trans-Adriatic (TAP) gas pipelines were constructed and expanded, leading to the creation of the Southern Gas Corridor. Today, Azerbaijan exports approximately 20 billion cubic meters of gas to Europe annually, continuing its economic development. Starting from 2027, gas exports will reach 30 billion cubic meters. Since the start of the "Contract of the Century," 593 million tons (approximately 4.4 billion barrels) of oil have been produced from the "Azeri-Chirag-Gunashli" block, with over 4.3 billion barrels of oil exported to global markets via the Baku-Tbilisi-Ceyhan pipeline. This development has enhanced Azerbaijan's energy security and ensured the effective management of energy resources in the region [1].

The "Contract of the Century" not only brought economic benefits to Azerbaijan but also provided political guarantees. The goal of national leader Heydar Aliyev was to ensure the eternal political independence of Azerbaijan, and this was successfully achieved. With a view to Azerbaijan's future development, the national leader established the State Oil Fund of the Republic of Azerbaijan (SOFAZ) on December 29, 1999. Through the efficient management of hydrocarbon revenues, SOFAZ has become a guarantor of financial stability for future generations, directing funds into long-term investments, development projects, and human capital development.

On September 14, 2017, in Baku, at the Heydar Aliyev Center, amendments were made to the agreement on the joint development of the "Azeri," "Chirag" oil fields, and a portion of the "Gunashli" field, and the agreement was restructured and signed. The agreement's duration was extended until the end of 2049, demonstrating the long-term prospects for Azerbaijan's oil production. Under the new agreement, 75% of the profit oil remains with Azerbaijan.

Today, the experience and international reputation gained through the "Contract of the Century" play an important role in attracting foreign investments into Azerbaijan's green energy sector. Revenues from oil exports are being used as investments for the development of alternative energy sources. The "Contract of the Century" has not only strengthened Azerbaijan's economy but also improved the social welfare of its population, increased its international political standing, and enhanced its military potential. It is no coincidence that in 2020, under the

leadership of Supreme Commander-in-Chief Ilham Aliyev, the Azerbaijani Army liberated Karabakh in just 44 days.

Today, investments are being made in the production of alternative energy in the liberated Karabakh, Nakhchivan, Khizi district, and the Absheron Peninsula, with international companies invited to contribute. Azerbaijan aims to increase the share of renewable energy in its energy balance to 30% by 2030. This is crucial for strengthening Azerbaijan's energy security, ensuring sustainable economic development, and improving the country's ecological situation.

In November of this year, Azerbaijan hosted the 29th session of the Conference of the Parties (COP29) to the United Nations Framework Convention on Climate Change, which was no coincidence. Over the years since the signing of the "Contract of the Century," Azerbaijan's socio-economic development has reached a level where it is now capable of contributing to the resolution of global problems [6].

The opportunities created by the "Contract of the Century" for the Azerbaijani economy:

- Ensuring significant investments in the country's oil and gas industry and infrastructure through substantial expenditures;

- Full utilization of the material-technical base and production potential created over a long historical period in the country's oil and gas industry;

- Attraction and mastery of new techniques and technologies for the development of deep-sea oil fields in line with global experience;

- Improvement of the technical supply of production facilities, auxiliary objects, and infrastructure;

- Regular increase in oil production and Azerbaijan's leadership position in the economy of the South Caucasus;

- Full satisfaction of the country's and population's demand for natural gas, cessation of natural gas imports, and the beginning of exports to neighboring countries and Europe;

- Large-scale construction of main oil and gas pipelines, ensuring reliable access of Azerbaijani oil and natural gas to global markets;

- Sharp increase in exploration and drilling activities, evaluation of new blocks and areas in the Azerbaijani sector of the Caspian Sea;

- Increase in employment, creation of new jobs, and improvement of the qualification of personnel and production standards;

- Ensuring foreign currency inflow into the state budget;

- Creation of the State Oil Fund for accumulating currency resources through the revenues obtained from the sale of state-owned oil [5].

The 30 years since the signing of the "Contract of the Century" have once again confirmed that the "Azeri", "Chirag", and "Deepwater Gunashli" (ACG) projects were not merely a standard production-sharing agreement between the Azerbaijani government and a consortium of foreign oil companies. The agreement on the development of ACG marked the beginning of a new era for Azerbaijan's oil and gas industry. Its realization was a landmark event for both Azerbaijan and the participating companies.

The ACG project was an achievement target set by independent Azerbaijan. This goal instilled confidence in the future among people. The implementation of the agreement brought together individuals from various nations and countries. They built platforms, laid pipelines, constructed terminals, and brought modern technologies to develop the natural reserves in the deep layers of the Caspian Sea. This was not just a victory of energy; it marked the beginning of the country's future major successes and the triumph of Azerbaijan's new oil strategy, authored by the great leader Heydar Aliyev.

In the past 30 years, the "Contract of the Century" has brought economic development and progress to Azerbaijan, as well as social welfare to its people. It is enough to note that by July

1 of this year, the Azeri-Chirag-Gunashli fields have provided the State Oil Fund of Azerbaijan with \$202 billion. This revenue has ensured the country's dynamic socio-economic development. The income from oil has enabled the diversification of the country's economy and the rapid development of the non-oil sector. As a result, numerous jobs have been created. At the same time, thanks to the thoughtful and purposeful activities of President Ilham Aliyev, significant steps have been taken to transform "black gold" into human capital [4].

Now, we are also benefiting from the experience of this agreement, as are our neighbors and friends. The "Contract of the Century" has become such a strong foundation, such a steel platform, that it has paved the way for new, grand projects. The giant engineering structure of the third millennium, the Baku-Tbilisi-Ceyhan main export oil pipeline, has been constructed, as has the Baku-Tbilisi-Erzurum gas pipeline, which made Azerbaijan a gas exporter. The 3,500-kilometer "Southern Gas Corridor" has been created, turning our country into a pan-European gas supplier. In other words, the strategy laid down by the great leader Heydar Aliyev has been successfully continued by President Ilham Aliyev, developed in accordance with the requirements of the day, and is leading Azerbaijan to new heights [3].

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