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# **Agricultural sciences**

## **INFLUENCE OF PLANT DENSITY ON LEAF AREA IN MAIZE CROPS SOWN FOR GRAIN AND SILAGE -CASE REPORT-**

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### **Abstract**

The aim of the current study was to investigate the impact of plants density on physiological index in corn crops. Seven hybrids were sown at different density for grain and silage. The leaf surface, plant foliar surface and number of leafs were investigated in this respect. In grain crop, the foliar surface of leaf, foliar surface of plant and total assimilation surface proved to be higher compared to silage crop. The most prevalent influential factor in this sense proved to be the sown density.

**Keywords:** corn, grain, physiological index, silage

### **Introduction**

The agricultural ecosystem occupies a special place in the process of capturing and storing CO<sub>2</sub> due to the photosynthesis process of plants. The ability of the genotypes designed to absorb more CO<sub>2</sub> per unit of green surface and the physiological characteristics of the plants govern the efficiency of photosynthesis. The world's 5 billion hectares of arable land, which accounts for 15% of the atmosphere's total carbon, collects approximately 120 gigatons of carbon dioxide per year through photosynthesis, which is more than 100 times more than all the carbon-containing inputs consumed.

The following goals governed physiological studies:

- estimating the amount of the plant's photosynthetic capacity based on the genetic, biological, and technological traits of the genotypes undergoing study;
- assessment of the perennial fodder legumes' symbiotic biological fixing potential, whether they are grown solely or within association with perennial grasses;

Since the maize culture makes up over half of the experimental agricultural area, it is statistically representative for the research on the plant's leaf surface that were conducted there. In this sense, a comparative experience was installed with 7 corn hybrids, coming from different groups of maturity (semi-early, semi-late, late) and morphological particularities. The biometric measurements were carried out differently for each hybrid, at the stage of ripening the grain in milk, at approx. 22 days after emergence of silk. The photosynthesis capacity of the studied hybrid plants was assessed by measuring the foliar surface (S) at the plant and surface levels based on the maturity and density groups of the plants;

### **Materials and method**

All tests related to the current research were observational and non-invasive. Ethical issues of this study were evaluated according to the European Union's Directive (Directive 2010/63/EU). The study was approved by the Scientific Council at the Research and Development Station for Bovine Arad.

Regarding technology, maize was planted in two different densities based on where the crops were intended to end up: for silage with 85.000 plants/ha respectively for grains with 75.000 plants/ha. An area of 0.5ha (7 hectares in total) was cultivated for each variant. All variants were uniformly fertilized, according to the technology applied in the resort to the corn crop, namely 20t of manure and 300 kg of complex fertilizers (NPK). At the stage of performing biometric determinations, the density of corn plants was reduced by 3% (in average).

Heterophilic microbial communities regulate the N and C cycles in soil, which work together to generate organic matter by breaking down aerial, litter, and understory vegetation. The nutrients that remain after the breakdown of organic matter are recycled, particularly the N, P, K, and S that are essential for plant growth and the survival of the ecosystem as an entire system. In this case, it contributes to maintaining the structure and increasing soil fertility, exercising the support function. Also, the storage of organic matter in the soil also has a role in regulating greenhouse gas emissions and limiting the flow of nitrates into the environment, which are responsible for water pollution. The relationships between the 2 biogeochemical cycles (N and C) are based on the processes involved in the transformation of organic matter in soils, as follows:

- through the biological processes of photosynthesis, through the participation of CO<sub>2</sub> in autotrophic plants and the fixation of N<sub>2</sub> with the aid of symbiotic nitrogen-fixing bacteria, atmospheric carbon and nitrogen first reach the soil-plant system.

- the restoration of plant biomass is correlated with the addition of organic matter to the soil (plant leftovers after harvesting, plant roots, rhizodeposits)

- the heterotrophic microorganisms in the soil, also called microbial biomass, participate directly in the decomposition of organic matter by mineralizing part of the carbon in the form of CO<sub>2</sub>, as the last form, and eliminating it in the atmosphere. Another part of carbon is assimilated in the body of microorganisms. Following the assimilation and mineralization processes, a large part of the carbon remains in the mineralized soils following the decomposition of organic matter. At the same time, a small part of organic matter (vegetable, animal waste, manure) is directly humified or transformed into organic matter inaccessible to biodegradation.

- soil heterotrophic organisms act directly on nutrient cycles, mainly on nitrogen. The importance of nitrogen flow, associated with carbon degradation, depends on the content of this element in soil organic matter. These heterotrophic organisms in the soil constitute the link between the carbon cycles and those of other elements, especially that of nitrogen.

The assimilation of atmospheric nitrogen through symbiosis with certain nitrogen-fixing microorganisms in the soil and the biological fixation of carbon through photosynthesis operate in the same natural soil-plant system, combining to fix carbon and nitrogen symbiotically in a single organism. The assimilation of atmospheric nitrogen through symbiosis with certain nitrogen-fixing microorganisms in the soil and the biological fixation of carbon through photosynthesis function in the same natural soil-plant system, combining to fix carbon and nitrogen symbiotically in a single organism. In this relationship, the plant provides the carbon and energy captured through photosynthesis, in the form of root exudates, rich in carbohydrates and electrons, to nitrogen-fixing bacteria, which in turn fix nitrogen in various forms (N<sub>2</sub>-NH<sub>3</sub>-NH<sub>4</sub>). The fixation of atmospheric carbon and nitrogen is guaranteed by this collaborative process including bacteria, mycorrhizae, and plants. This C-N cycle link is particularly prevalent in leguminous plants, which work in symbiosis with certain soil-dwelling nitrogen-fixing bacteria and have their own enzyme equipment (nitrogenase) to fix atmospheric nitrogen.

In general, following the application of chemical fertilizers with nitrogen, the plants use between 20-50% of the applied doses, the rest of the nitrogen (50-80%) is lost through volatilization and leaching. In the atmosphere there is an unlimited source of nitrogen (78000 t of N on each ha of land) and in the soil there is a large reserve of phosphorus (for a period of several centuries), but these cannot be mobilized by the communities microbes.

With a global sales market of more than \$100 billion annually, the use of mineral fertilisers containing nitrogen is the most important fertiliser category in agricultural practice. The introduction of leguminous species into all agricultural rotation structures is the most effective and non-polluting option for agriculture. These species fix large amounts of nitrogen symbiotically (50–400 kg/ha), which is essential for both the legumes' own nutrition and that of the species that proceed in the rotation.

The main aim of the current research was to evaluate the quantitative emphasising of the symbiotic fixation of atmospheric nitrogen in the leguminous crop, either in monoculture or in association with perennial gramineous.

The effects of forage structure were assessed using a one-way ANOVA protocol. Differences between means were tested with the posthoc qi square test and were defined as being statistically significant at  $p < 0.05$ . The analysed data were expressed as least square means and standard errors of the mean. All the statistical inferences were carried out using the software package Statistica (StatSoft Inc., Tulsa, OK USA) (6).

### Results and discussion

Leaf surface is a very important physiological index in order to highlight the metabolic processes such as growth, photosynthesis, transpiration or respiration. The knowledge of the leaf surface is indispensable in the activity of modeling evapotranspiration and photosynthesis, especially during periods of active plant growth, precursors to the formation of production. Any plant species' leaves typically provide between 50 and 70 percent of the entire amount of photoassimilates, making them crucial to the plant's overall productivity. The technique of employing particular leaf limb measurements was used to evaluate the leaf surface. The following relationship was used to process the data obtained after many measurements of various factors related to the plant basal rosette:

$SF (cm^2) = L \times l \times b$  where, L=leaf length, l=leaf wide b=correction coefficient

Both, the plant's developmental stage and the leaf's geometric shape affect the correction coefficient. Based on these variables, the following adjustment coefficient were employed:

-b=0,62 (for the plants in developmental stage 2 - 2-3 weeks following starting or emergence into vegetation)

-b=0,68 (for the plants in developmental stage 3 – 4-5 weeks following starting or emergence into vegetation)

- b=0,72 (for the plants in developmental stage 4 – at least 6 weeks following starting or emergence into vegetation)

The greatest amounts of carbon in the soil are captured and sequestered by plant species with high photosynthetic capability and drought resilience, which significantly lowers the atmospheric concentration of carbon dioxide. The size of the leaves' absorption surface is also directly impacted by agricultural procedures, which also significantly affect plant productivity and carbon sequestration capacity. Plants' leaf surface and absorption capacity are diminished by extended dryness and a reduction in the amount of water available in the soil. The previously presented biometric data show that at the same plant density, the size of the assimilation surface is influenced by the destination of the crop. Accordingly, at a density of 75,000 plants/ha, the average leaf surface area in the grain corn crop was 361 cm<sup>2</sup>, whereas in the silage crop it was 232 cm<sup>2</sup>. This discrepancy of 35.7% was statistically significant ( $p < 0.001$ ).

**Table 1.**

**The influence of plant density on leaf area (cm<sup>2</sup>) in maize crop sown with 75,000 plants/ha**

Genetic structure	Silage crop				Grain crop			
	Lenght (cm)	Wide (cm)	Surface (cm <sup>2</sup> )	%	Lenght (cm)	Wide (cm)	Surface (cm <sup>2</sup> )	%
DK 4728 mid-early	46,8	4,5	211	91,7	58,7	5	293	81,2
DK 5404 mid-late	42,6	4,7	201	86,6	68,1	6,3	429	118,8
DK 5542 mid-late	45,6	5,2	237	102,2	66,2	6	397	110
Average mid-late	43,6	5,7	249	107,3	67,2	6,2	417	114,5
DK 5709 mid-late	47	5,3	250	107,8	63,8	5,3	338	93,6
DK 5810 late	41,8	5,7	232	102,6	64,1	5,5	353	97,8
DK 5812 late	43,5	5,1	222	95,7	65,8	5,8	382	105
DK 6897 late	44,9	5,4	242	104,3	64	6,7	429	118,8
Average late	44,3	5,4	239	103,0	64,4	5,8	373	103,3
Crop average	44,7	5,2	232	100	63,4	5,7	361	100



**Table 2.**

**The influence of plant density on leaf area (cm<sup>2</sup>) in maize crop sown with 85,000 plants/ha**

Genetic structure	Silage crop			Grain crop		
	Lenght (cm)	Wide (cm)	Surface (cm <sup>2</sup> )	Lenght (cm)	Wide (cm)	Surface (cm <sup>2</sup> )
DK 4728 mid-early	35,7	4,2	150	78,5	43,8	4,4
DK 5404 mid-late	41,9	4,8	201	105,2	57,2	5,8
DK 5542 mid-late	38,3	4,2	161	84,3	51,9	5,2
Average mid-late	40,1	4,5	180	94,3	54,5	5,5
DK 5709 mid-late	43,2	4,8	207	108,4	49,3	4,8
DK 5810 late	43,4	5,7	247	129,3	49,3	5,9
DK 5812 late	45,8	4,5	206	107,8	46,3	4,5
DK 6897 late	42,3	5,1	216	113,1	48	5,4
Average late	43,6	5	218	114,1	48,2	5,1
Crop average	41,5	4,6	191	100	48,8	5

**Table 3.**

**The influence of plants density on average plants foliar surface in silage and grain maize crop**

Genetic structure	Silage crop				Grain crop			
	Average no. of leafs/plant	Foliar surface of leaf (cm <sup>2</sup> )	Plant foliar surface cm <sup>2</sup> /plant	%	Average no. of leafs/plant	Foliar surface of leaf cm <sup>2</sup> /plant	Plant foliar surface cm <sup>2</sup> /plant	%
DK 4728 mid-early	12,9	293	3780	71,9	13,8	211	2912	95,1
DK 5404 mid-late	12,7	429	5448	107	12,1	201	2432	79,4
DK 5542 mid-late	13,4	397	5320	104,5	13,3	237	3152	102,9
Average mid-late	13	417	5384	105,7	12,7	249	3162	103,3
DK 5709 mid-late	14,4	338	4867	95,6	13,6	250	3400	111,1
DK 5810 late	14,2	353	5013	100,7	13,8	238	3284	107,2
DK 5812 late	13,7	382	5233	102,8	12,9	222	2864	93,5
DK 6897 late	13,8	429	5920	116,2	12,7	242	3073	100,4
Average late	14	373	5258	103,2	13,1	239	3155	103
Crop average	13,3	361	5093	100	13,2	232	3062	100

The assimilation surface of the leaves is reduced by an average of 21.5% (p0.001) in the silage crop and 48% (p0.001) in the grain crop in the variants sown at a density of 85,000 plants/ha. The method of production usage (for grain or silage) has a greater impact on the leaf area measured according to the average number of leaves/plant than does the number of leaves associated with the individual plant. Accordingly, the biometric data from table 3 show that the variant for grains with a density of 75,000 plants/ha had 66.3% more leaf area/plant compared to variant with a density of 85,000 plants/ha (silage).

Within each type of crop, an increase in leaf surface was noted in late hybrids compared to mid-early or mid-late. This increase proved to be statistically significant, the threshold of 16.2% giving it this character (p0.001).

### **Conclusions**

The grain crop recorded the following values related to the studied indicators:

- foliar surface/leaf recorded an area between 293-429 cm<sup>2</sup>/leaf, with an average value of 361 cm<sup>2</sup>/leaf;
- foliar surface/plant recorded values between 3780-5920 cm<sup>2</sup>/plant, with an average value of 5093 cm<sup>2</sup>/plant;
- the foliar surface index (FSI) recorded values between 2,7594 m<sup>2</sup>/m<sup>2</sup> and 4,3216 m<sup>2</sup>/m<sup>2</sup> with an average value of 3,7178 m<sup>2</sup>/m<sup>2</sup>;
- foliar surface ratio (FSR) recorded values between 30.5-50.3 cm<sup>2</sup>/g dry matter, according to the plants genetic structure, with an average value of 44,7 cm<sup>2</sup>/g dry matter;
- total assimilation surface recorded values between 27594 m<sup>2</sup>/ha and 43216 m<sup>2</sup>/ha, with an average value of 37178 m<sup>2</sup>/ha.

The silage crop recorded the following values related to the studied indicators:

- foliar surface/leaf recorded an area between 211-250 cm<sup>2</sup>/leaf, with an average value of 232 cm<sup>2</sup>/leaf;
- foliar surface/plant recorded values between 2912-3400 cm<sup>2</sup>/plant, with an average value of 3062 cm<sup>2</sup>/plant;
- the foliar surface index (FSI) recorded values between 1.9942 m<sup>2</sup>/m<sup>2</sup> and 2.7880 m<sup>2</sup>/m<sup>2</sup> with an average value of 2.5108 m<sup>2</sup>/m<sup>2</sup>;
- foliar surface ratio (FSR) recorded values between 30.3-38.4 cm<sup>2</sup>/g dry matter, according to the plants genetic structure, with an average value of 35.2 cm<sup>2</sup>/g dry matter;
- total assimilation surface recorded values between 19942 m<sup>2</sup>/ha and 27880 m<sup>2</sup>/ha, with an average value of 25108 m<sup>2</sup>/ha.

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# **Cultural sciences**

## **MONUMENTS OF WESTERN AZERBAIJAN**

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### **Abstract**

The article talks about the material and cultural heritage of Western Azerbaijan, historical monuments, as well as the deportation of Azerbaijanis from their native lands. As can be seen from historical sources, the lands of Western Azerbaijan have always been of interest to neighboring states, as they possess countless natural resources. It is so rich, so interesting, so attractive that it can retain its freshness and beauty despite the passing of centuries. Our ancestors created very valuable examples of material culture, which are well documented on the territory of our republic. These monuments are a visible proof of the history, culture, in short, development of each nation or state. In the 20th century, as a result of ethnic cleansing and vandalism of historical monuments by Armenians against Azerbaijanis, the monoethnic state of Armenia was created, all historical and architectural monuments proving the fact that Azerbaijanis settled here were destroyed, and cemeteries were ruined. Armenians are still trying with all their might to deny the fact that the territory of Western Azerbaijan belongs to our people. Fortunately, Azerbaijan has repeatedly managed to prove its claim and support it with evidence in the form of preserved written and oral folklore sources. Primary sources and various research works allow to obtain sufficient information about the material cultural monuments in the territory of the Iravan Khanate, the art, educational system and literary environment of this Azerbaijani state. The article also covers information about some of the destroyed Azerbaijani monuments in Western Azerbaijan, like Red Bridge, Lambali bridges, Iravan Fortress, Sardar Mosque, and etc. The article further describes the Western Azerbaijan Community and its activities aimed at preserving historical monuments and promoting national interests abroad.

### **Xülasə**

Məqalədə Qərbi Azərbaycanın maddi-mədəni irsindən, tarixi abidələrindən, eləcə də azərbaycanlıların öz doğma torpaqlarından deportasiya edilməsindən bəhs edilir. Tarixi mənbələrdən də göründüyü kimi, Qərbi Azərbaycan torpaqları saysız-hesabsız təbii sərvətlərə malik olduğundan qonşu dövlətlərin həmişə marağında olub. Qərbi Azərbaycanın tarixi qədər zəngin, o qədər maraqlı, o qədər cəlbedicidir ki, əsrlər keçməsinə baxmayaraq öz tərəvətini və gözəlliyini saxlaya bilir. Əcdadlarımız çox qiymətli maddi mədəniyyət nümunələri yaratmışlar ki, bu nümunələr respublikamızın ərazisində sənədləşdirilmişdir. Bu abidələr hər bir xalqın, dövlətin tarixinin, mədəniyyətinin, bir sözlə, inkişafının əyani sübutudur. 20-ci əsrdə ermənilərin azərbaycanlılara qarşı etnik təmizləmə və tarixi abidələrə qarşı vandalizmi nəticəsində monoetnik Ermənistan dövləti yaradılmış, burada azərbaycanlıların məskunlaşdığını sübut edən bütün tarixi-memarlıq abidələri dağıdılmış, qəbiristanlıqlar xarabalığa çevrilmişdir. Ermənilər hələ də var gücləri ilə Qərbi Azərbaycan ərazisinin xalqımıza məxsus olması faktını təkzib etməyə çalışırlar. Xoşbəxtlikdən, Azərbaycan dafələrlə öz iddiasını sübut etməyə və qorunub saxlanmış yazılı və şifahi folklor mənbələri şəklində sübutlarla dəstəkləməyə nail olmuşdur. İlk mənbələr və müxtəlif tədqiqat işləri İrəvan xanlığı ərazisindəki maddi mədəniyyət abidələri, bu Azərbaycan dövlətinin incəsənəti, təhsil sistemi və ədəbi mühiti haqqında kifayət qədər məlumat əldə etməyə imkan verir. Məqalədə Qərbi Azərbaycanda dağıdılmış bəzi Azərbaycan abidələri, məsələn, Qırmızı Körpü, Ləmbəli körpüləri, İrəvan qalası, Sərdar məscidi və s. haqqında məlumatlar da yer alır. Məqalədə həmçinin Qərbi Azərbaycan İcması və onun tarixi abidələrin qorunması və xaricdə milli maraqların təbliği istiqamətində fəaliyyətləri təsvir edilir.

**Keywords:** Western Azerbaijan, historical monuments, native lands, written sources, ethnic cleansing

**Açar sözlər:** Qərbi Azərbaycan, tarixi abidələr, doğma torpaqlar, yazılı mənbələr, etnik təmizləmə

### **INTRODUCTION**

Historical studies confirm that Azerbaijan is located in the territory of the first human civilization. Due to their geographical position and the environment that provides living conditions, these places have been written down in history as the first human settlements. As a result of archaeological research, it became clear that the ancient people who lived here have a very ancient and rich history. Our ancestors created very valuable

examples of material culture, which are well documented on the territory of our republic. These monuments are a visible proof of the history, culture, in short, development of each nation or state. It is interesting that there are too many such monuments in the territory of Azerbaijan and their age is counted in centuries. Therefore, the European travelers who visited our country did not hide their admiration for the historical and cultural monuments of Azerbaijan and mentioned it many times in their works.

### **MATERIALS AND METHODS**

Azerbaijani culture is a culture with a thousand-year history. It is so rich, so interesting, so attractive that it can retain its freshness and beauty despite the passing of centuries. The land of Azerbaijan has historically been interesting for mankind. Both its earthly wealth and spiritual wealth have always attracted the interest of the world's humanity.

It is for this reason that the Armenians started a long-planned policy of destroying the traces of the Azerbaijani settlement in Western Azerbaijan and appropriating our material and cultural monuments. Currently, these lands are located in the territory of Armenia, but this region is the ancient Turk-Oghuz homeland, the historical land of Azerbaijan.

To write this work, we collected a lot of material from electronic and written sources, analyzed them and mentioned many interesting facts, including information on the destroyed monuments of Western Azerbaijan.

### **RESULTS**

In the territory of Armenia, which is the historical land of Azerbaijan, were more than a thousand Azerbaijani settlements, hundreds of historical-architectural monuments, caravanserais, palaces, mosques, mausoleums, tombs, cemeteries, grave monuments, etc. In the 20th century, as a result of ethnic cleansing and vandalism of historical monuments by Armenians against Azerbaijanis, the monoethnic state of Armenia was created, all historical and architectural monuments proving the fact that Azerbaijanis settled here were destroyed, and cemeteries were ruined. If at the beginning of the 20th century, 310 mosques were registered in the territory of Iravan, now only one mosque remains (partially destroyed) in the territory of Armenia: the Blue Mosque, which is presented to foreign visitors as the "Persian" mosque. [1, electronic resource].

Moreover, the Armenians tried to create fake written sources in the Armenian language that supposedly confirm their presence in this area many centuries ago. This is one of the indicators of Armenian vandalism, barbaric attitude towards the heritage of the Azerbaijani people.

Fortunately, Azerbaijan has repeatedly managed to prove its claim and support it with evidence in the form of preserved written and oral folklore sources.

Now we will give information about some of the destroyed Azerbaijani monuments in Western Azerbaijan.

#### **Red Bridge**

The oldest bridge in Iravan, the Red Bridge, was built in 1679 on the Zangi River. This bridge, which at that time was the only passage over the Zangi River to the city, got its name from the red stone that it was made of. It was of great importance for the history of the city, since it passed along the ancient Silk Road. Sometimes the bridge was also called the Zangi Bridge, as it was built across the Zangi River.

The overall length of the Red Bridge was 80 m, the height was 11 m, and the width was 4.8 m. This two-arch bridge also had a small auxiliary arch to provide additional two-way flow. After the construction of the Great Victory Bridge, the Red Bridge was not used, and this historical monument fell apart. [2, Ələkbərli Ə., Bakı, 2007]

#### **Lambali bridges**

There were bridge arches over the Tona River in Lambali village of Barana district of Loru mahal (with changed names: Bagratashen village of Noyemberyan district), where Azerbaijanis densely populated.

Three bridges connecting the villages of Lambali and Sadakhli were located on the ancient Silk Road, connecting the mountainous and lowland parts of Borchali.

This bridge, built in the 17th-18th centuries, was demolished during the Russian-Iranian wars in the 19th century. [3, electronic resource].

#### **Iravan Fortress**

Iravan fortress was built in 1504 by order of the Safavid ruler Shah Ismail I by his vizier Ravangulu Khan on the banks of the Zangi River, on the site of the current city of Iravan. The fortress was named Iravan or Ravan after the vizier who built it.

Historical sources indicate that there were 800 houses and 8 mosques in the Iravan fortress. In the drawing of the Iravan fortress, drawn up after its occupation by the Russians in 1827, the scale confirmed that its total length was 850 m and its width was 790 m. The castle, which had an almost square shape, occupied an area of 7 hectares. The height of the double fortress walls was 10.5 - 12 m. And the fortress wall, consisting of one layer, passed by the Zangi River.

Iravan fortress had three gates: the Tabriz Gate in the southern part, the Shirvan Gate (Meydan Gate) and the Korpu Gate in the north.

After the Russian occupation, Iravan fortress was declared state property. In the 1850s, repair and construction work was carried out inside the fortress. At the same time, the fortress contained Russian military units and a significant number of cannons.

Iravan fortress was used as a military fortress until March 12, 1864. After the fortress was officially abandoned, the stones of its walls and towers were dismantled by local residents living in the surrounding area. And since the 1880s, one after another, buildings and defensive structures inside the fortress disappeared. However, in the 1930s the fortress was completely destroyed. [4, 5: Nazim Mustafa, Bakı, 2016].

#### Sardar Mosque

Sardar Mosque, built in 1810s, in various sources it is also referred to as "Khan Mosque" and "Abbas Mirza Mosque".

After the Russian occupation, the mosque was used for various purposes. August von Haxthausen, who was in Iravan in August 1843, confirmed that the Sardar Mosque located in the Iravan fortress was turned into a barracks. [6, Nazim Mustafa, Bakı 2020]

In 1864, after the Russian troops stopped using the Iravan fortress for military purposes, the historical monuments inside the fortress, as well as the Sardar Mosque, were destroyed. In the early 1900s, Armenians migrated from the Ottoman Empire settled in the mosque, and during the Soviet era, the mosque was subjected to destruction. Residential houses were built in its place, and the mosque was completely demolished in November 2014. [7]

#### Sardar's Fortress

Sardar's fortress was built during the reign of Huseyngulu Khan Qajar. This fortress, which dates back to the years 1807–1826, was used as the center of the Sardarabad district and was the summer residence of the Khan of Iravan.

In 1828, the Sardarabad fortress was occupied by Russian troops, and as a result, the fortress was severely damaged. In the following years, the fortress was completely destroyed. [2, Ələkbərli Ə., Bakı, 2007]

#### Palace of Sardar

Palace of Sardar, or Khan's Palace, one of the masterpieces of Azerbaijani architecture, was built in 1578 by Tokhmag Khan, Beylerbey of Iravan, and a large garden was built opposite the castle on the right bank of the Zangi River.

The Hall of Mirrors in the Palace of Sardar and the Summer Palace in the Khan Garden were built by Muhammad Khan Qajar in 1791, thus completing the palace complex. The monument was fundamentally renovated in 1810, during the reign of Huseyngulu Khan, and a number of new buildings were added to it. The paintings on the walls of the Sardar Palace were completed in 1815 by Mir Abdurraza Khan, a representative of the Tabriz school of painting. After the Russian occupation of Iravan in 1827, the palace was severely damaged.

In the plan of the city drawn up in 1837, it was clear that the palace covered an area of approximately 1 hectare. The palace was renovated in the middle of the 19th century. In 1867-1874, Mirza Kadym Iravani carried out restoration works in the Sardar Palace.

From the beginning of the 20th century, the Sardar palace began to rapidly crumble. After the complete destruction of the palace in 1914, the portraits in it were dismantled and taken to Georgia. Those works are currently held in the State Museum of Georgia. After the demolition of the palace, a brandy factory was built on its territory. [2, Ələkbərli Ə., Bakı, 2007; 8].

The material culture and architectural monuments, culture and art of the Iravan Khanate, as well as the education system, are described in the works of French travelers Jean Tavernier and Jean Chardin and in the studies of I. Chopin after the occupation of the Khanate by Russia.

Despite frequent destructive wars in the Khanate of Iravan, especially in its capital, Iravan, science and culture flourished. In the territory of the Iravan Khanate there were hundreds of monuments of material culture, architecture and art - mosques, mausoleums, epigraphic monuments, ram sculptures, examples of fine and decorative art. Currently, hundreds of manuscripts stored in the Iravan Institute of Manuscripts - Matenadar belong to the period of activity of the Iravan Khanate. [9, AMEA. İRƏVAN XANLIĞI. Bakı, 2010. s. 187]

## **DISCUSSION**

The Western Azerbaijan Community

The organization is the only public institution dealing with the problem of refugees from Western Azerbaijan since 1989. It is here that facts and documents related to Azerbaijanis who became refugees in 1987-1991 are collected and stored. Of the 50,000 families evicted from Western Azerbaijan in 1987-1991, the damage has been estimated for about 20,000, and this work is currently being continued. [10, electronic resource]

The Western Azerbaijani community is engaged in the protection of the rights of Azerbaijanis expelled from the territory of Armenia. The Western Azerbaijan Community adopted the concept of "Ensuring the safe and dignified peaceful return of Azerbaijanis expelled from the territory of current Armenia" - "Concept of Return" within the framework of its activities on the return of Azerbaijanis forcibly expelled from the territory of current Armenia. The concept defines the general framework of goals, principles, preparatory and implementation measures to be implemented by the Community for the return of Azerbaijanis forcibly expelled from the territory of current Armenia. The concept is based on international law, relevant national legislation, historical facts and serves to establish justice and peace. [10, electronic resource]

On December 24, 2022, the President of the Republic of Azerbaijan Ilham Aliyev got acquainted with the conditions created in the administrative building of the Western Azerbaijan Community and met with a group of intellectuals of Western Azerbaijan.

Within the framework of the meeting, the head of state emphasized that one day our compatriots from Western Azerbaijan, their relatives, children and grandchildren will return to our historical land, Western Azerbaijan. President Aliyev noted the importance of the activities of the Western Azerbaijan Community in promoting national interests not only within the country, but also at the international level.

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# **Economic sciences**

## **HOW IS AI REVOLUTIONIZING THE TRADITIONAL CYCLE OF MONEY?**

**Constantinos Challoumis**

### **Abstract**

In the intricate dance of modern economies, the traditional cycle of money has long been the backbone of financial systems, governing how savings are invested, and wealth is distributed. However, with the advent of Artificial Intelligence, this cycle is undergoing a profound transformation. As AI algorithms begin to optimize investment decisions, streamline transactions, and redraw the boundaries of financial inclusion, the very fabric of our economic structures is being reshaped. In this article, we'll research into the fascinating ways AI is revolutionizing the traditional cycle of money, and what this means for the future of our economic systems.

**Keywords:** AI, revolutionizing cycle of money

### **Introduction: The Traditional Cycle of Money - Enforcement Savings and Investments**

Before the advent of artificial intelligence, the traditional cycle of money was a well-established concept that governed the flow of money within an economy. It consisted of two primary components: enforcement savings and investments, and escape savings and investments.

Against the backdrop of a thriving economy, enforcement savings and investments played a vital role in strengthening the economic structure. These savings remained within the local banking system, fueling investments in manufacturing and highly specialized activities. Large corporations invested capital in these areas, creating a ripple effect that stimulated economic growth. As a result, the entire economy operated at maximum capacity, with each economic unit finding its place and contributing to the overall development of the economy's structure (Aleksandr Matveevich Rumiantsev, 1983; Boughton, 1994; Canh & Thanh, 2020; Engels, 1844; Gilpin & Gilpin, 2001; Harris, 2020; IMF, 1994, 2021; Keynes, 1936; Lenin, 1916; Marx, 1867; OECD, 2021; Papageorgiou, 2012; Richardson, 1964; Rikhardsson et al., 2021; Stiglitz, 2002; World Bank, 2003; World Bank Group, 2024a, 2024b).

In this scenario, the money cycle accelerated, and the economy's structure self-organized. The distribution and reuse of money increased, leading to a robust economy. According to data, countries with high enforcement savings and investments, such as those with a high index money cycle, exhibited a strong correlation between the two, with a coefficient of approximately 0.94. This indicated that the economy was functioning optimally, with money being distributed and reused efficiently.

Furthermore, the regulatory policy played a crucial role in promoting enforcement savings and investments. By imposing higher taxes on businesses that replaced the economic tasks of small ones and providing subsidies for investments in factories and highly specialized activities, the government encouraged the growth of large corporations. This, in turn, strengthened the money cycle and led to a more robust economy.

### **Escape Savings and Investments**

Savings that were diverted away from the local economy, known as escape savings, had a detrimental effect on the economic structure. These savings were invested outside the economy, leading to a decrease in the distribution and reuse of money. As a result, the economy's structure was weakened, and its growth was stifled.

Escape investments, which took the place of small businesses or led profits outside the economy, further exacerbated the problem. They disrupted the delicate balance of the economy, causing a decline in the money cycle and ultimately affecting the economy's qualitative attributes. The consequences of escape savings and investments were far-reaching, leading to a less robust economy and a decrease in economic growth.

In essence, escape savings and investments hindered the growth of the economy by reducing the distribution and reuse of money. This, in turn, affected the economy's structure, making it less robust and more vulnerable to external shocks.

Further analysis of escape savings and investments reveals that they can have a profound impact on the economy's healthcare and education systems. The taxes imposed on these systems can affect the economy's qualitative attributes, leading to a decline in overall economic growth.

### **The Role of Banking Systems in the Money Cycle**

Assuming the money cycle is the backbone of any economy, the role of banking systems cannot be overstated. Banking systems play a vital role in facilitating the distribution and reuse of money, which in turn strengthens the economy. In essence, banking systems act as either receivers or givers, and their role has a significant impact on the economy.

#### **Receiver vs. Giver: The Impact on the Economy**

Cycle after cycle, the banking system's role as a receiver or giver determines the fate of the economy. When the banking system acts as a receiver, it means that more enforcement savings are being invested in the local economy, leading to a stronger economy. This is because enforcement savings are invested in manufacturing and highly specialized activities, which in turn create jobs and stimulate economic growth. On the other hand, when the banking system acts as a giver, it means that more escape savings are being diverted away from the local economy, leading to a weaker economy. Escape savings result in profits being taken outside the economy, diverting funds for investments outside the framework of the economy, and ultimately leading to a less efficient economy.

The consequences of a banking system acting as a giver are far-reaching. It leads to a lack of investment in the local economy, resulting in stagnant economic growth and high unemployment rates. Moreover, escape savings and investments lead to a lack of distribution and reuse of money, which in turn weakens the economy. Conversely, when the banking system acts as a receiver, it leads to a stronger economy, characterized by high economic growth rates, low unemployment rates, and a well-structured economy.

In countries where the banking system acts as a receiver, the economy operates at maximum capacity, and the entire economic system is active. This is evident in countries with high bank deposits per GDP, indicating a high level of enforcement savings. In such economies, the money cycle is accelerated, and the economy's structure is developed and suitably governed simultaneously.

#### **The Importance of Appropriate Regulatory Policy**

The theory of the money cycle holds that an appropriate regulatory policy is vital for strengthening the economy. The regulatory policy should impose higher taxes on businesses that replace the economic tasks of small ones and provide subsidies for them to invest their capital in factories and highly specialized activities. This approach encourages enforcement savings and investments, leading to a stronger economy.

The importance of appropriate regulatory policy cannot be overstated. It eliminates the consequences of interventionism on monetary and public policy, as well as free market autoregulation. Instead, it replaces these policies with suitable regulatory public and tax policy via an appropriate banking system. This approach ensures that the banking system acts as a receiver, not as a giver, leading to a stronger economy.

The regulatory policy should also focus on imposing low taxes, which strengthen the money cycle. According to the money cycle, the only taxes that have an impact on the economy, and particularly its qualitative attributes, are those related to the healthcare and education systems. By imposing low taxes, the regulatory policy encourages enforcement savings and investments, leading to a stronger economy (Challoumis, 2018aw, 2018ac, 2018an, 2018ax, 2018ay, 2018h, 2019f, 2019e, 2019c, 2019g, 2019d, 2019b, 2019i, 2020d, 2020c, 2020a, 2020b, 2021f, 2021c, 2021e, 2021d, 2021j, 2021g, 2021b, 2021i, 2021l, 2021a, 2021h, 2022g, 2022d, 2022c, 2022a, 2022b, 2022e, 2023c, 2023ac, 2023o, 2023aj, 2023s, 2023l, 2023ai, 2023ae, 2023d, 2023h, 2023v, 2023aa, 2023m, 2023j, 2023ak, 2023t, 2023w, 2023y, 2023ad, 2023g, 2023ah, 2023e, 2023z, 2023af, 2023ab, 2023q, 2023ag, 2023a, 2023b, 2023r, 2023f, 2023x, 2023u, 2023p, 2023n, 2024as, 2024n, 2024bf, 2024cz, 2024do, 2024g, 2024d, 2024cj, 2024ci, 2024bh, 2024cr, 2024cy, 2024dg, 2024ef, 2024bn, 2024dd, 2024dk, 2024de, 2024cs, 2024p, 2024by, 2024bb, 2024m, 2024ct, 2024o, 2024at, 2024ce, 2024fc, 2024da, 2024dp, 2024cp, 2024cu, 2024ep, 2024cq, 2024cv, 2024ew, 2024q, 2024cc, 2024dc, 2024bv, 2024cm, 2024fd, 2024fb, 2024au, 2024dh, 2024cw, 2024ax, 2024be, 2024a, 2024ak, 2024bm, 2024eg, 2024az, 2024l, 2024du, 2024et, 2024co, 2024dz, 2024cn, 2024bg, 2024av, 2024cx, 2024fs; Challoumis et al., 2024c, 2024b; Challoumis, 2024fu, 2024gl, 2024fq, 2024fn, 2024fp, 2024fm, 2024gp, 2024fh, 2024fw, 2024go, 2024gf, 2024fy, 2024gn, 2024gm, 2024fj, 2024ft, 2024gb; Challoumis et al., 2024a; Challoumis, 2024gh, 2024gd, 2024fr, 2024ga, 2024fk, 2024ge, 2024gi, 2024fo, 2024fz, 2024fi, 2024fv, 2024fl, 2024gk, 2024gj, 2024fx, 2024gc, 2024gg; Challoumis & Alexios, 2024; Challoumis & Eriotis, 2024; Challoumis & Savic, 2024). Regulatory policies that promote enforcement savings and investments are vital for strengthening the economy. By encouraging businesses to invest in manufacturing and highly specialized activities, the regulatory policy ensures that the economy operates at maximum capacity, leading to high economic growth rates, low unemployment rates, and a well-structured economy. Ultimately, the role of banking systems in the money cycle cannot be overstated, and an appropriate regulatory policy is vital for ensuring that the banking system acts as a receiver, not as a giver, leading to a stronger economy.

**The Consequences of Interventionism on Monetary and Public Policy: The Limitations of Free Market Autoregulation**



Some argue that the traditional cycle of money is flawed, and the intervention of artificial intelligence (AI) has exposed the limitations of free market autoregulation and the need for suitable regulatory public and tax policy.

Self-regulation, by its very nature, relies on the assumption that market forces can correct themselves without external interference. However, this approach has proven to be inadequate in preventing economic downturns and promoting sustainable growth. The lack of regulation can lead to monopolies, unequal distribution of wealth, and environmental degradation. In the context of the cycle of money, autoregulation can result in a disproportionate amount of escape savings, which divert funds away from the local economy and hinder its growth. According to data, countries with high escape savings tend to have a lower index money cycle, indicating a less efficient distribution and reuse of money.

Furthermore, the absence of regulation can lead to a lack of investment in vital public services such as healthcare and education. These services are critical to the development of human capital, which is vital for driving economic growth. The money cycle theory suggests that taxes related to these services have a direct impact on the economy's qualitative attributes. Therefore, a lack of investment in these areas can have long-term consequences for the economy.

In addition, the free market approach can lead to a lack of accountability and transparency. Without proper regulation, businesses may engage in unethical practices, which can have devastating consequences for the environment and society as a whole. The money cycle theory emphasizes the importance of a suitable banking system, which acts as a receiver of enforcement savings, promoting the distribution and reuse of money within the local economy. However, without regulation, the banking system may prioritize escape savings, hindering the growth of the economy.

#### **The Need for Suitable Regulatory Public and Tax Policy**

At the heart of the money cycle theory is the idea that a suitable regulatory public and tax policy is vital for promoting economic growth and development. By imposing higher taxes on businesses that replace the economic tasks of small ones, the government can encourage investment in factories and highly specialized activities, promoting the growth of the economy. On the other hand, providing subsidies for small businesses can help them invest in capital, leading to a more efficient distribution and reuse of money.

Moreover, a suitable regulatory policy can help promote investment in vital public services such as healthcare and education. By imposing low taxes, the government can encourage businesses to invest in these areas, leading to a more skilled and healthy workforce. This, in turn, can drive economic growth and development.

It is vital to note that the money cycle theory emphasizes the importance of a nuanced approach to regulation. Rather than imposing blanket regulations, the government should focus on creating a regulatory environment that promotes economic growth and development while protecting the environment and society as a whole (Challoumis, Constantinos, 2015a, 2015b, 2016, 2017, 2018o, 2018c, 2018l, 2018g, 2018v, 2018b, 2018a, 2018m, 2018n, 2018j, 2018q, 2018h, 2018e, 2018k, 2018i, 2018r, 2018t, 2018w, 2018p, 2018f, 2018s, 2018d, 2018u, 2020, 2024a, 2024g, 2024b, 2024c, 2024e, 2024d, 2024f; Challoumis, 2010, 2011, 2018m, 2024ea, 2024ba, 2024dr, 2024ag, 2024f, 2024bi, 2024dn, 2024eo, 2024ar, 2024dq, 2018at, 2024ez, 2024af, 2024cg, 2024ds, 2024ej, 2024bo, 2024br, 2024bs, 2024aa, 2024w, 2018bi, 2024bd, 2024v, 2024dm, 2024ac, 2024eu, 2024dx, 2024bc, 2024dl, 2024ai, 2024k, 2018ah, 2024dy, 2024er, 2024bx, 2024ch, 2024di, 2024aj, 2024r, 2024eb, 2024ei, 2024ao, 2018p, 2024x, 2024ab, 2024dt, 2024en, 2024cb, 2024aq, 2024ca, 2024ek, 2024aw, 2024ay, 2018ai, 2024es, 2024s, 2024b, 2024db, 2024ah, 2024bl, 2024ev, 2024bk, 2024fe, 2024dj, 2018b, 2024eh, 2024al, 2024ap, 2024ex, 2024ec, 2024bw, 2024ad, 2024ck, 2024cl, 2024ff, 2018bb, 2024em, 2024eq, 2024bu, 2024ae, 2024u, 2024bj, 2024y, 2024j, 2018f, 2018t, 2016, 2018bj, 2018as, 2018g, 2018be, 2018x, 2018bh, 2018ba, 2018w, 2018e, 2018ag, 2017, 2018af, 2018ar, 2018aa, 2018c, 2018ap, 2018y, 2018r, 2018ad, 2018ab, 2018bk, 2018ak, 2018q, 2018az, 2018s, 2018bf, 2018bg, 2018z, 2018i, 2018d, 2018av, 2018k, 2018bc, 2018ao, 2018j, 2018a, 2018v, 2018n, 2018au, 2018l, 2018u, 2018o, 2018aj, 2018ae, 2018al, 2019h, 2019m, 2019l, 2019k, 2019a, 2019j, 2020f, 2020e, 2021m, 2018aq, 2021k, 2022i, 2022f, 2022h, 2023i, 2023k, 2023al, 2024bp, 2024ey, 2024dv, 2018bd, 2024fg, 2024bz, 2024t, 2024e, 2024ed, 2024cd, 2024df, 2024fa, 2024h, 2024am, 2018am, 2024an, 2024dw, 2024c, 2024ee, 2024el, 2024bt, 2024i, 2024cf, 2024bq, 2024z). It is worth noting that AI has the potential to revolutionize the regulatory environment by providing real-time data and insights, enabling policymakers to make more informed decisions. By leveraging AI, governments can create a more efficient and effective regulatory framework that promotes economic growth and development while minimizing the risks associated with interventionism.

#### **The Money Cycle and Economic Structure**

Your understanding of the traditional cycle of money is incomplete without grasping the concept of the money cycle and its impact on the economic structure. The money cycle is a critical component of the economy, and its functioning has a direct bearing on the overall performance of the economy.

#### **How Enforcement Savings Strengthen the Economy**

Across the globe, economies thrive when enforcement savings are high, and the money cycle is robust. This is because enforcement savings remain within the local banking system, facilitating investments in manufacturing and highly specialized activities. As a result, large corporations invest capital in these sectors, and the entire economic system operates at maximum capacity. For instance, in countries where enforcement savings are higher than escape savings, the economy tends to operate at full capacity, and the economic structure is well-developed and suitably governed.

In an economy with high enforcement savings, each economic unit finds its place, and the economy's structure is developed and governed simultaneously. This leads to a more efficient distribution and reuse of money, ultimately strengthening the economy. The money cycle accelerates, and the economy operates at full capacity, indicating a well-structured economy.

The data supports this notion, with countries having a high index money cycle and general index money cycle of approximately 0.94, indicating a high distribution and reuse of money, leading to an appropriate structure of the economy. In such economies, the money cycle replaces interventionism and free market autoregulation with suitable regulatory public and tax policy via an appropriate banking system.

#### **The Consequences of Escape Savings on the Economy**

Alongside the benefits of enforcement savings, escape savings have a contrasting impact on the economy. Escape investments divert funds away from the local economy, leading to a decrease in the distribution and reuse of money. This results in the economy operating below its maximum capacity, and the economic structure becomes disorganized.

Escape savings and investments lead to profits being taken outside the economy, or funds being diverted for investments outside the framework of the economy. As a result, the economy's structure becomes distorted, and the money cycle slows down. The consequences of escape savings are far-reaching, affecting not only the economy's performance but also its qualitative attributes.

The imposition of low taxes can strengthen the money cycle, but it is necessary to note that taxes related to healthcare and education systems have a significant impact on the economy. The banking system plays a critical role in the money cycle, and its functioning is necessary for the distribution and reuse of money.

Consequences of escape savings are multifaceted, affecting the economy's performance, structure, and qualitative attributes. It is necessary to understand the distinction between enforcement and escape savings to develop policies that promote a robust money cycle, ultimately leading to a well-structured economy.

#### **The Impact of Taxes on the Money Cycle**

Not all taxes are created equal when it comes to their impact on the money cycle. While some taxes can stifle economic growth, others can actually strengthen the cycle and promote a more efficient distribution of money.

#### **The Role of Healthcare and Education Systems**

An often overlooked aspect of the money cycle is the critical role that healthcare and education systems play in shaping its trajectory. Taxes related to these systems have a disproportionate impact on the economy, particularly its qualitative attributes. For instance, a study by the OECD found that countries with high-quality education systems tend to have higher levels of economic growth and productivity. This is because a well-educated workforce is better equipped to adapt to changing economic conditions and drive innovation. Similarly, a robust healthcare system can lead to a healthier workforce, reducing absenteeism and increasing productivity.

A closer examination of the money cycle reveals that taxes on healthcare and education have a ripple effect throughout the economy. When these taxes are low, businesses are more likely to invest in their employees' well-being and development, leading to increased productivity and competitiveness. This, in turn, can lead to higher economic growth and a more efficient distribution of money. On the other hand, high taxes on healthcare and education can stifle investment in these critical areas, ultimately weakening the money cycle.

Furthermore, the money cycle theory suggests that the economic function both reflects and identifies the state of the economy at the same time. Therefore, because all economic units are operational, the role of money—namely, its distribution and reuse—makes the structure of the economy more apparent. In this context, taxes on healthcare and education systems play a vital role in shaping the economy's structure and promoting a more efficient distribution of money.

#### **The Effect of Low Taxes on the Economy**

One of the most significant factors influencing the money cycle is the level of taxation. Low taxes can have a profound impact on the economy, particularly when it comes to the distribution and reuse of money. When taxes are low, businesses are more likely to invest in their operations, leading to increased economic activity and job creation. This, in turn, can lead to a more efficient distribution of money, as businesses are more likely to reinvest their profits in the local economy.

Low taxes can also lead to increased economic growth, as businesses are more likely to take risks and invest in new ventures. This can lead to increased innovation and entrepreneurship, ultimately driving economic progress. Moreover, low taxes can reduce the burden on small businesses, allowing them to compete more effectively with larger corporations. This can lead to a more diverse and resilient economy, better equipped to withstand economic shocks.

Indeed, the data suggests that low taxes can have a significant impact on the money cycle. According to the World Bank, countries with lower tax rates tend to have higher levels of economic growth and development. This is because low taxes create an environment conducive to investment and entrepreneurship, leading to a more efficient distribution of money and a stronger economy.

Indeed, the effect of low taxes on the economy cannot be overstated. By reducing the burden on businesses and individuals, low taxes can lead to increased economic activity, innovation, and entrepreneurship. This, in turn, can lead to a more efficient distribution of money and a stronger economy, ultimately driving economic progress and development.

### **AI and the Disruption of the Traditional Cycle of Money**

Once again, we are witnessing a seismic shift in the way money flows through our economy. The traditional cycle of money, where savings are invested in either enforcement or escape investments, is being disrupted by the emergence of artificial intelligence (AI). This disruption has far-reaching implications for the way we think about money, investments, and the economy as a whole.

### **The Emergence of New Financial Technologies**

For decades, the traditional banking system has played a central role in the cycle of money, acting as a receiver of savings and a distributor of investments. However, with the advent of AI, new financial technologies are emerging that are challenging this traditional model. Fintech companies, blockchain-based platforms, and digital wallets are just a few examples of the new players in the financial landscape. These technologies are enabling faster, cheaper, and more secure transactions, making it possible for individuals and businesses to bypass traditional banks and invest directly in a wide range of assets.

Furthermore, AI-powered algorithms are being used to analyze vast amounts of data and identify investment opportunities that were previously inaccessible to individual investors. This democratization of access to investment opportunities is leveling the playing field and creating new opportunities for individuals and small businesses to participate in the economy. As a result, the traditional banking system is being forced to adapt and evolve in order to remain relevant.

In addition, the emergence of decentralized finance (DeFi) platforms is enabling individuals to lend and borrow money directly, without the need for intermediaries like banks. This shift towards decentralized finance has the potential to increase the efficiency and transparency of financial transactions, while also reducing costs and increasing accessibility.

### **The Potential for Increased Efficiency and Transparency**

Traditional financial systems have long been plagued by inefficiencies and a lack of transparency. However, with the advent of AI, there is a potential for increased efficiency and transparency in the cycle of money. AI-powered algorithms can analyze vast amounts of data in real-time, enabling faster and more accurate decision-making. This can help to reduce the risk of fraud and error, while also increasing the speed and efficiency of transactions.

Moreover, AI can help to increase transparency in financial transactions by providing real-time tracking and monitoring of investments. This can help to reduce the risk of mismanagement and corruption, while also increasing accountability and trust in the financial system. As a result, individuals and businesses can have greater confidence in their investments, and the economy as a whole can benefit from increased efficiency and transparency.

Traditional financial institutions have long been criticized for their lack of transparency and accountability. However, with the advent of AI, there is a potential for increased transparency and accountability in the financial system. AI-powered algorithms can analyze vast amounts of data and identify patterns and trends that may indicate fraudulent or unethical behavior. This can help to increase trust and confidence in the financial system, while also reducing the risk of financial crises.

Emergence of AI-powered financial technologies is also enabling the creation of new financial instruments and products that are more tailored to the needs of individual investors. For example, AI-powered

robo-advisors are enabling individuals to invest in diversified portfolios with minimal effort and cost. This democratization of access to investment opportunities has the potential to increase financial inclusion and reduce inequality.

### **AI-Powered Banking Systems: A New Era of Enforcement Savings**

To fully understand the impact of AI on the traditional cycle of money, we must examine the role of AI-powered banking systems in promoting enforcement savings.

#### **The Benefits of AI-Driven Regulatory Policy**

AI-driven regulatory policies are revolutionizing the way banks operate, enabling them to become facilitators of economic growth rather than mere receivers of deposits. By leveraging machine learning algorithms and data analytics, AI-powered banking systems can identify areas of high economic potential and provide targeted subsidies to businesses that invest in manufacturing and highly specialized activities. This approach not only increases enforcement savings but also promotes the growth of small businesses, which are the backbone of any economy.

Furthermore, AI-driven regulatory policies can help reduce the burden of taxation on businesses, allowing them to invest more in their operations and create jobs. By analyzing data on tax compliance and economic activity, AI-powered systems can identify areas where tax rates can be lowered, promoting economic growth and increasing enforcement savings. This data-driven approach to taxation enables governments to create a more conducive business environment, attracting investments and promoting economic development.

In addition, AI-powered banking systems can help reduce the risk of escape savings by identifying and mitigating potential risks in the financial system. By analyzing patterns of financial transactions and identifying anomalies, AI-powered systems can detect and prevent fraudulent activities, reducing the likelihood of escape savings. This increased transparency and security promote trust in the banking system, encouraging individuals and businesses to invest their savings in the local economy, thereby increasing enforcement savings.

#### **The Future of Banking: From Receiver to Facilitator**

For the first time in history, AI-powered banking systems are enabling banks to transition from mere receivers of deposits to facilitators of economic growth. By leveraging machine learning algorithms and data analytics, banks can provide targeted loans and subsidies to businesses, promoting economic development and increasing enforcement savings.

Moreover, AI-powered banking systems can help banks become more proactive in identifying areas of high economic potential, providing financial services and products tailored to the needs of local businesses. This approach not only increases enforcement savings but also promotes financial inclusion, enabling more individuals and businesses to access financial services and participate in the economy.

Policy makers and regulators must recognize the potential of AI-powered banking systems to promote enforcement savings and economic growth. By creating a conducive regulatory environment, governments can encourage the adoption of AI-powered banking systems, promoting a new era of enforcement savings and economic development.

### **The Rise of Digital Currencies and Their Impact on the Money Cycle**

All traditional notions of money and finance are being upended by the emergence of digital currencies, which are fundamentally altering the way we think about the cycle of money.

#### **The Decentralized Nature of Cryptocurrencies**

Naturally, one of the most significant aspects of digital currencies is their decentralized nature, which allows for peer-to-peer transactions without the need for intermediaries like banks. This decentralization is made possible by blockchain technology, a distributed ledger system that records transactions across a network of computers. As a result, digital currencies operate independently of traditional financial systems, free from the control of central banks and governments. This autonomy enables faster, cheaper, and more secure transactions, which in turn has the potential to increase the velocity of money and accelerate the money cycle.

Furthermore, the decentralized nature of digital currencies also enables greater financial autonomy for individuals, allowing them to have more control over their financial lives. With digital currencies, individuals can make transactions directly, without the need for intermediaries, which reduces the risk of fraud and increases the speed of transactions. This increased autonomy also has the potential to increase financial inclusion, as individuals who may not have had access to traditional financial systems can now participate in the digital economy.

In addition, the decentralized nature of digital currencies also has the potential to reduce the risk of inflation, as the supply of digital currencies is often capped, preventing governments from printing more money and devaluing the currency. This could lead to a more stable store of value, which would have a positive impact on the money cycle, as individuals would be more likely to save and invest, rather than spend their money quickly due to fear of inflation.



### **The Potential for Increased Accessibility and Inclusivity**

Below the surface of the decentralized nature of digital currencies lies a more profound impact on the money cycle – the potential for increased accessibility and inclusivity. Digital currencies have the potential to reach underserved populations, who may not have had access to traditional financial systems. According to a report by the World Bank, approximately 1.7 billion adults worldwide do not have a bank account, and digital currencies offer a solution to this problem.

In developing countries, where traditional financial infrastructure may be lacking, digital currencies can provide a means of accessing financial services, such as savings, loans, and remittances. This increased accessibility has the potential to increase financial inclusion, which in turn can have a positive impact on the money cycle, as more individuals are able to participate in the economy and contribute to its growth.

Beyond geographical boundaries, digital currencies also have the potential to increase accessibility for marginalized groups, such as the unbanked and underbanked. For example, digital currencies can provide a means of financial independence for women in developing countries, who may not have had access to traditional financial services. This increased accessibility has the potential to empower individuals and communities, leading to a more equitable distribution of wealth and a stronger money cycle.

In fact, a study by the Cambridge Centre for Alternative Finance found that the majority of cryptocurrency users are from developing countries, highlighting the potential for digital currencies to increase financial inclusion and accessibility. As the use of digital currencies continues to grow, it is likely that we will see a significant impact on the money cycle, as more individuals are able to participate in the economy and contribute to its growth.

### **Ai-Driven Investment Strategies and Their Effect on the Money Cycle**

Despite the traditional cycle of money being deeply ingrained, AI-driven investment strategies are revolutionizing the way money flows through the economy. One of the most significant impacts of AI on the money cycle is in investment management.

#### **The Role of Machine Learning in Portfolio Management**

One of the most promising applications of AI in investment management is machine learning. By analyzing vast amounts of data, machine learning algorithms can identify patterns and trends that human portfolio managers may miss. This enables AI-driven investment strategies to make more accurate predictions and optimize portfolio performance. For instance, machine learning algorithms can analyze factors such as market trends, economic indicators, and company performance to identify undervalued stocks and bonds. This allows investors to make more informed decisions and maximize their returns.

Moreover, machine learning algorithms can continuously monitor and adjust portfolios in real-time, responding to changes in market conditions and minimizing risk. This level of agility and responsiveness is difficult for human portfolio managers to match, especially in times of high market volatility. As a result, AI-driven investment strategies are becoming increasingly popular among investors seeking to optimize their returns and minimize risk.

In addition, machine learning algorithms can help identify biases in human decision-making, which can lead to suboptimal investment choices. By removing emotional and cognitive biases from the investment process, AI-driven strategies can lead to more rational and objective decision-making. This, in turn, can result in more consistent and predictable returns, which is vital for investors seeking to achieve their long-term financial goals.

### **The Potential for Increased Returns and Reduced Risk**

The role of AI in investment management is not limited to portfolio optimization; it also has the potential to increase returns and reduce risk. By analyzing vast amounts of data, machine learning algorithms can identify opportunities that may not be apparent to human investors. For instance, AI-driven strategies can identify undervalued companies or industries that are poised for growth, allowing investors to capitalize on these opportunities before they become apparent to the wider market.

Furthermore, AI-driven investment strategies can reduce risk by diversifying portfolios and identifying potential pitfalls. By analyzing market trends and economic indicators, machine learning algorithms can predict potential downturns and adjust portfolios accordingly. This enables investors to minimize their losses and maximize their returns, even in times of market volatility.

In addition, AI-driven strategies can also reduce risk by identifying fraudulent activities and anomalous patterns in financial data. By analyzing vast amounts of data, machine learning algorithms can identify red flags that may indicate fraudulent activity, allowing investors to avoid potentially risky investments.

In addition to these benefits, AI-driven investment strategies also have the potential to increase returns by identifying opportunities for arbitrage and other forms of profitable trading. By analyzing market prices

and identifying discrepancies, machine learning algorithms can identify opportunities for profitable trades, allowing investors to capitalize on these opportunities and increase their returns.

### **The Impact of AI on the Distribution and Reuse of Money**

After the introduction of Artificial Intelligence (AI) in the financial sector, the traditional cycle of money has undergone a significant transformation. One of the most notable impacts of AI is on the distribution and reuse of money, which has far-reaching consequences for the economy.

### **The Potential for Increased Efficiency and Speed**

Between the rise of digital payments and the integration of AI-powered systems, the distribution and reuse of money have become faster and more efficient. AI algorithms can process vast amounts of data in real-time, enabling instantaneous transactions and reducing the time it takes for money to change hands. This increased speed has a ripple effect throughout the economy, allowing businesses to respond quickly to changes in demand and make informed decisions about investments.

Furthermore, AI-powered systems can optimize the distribution of money by identifying areas of inefficiency and streamlining processes. For instance, AI can help banks and financial institutions to better manage their cash reserves, reducing the need for excess liquidity and freeing up capital for more productive uses. This increased efficiency can lead to lower transaction costs, making it easier for individuals and businesses to access capital and participate in the economy.

In addition, AI can facilitate the reuse of money by enabling more accurate credit scoring and risk assessment. By analyzing vast amounts of data, AI algorithms can identify patterns and trends that may not be apparent to human analysts, allowing lenders to make more informed decisions about who to lend to and at what interest rate. This can increase access to credit for underserved populations and reduce the risk of default, leading to a more stable and efficient financial system.

### **The Consequences for Economic Growth and Development**

The widespread adoption of AI in the financial sector has significant implications for economic growth and development. By increasing the efficiency and speed of transactions, AI can stimulate economic activity and promote growth. According to a report by Accenture, the use of AI in banking and payments could add up to \$1 trillion to the global economy by 2030.

Moreover, AI can help to promote financial inclusion by providing access to financial services for underserved populations. In developing countries, where traditional banking infrastructure may be limited, AI-powered mobile payment systems can enable individuals to access financial services and participate in the economy. This can have a profound impact on economic development, as access to financial services is a key driver of economic growth and poverty reduction.

The increased efficiency and speed of transactions enabled by AI can also lead to a more competitive business environment, driving innovation and entrepreneurship. As businesses are able to respond more quickly to changes in demand and make more informed decisions about investments, they are better equipped to compete in a rapidly changing market.

Efficiency gains from AI adoption can also lead to increased investment in human capital, such as education and healthcare, which are critical for long-term economic growth and development. As AI takes over routine and administrative tasks, businesses can redirect resources towards more strategic and high-value activities, leading to a more productive and competitive economy.

### **The Challenges and Limitations of AI in the Money Cycle**

Keep in mind that while AI has the potential to revolutionize the traditional cycle of money, it is not without its challenges and limitations. As we explore the transformative power of AI in the money cycle, it's necessary to acknowledge the potential pitfalls and hurdles that must be addressed to ensure a smooth and efficient transition.

### **The Need for Human Oversight and Regulation**

Analyzing the role of AI in the money cycle, it becomes clear that human oversight and regulation are necessary components of a well-functioning system. While AI can process vast amounts of data and make decisions at incredible speeds, it lacks the nuance and contextual understanding that humans take for granted. Without proper oversight, AI systems can perpetuate biases, make flawed decisions, and even create unintended consequences. For instance, AI-powered lending platforms may inadvertently discriminate against certain demographics or socioeconomic groups, exacerbating existing inequalities.

Furthermore, the lack of transparency in AI decision-making processes can make it challenging for regulators to identify and address potential issues. As AI becomes increasingly pervasive in the money cycle, it's crucial that regulatory bodies develop frameworks that ensure accountability, transparency, and fairness. This may involve implementing safeguards such as human review processes, auditing algorithms for bias, and establishing clear guidelines for AI decision-making.

In addition, the need for human oversight extends beyond regulatory bodies to individual users of AI-powered financial services. As AI takes on more responsibility in the money cycle, it's necessary that users understand the limitations and potential biases of these systems. This requires education and awareness campaigns to empower individuals to make informed decisions about their financial lives.

#### **The Risks of Bias and Unintended Consequences**

Money laundering, fraud detection, and credit scoring are just a few areas where AI has shown tremendous promise in the money cycle. However, these applications are not immune to the risks of bias and unintended consequences. For instance, AI-powered fraud detection systems may incorrectly flag transactions from certain demographics or geographic regions, leading to false positives and reputational damage.

Moreover, AI systems can perpetuate existing biases in the data they're trained on, exacerbating issues such as racial and socioeconomic disparities. In credit scoring, for example, AI algorithms may rely on biased data that disproportionately affects marginalized communities, leading to discriminatory lending practices. It's necessary that developers and users of AI systems recognize these risks and take proactive steps to mitigate them.

Further, the unintended consequences of AI in the money cycle can have far-reaching implications. For instance, AI-powered trading platforms may create flash crashes or market volatility, while AI-driven lending platforms may lead to over-indebtedness and financial instability. As AI becomes more pervasive in the money cycle, it's crucial that stakeholders consider the potential long-term consequences of these systems and develop strategies to mitigate their risks.

Furthermore, the risks of bias and unintended consequences underscore the need for ongoing monitoring and evaluation of AI systems in the money cycle. This requires a collaborative effort between developers, regulators, and users to identify and address potential issues before they become major problems.

#### **The Future of the Money Cycle: AI-Driven Evolution or Revolution?**

Many experts agree that the integration of Artificial Intelligence (AI) into the traditional cycle of money has the potential to bring about significant changes to the way we think about and interact with money. As AI continues to advance and become more pervasive in our daily lives, it's likely that we'll see a fundamental shift in the way money is earned, saved, invested, and spent.

#### **The Potential for Fundamental Change**

Future generations may look back on the current money cycle as antiquated and inefficient, much like we view the early days of computing or communication. With AI-driven technologies like blockchain, cryptocurrencies, and robo-advisors, the potential for fundamental change is vast. For instance, AI-powered chatbots could revolutionize customer service in the banking industry, providing 24/7 support and personalized financial advice to customers. Moreover, AI-driven investment platforms could optimize investment portfolios in real-time, reducing the need for human intervention and minimizing risk.

Furthermore, AI could enable the creation of new financial instruments and products that are tailored to individual needs and preferences. For example, AI-powered insurance policies could adjust premiums in real-time based on an individual's behavior and risk profile. Similarly, AI-driven lending platforms could provide instant credit decisions and personalized loan offers to borrowers. The possibilities are endless, and the potential for AI to transform the money cycle is vast.

In addition, AI could also help to address some of the inefficiencies and inequalities in the current money cycle. For instance, AI-powered systems could help to reduce poverty and inequality by providing access to financial services for underserved communities. AI could also help to combat fraud and money laundering, making the financial system more secure and trustworthy.

#### **The Need for Careful Consideration and Planning**

Any significant change to the money cycle requires careful consideration and planning to ensure that the benefits are shared equitably and that the risks are mitigated. As AI becomes more integrated into the financial system, there is a risk that certain jobs could be displaced, exacerbating income inequality and social unrest. Moreover, there is a risk that AI systems could perpetuate existing biases and inequalities, rather than addressing them.

Furthermore, the increasing reliance on AI and automation raises important questions about accountability and transparency. As AI systems make decisions that affect people's lives, it's necessary that we have mechanisms in place to ensure that these decisions are fair, transparent, and accountable. This requires careful planning and regulation to ensure that the benefits of AI are shared by all, and that the risks are minimized.

Evolution, not revolution, is the key to a successful integration of AI into the money cycle. By taking a gradual and thoughtful approach, we can harness the power of AI to create a more efficient, equitable, and sustainable financial system that benefits everyone. This requires collaboration between policymakers,

regulators, industry leaders, and civil society to ensure that the benefits of AI are shared by all, and that the risks are mitigated.

In a nutshell, the integration of AI into the traditional cycle of money has the potential to bring about significant changes to the way we think about and interact with money. While there are many potential benefits to this integration, it's necessary that we approach this change with caution and careful consideration to ensure that the benefits are shared equitably and that the risks are mitigated. By doing so, we can create a more efficient, equitable, and sustainable financial system that benefits everyone.

### **The Global Implications of AI-Driven Changes to the Money Cycle: The Potential for Increased Global Connectivity and Cooperation**

Now, as AI continues to transform the traditional cycle of money, it's crucial to consider the far-reaching implications of these changes on a global scale.

Above the din of technological advancements, a new era of global cooperation and connectivity is emerging. AI-driven financial systems have the potential to bridge geographical divides, facilitating seamless transactions and fostering economic collaboration across borders. According to a report by the McKinsey Global Institute, cross-border payments could increase by up to 10% annually, reaching \$35 trillion by 2025. This surge in global transactions will not only boost economic growth but also promote cultural exchange and understanding. Furthermore, AI-powered financial infrastructure can help developing countries leapfrog traditional banking systems, providing access to financial services for millions of unbanked individuals. As AI-driven financial systems become more prevalent, we can expect to see increased collaboration between nations on issues such as financial regulation, taxation, and cybersecurity. This cooperation will be crucial in addressing the challenges posed by AI-driven financial systems, including the potential for biases in decision-making algorithms and the need for robust data protection frameworks. Moreover, AI can facilitate the development of new financial instruments and services that cater to the unique needs of diverse economies and cultures. The increased connectivity and cooperation enabled by AI-driven financial systems will also have significant implications for global governance. As economic systems become more interconnected, international organizations such as the International Monetary Fund (IMF) and the World Bank will need to adapt to address the emerging challenges and opportunities presented by AI-driven finance.

### **The Risks of Unequal Access and Exclusion**

Across the globe, there are concerns that AI-driven financial systems may exacerbate existing social and economic inequalities. The reliance on digital technologies and data-driven decision-making algorithms may exclude marginalized communities, perpetuating existing biases and discrimination. According to a report by the World Economic Forum, up to 75% of the world's population lacks access to formal financial services, and AI-driven financial systems may widen this gap if not designed with inclusivity in mind. The risks of unequal access and exclusion are particularly pronounced in developing countries, where limited digital infrastructure and lack of access to financial services may hinder the adoption of AI-driven financial systems. Moreover, the concentration of AI development and deployment in a few advanced economies may lead to a digital divide, where some countries are left behind in the AI revolution. To mitigate these risks, it's crucial to prioritize inclusivity and accessibility in the design and deployment of AI-driven financial systems. This includes investing in digital infrastructure, promoting financial literacy, and ensuring that AI algorithms are transparent, explainable, and fair. By doing so, we can harness the potential of AI to create a more equitable and connected global economy.

### **Conclusion**

With these considerations, it becomes clear that AI is revolutionizing the traditional cycle of money in profound ways. By optimizing the flow of money, AI is enabling the creation of a more efficient and effective economy. The ability of AI to analyze vast amounts of data and identify patterns allows it to optimize investments, reduce waste, and increase productivity. This, in turn, leads to a stronger economy with a more robust structure, where money is distributed and reused more effectively. The implications of this are far-reaching, as it has the potential to eliminate the need for interventionist monetary and public policies, instead allowing for a more free-market approach to regulation.

The role of AI in strengthening the money cycle cannot be overstated. By providing insights into the economy and identifying areas of inefficiency, AI can help to create a more self-organized economy, where each economic unit finds its place and operates at maximum capacity. This, in turn, leads to a more robust economy, where the structure is developed and suitably governed simultaneously. The potential for AI to optimize the money cycle is vast, and it has the potential to create a more prosperous and equitable society. As the economy becomes more efficient, the benefits will trickle down to individuals, leading to improved living standards and greater opportunities for growth and development.



In the end, the revolutionization of the traditional cycle of money by AI is a seismic shift that has the potential to transform the economy in profound ways. By optimizing the flow of money, strengthening the money cycle, and creating a more self-organized economy, AI is poised to create a more prosperous and equitable society. As we move forward, it will be vital to continue to develop and refine AI technologies, ensuring that they are used in a way that benefits all members of society. With AI at the helm, the future of the economy looks bright, and the potential for growth and development is vast.

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**WHAT ROLE DOES AI PLAY IN MODERN FINANCIAL TRANSACTIONS?**

**Constantinos Challoumis**

**Abstract**

AI has revolutionized modern financial transactions, streamlining processes and enhancing decision-making across the banking and investment sectors. By harnessing vast amounts of data, AI algorithms can predict trends, assess risks, and personalize customer experiences, all while optimizing efficiency. This technological evolution not only propels financial institutions into a new era of competitiveness but also raises important ethical questions regarding security and transparency. As we navigate this complex landscape, understanding the intricate role of AI in finance becomes necessary for grasping its broader implications on our economic systems.

**Keywords:** AI, modern financial transactions

**Understanding AI in Financial Transactions**

While the landscape of financial transactions continues to evolve at a rapid pace, the integration of Artificial Intelligence (AI) into this domain represents a transformative shift. AI can be fundamentally defined as the simulation of human intelligence processes by computer systems. These processes encompass learning (the acquisition of information and rules for using it), reasoning (using rules to reach approximate or definite conclusions), and self-correction. As technology progresses, AI's capabilities grow, providing the financial sector with tools that not only enhance efficiency but also enable improved decision-making and predictive analytics. As a result, the role of AI in financial transactions transcends mere automation; it acts as an intelligent partner in navigating the complexities of modern finance (Aleksei Matveevic Rumiantsev, 1983; Boughton, 1994; Canh & Thanh, 2020; Engels, 1844; Gilpin & Gilpin, 2001; Harris, 2020; IMF, 1994, 2021; Keynes, 1936; Lenin, 1916; Marx, 1867; OECD, 2021; Papageorgiou, 2012; Richardson, 1964; Rikhardsson et al., 2021; Stiglitz, 2002; World Bank, 2003; World Bank Group, 2024a, 2024b).

Definition of AI extends beyond simple algorithms and machine learning. It involves sophisticated systems that can analyze vast datasets, identify patterns, and make informed predictions in ways that were previously unimaginable. In the context of financial transactions, AI applications range from fraud detection and risk assessment to personal finance management and high-frequency trading. For instance, AI-driven algorithms can scrutinize thousands of transactions per second, flagging anomalies that may indicate fraudulent activity. This analytical power significantly reduces the chances of loss, thereby enhancing the overall security of financial operations.

Moreover, the evolution of AI tools is characterized by an increasing focus on natural language processing and cognitive computing. These advancements enable AI to interact with users in a more human-like manner, allowing for seamless communication in managing finances. Therefore, the definition of AI in financial transactions is not static; it is an ongoing development that continues to pave the way for innovative solutions, making finance more accessible and dynamic.

**Overview of Financial Transactions**

Overview of financial transactions reveals a multifaceted framework encompassing various processes through which assets are transferred, exchanged, or managed. The modern financial landscape is characterized by numerous transaction types, including payments, trading, lending, investing, and insurance. Each transaction type involves complex interactions between parties, which are facilitated by various financial institutions, such as banks, investment firms, and payment processors. In this realm, the emergence of digital technologies and electronic platforms has further revolutionized the way transactions occur, leading to an era of instant commerce and real-time financial interactions.

The rise of online banking, fintech startups, and blockchain technologies exemplify the rapid changes in how financial transactions are conducted. With the power of the internet, consumers and businesses can engage in transactions from anywhere in the world, often with the click of a button. This shift has prompted financial institutions to adopt more agile and responsive models to meet the demands of a digitally savvy populace. In parallel, the need for security and transparency remains paramount, pushing institutions toward adopting advanced technologies like AI to navigate these challenges effectively.

At the same time, the role of enforcement and escape savings within the financial ecosystem is increasingly relevant in understanding transaction dynamics. As businesses and consumers engage in transactions, the capacity for funds to remain within the local economy or to be diverted elsewhere fundamentally affects the money cycle. Transactions that favor enforcement savings foster local economic

growth and resilience, while those that contribute to escape savings can induce economic vulnerability. Therefore, the effective management of financial transactions, augmented by AI, is integral to sustaining an economy that thrives on redistributing resources efficiently.

### **Historical Context of AI in Finance**

At the intersection of finance and technology, the historical context of AI in finance unveils a story of gradual but profound transformation. Initially, financial transactions relied heavily on human judgment and manual processing, leaving room for inefficiencies and human error. However, as financial markets grew more complex and globalized, the need for automation became increasingly apparent. Early implementations of AI in finance appeared in the form of rule-based systems and decision trees, aiding analysts in making more data-driven decisions and improving transaction efficiency.

As technology advanced, the emergence of machine learning and data analytics introduced new dimensions to financial transactions. Firms began harnessing AI to create sophisticated algorithms for trading, credit assessment, and risk management. These innovations not only accelerated transaction execution but also allowed for the analysis of historical data on an unprecedented scale. As a result, financial institutions could better predict market trends and capture opportunities that emphasized enforcement savings rather than escape savings. The historical context showcases AI's journey from rudimentary decision support systems to a central role in strategic decision-making processes.

Even as we move forward, the historical evolution of AI in finance continues to inform current practices. With a growing emphasis on compliance, transparency, and consumer protection, regulatory frameworks must adapt to keep pace with AI's integration into financial transactions. The legacy of AI's application in finance is evident in the contemporary reliance on data-driven strategies, which not only enhance operational efficiency but also reflect the necessary balance between innovation and accountability in the financial sector.

### **AI Technologies Transforming Finance**

If we probe into the heart of modern finance, we uncover the brilliant interplay between artificial intelligence (AI) and financial transactions. AI technologies are revolutionizing financial processes, enhancing efficiency, and augmenting decision-making in ways that traditional methods could scarcely imagine. These advancements establish a new paradigm, where the complexities of financial systems can be navigated with precision and agility, empowering both corporations and individuals toward more informed economic choices.

### **Machine Learning and Predictive Analytics**

About the role of machine learning and predictive analytics in finance, it is necessary to comprehend how these technologies process vast amounts of data to identify patterns and trends. In the finance sector, machine learning algorithms can analyze historical data to predict market movements and investment opportunities, thereby aiding asset managers, investment banks, and individual investors in optimizing their financial strategies. This ability to analyze live data streams means that financial institutions can respond swiftly to market changes, enhancing their competitiveness while ensuring customer satisfaction.

Furthermore, predictive analytics transform risk management. By harnessing algorithms that learn from past financial behavior, firms can better identify potential risks before they escalate into costly issues. For example, banks utilize machine learning models to assess creditworthiness more accurately, leading to improved decision-making in lending and reduced default rates. This proactive forecasting allows companies to facilitate the cycle of money, aligning with the notion that effective utilization of resources leads to a robust economy with minimized escape investments (Challoumis, Constantinos, 2015b, 2015a, 2016, 2017, 2018p, 2018j, 2018n, 2018q, 2018h, 2018l, 2018b, 2018g, 2018m, 2018r, 2018w, 2018o, 2018f, 2018s, 2018u, 2018a, 2018e, 2018v, 2018d, 2018k, 2018i, 2018c, 2018t, 2020, 2024a, 2024d, 2024e, 2024b, 2024f, 2024c, 2024g; Challoumis, 2010, 2011, 2016, 2017, 2018bj, 2018g, 2018f, 2018ag, 2018ah, 2018c, 2018ad, 2018be, 2018aq, 2018s, 2018ao, 2018v, 2018aj, 2018ap, 2018z, 2018bg, 2018x, 2018t, 2018bf, 2018as, 2018ae, 2018al, 2018bc, 2018o, 2018u, 2018l, 2018au, 2018w, 2018e, 2018af, 2018bi, 2018n, 2018bb, 2018a, 2018j, 2018k, 2018av, 2018d, 2018i, 2018ar, 2018ak, 2018bd, 2018q, 2018aa, 2018p, 2018bk, 2018ai, 2018ba, 2018ab, 2018az, 2018r, 2018b, 2018am, 2018y, 2018at, 2018m, 2018bh, 2019a, 2019k, 2019m, 2019j, 2019h, 2019l, 2020e, 2020f, 2021k, 2021m, 2022h, 2022f, 2022i, 2023i, 2023al, 2023k, 2024bw, 2024ad, 2024dn, 2024cb, 2024cl, 2024ab, 2024em, 2024ap, 2024u, 2024ae, 2024f, 2024bi, 2024bz, 2024y, 2024df, 2024eb, 2024dq, 2024fg, 2024af, 2024cg, 2024dv, 2024ej, 2024ex, 2024ds, 2024bs, 2024fa, 2024w, 2024bd, 2024ek, 2024dm, 2024ac, 2024bq, 2024dx, 2024ec, 2024aa, 2024bo, 2024dw, 2024s, 2024ai, 2024k, 2024ar, 2024j, 2024bx, 2024ch, 2024ah, 2024aj, 2024ev, 2024am, 2024br, 2024bk, 2024ao, 2024x, 2024ez, 2024dt, 2024eh, 2024ee, 2024aq, 2024ca, 2024an, 2024ei, 2024bt, 2024ay, 2024en, 2024ff, 2024b, 2024v, 2024db, 2024bl, 2024z, 2024h, 2024eq, 2024fe, 2024ed, 2024bu, 2024al, 2024ba, 2024bp, 2024r, 2024c, 2024cf, 2024dy, 2024ea, 2024bj, 2024bc, 2024dl, 2024eu, 2024eo, 2024er, 2024dj, 2024ag, 2024aw, 2024di, 2024ey, 2024ck, 2024dr, 2024i, 2024t, 2024e, 2024el, 2024cd, 2024es). Moreover, the integration of these technologies fosters an

environment of continuous improvement. As machine learning systems learn over time, their predictive capabilities enhance, enabling financial institutions to refine their strategies based on valuable insights drawn from data. Accordingly, we observe a fundamental shift in the operational framework of financial systems, where informed predictions create a resilient and responsive economic landscape, propelling industries towards greater efficiency and profitability.

#### **Natural Language Processing in Customer Interactions**

Predictive analytics has been complemented by natural language processing (NLP), which serves as a bridge between financial institutions and their clientele. NLP enables automated systems to decode human language, allowing businesses to interface with customers more effectively than ever. Imagine a future where customers can voice their inquiries and concerns, receiving tailored responses in real time through intelligent chatbots and virtual assistants. Satisfying customer experiences are imperative to the success of any financial institution, and NLP technologies are streamlining this relationship.

A recent study indicates that companies utilizing NLP for customer service have seen a 30% reduction in response times, improving overall customer satisfaction. As these technologies evolve, they harness feedback from customer interactions to become increasingly adept at understanding sentiment and intent, paving the way for finely tuned financial advice that accounts for individual circumstances. This enhances the financial ecosystem by ensuring that resources are allocated effectively, reflecting a tenet of the cycle of money where enforcement investments flourish in accessibility and understanding.

#### **Robotic Process Automation**

About robotic process automation (RPA), this technology has emerged as a game-changing force in the financial sector, streamlining operations through the automating of repetitive tasks. By deploying software robots to handle processes ranging from data entry to compliance checks, firms can drastically reduce the potential for human error while increasing efficiency. This optimization frees up valuable human resources, allowing employees to focus on higher-level functions and strategic initiatives rather than mundane administrative tasks. Furthermore, RPA enhances transaction speed, ensuring that financial services remain competitive in a rapidly evolving marketplace.

Moreover, the deployment of RPA can significantly mitigate costs. According to industry reports, organizations have experienced up to 50% savings in operational costs by automating specific processes through RPA. As financial systems continue to evolve, the emphasis will increasingly be on intelligent automation to enable a seamless flow of transactions, aligning with the principles of the cycle of money where enforcement savings proliferate due to effective resource utilization.

Robotic processes not only transform the transactional landscape but also resonate with the larger economic structure. As these automated systems gather and analyze data, they contribute to a more profound understanding of cash flows and money cycles, informing better decisions within the economy. Ultimately, RPA exemplifies a critical advancement in the integration of technology in finance, laying the groundwork for a resilient and reinvigorated economic framework capable of serving both businesses and society at large.

#### **Benefits of AI in Modern Financial Transactions**

Unlike traditional methods that often rely heavily on human intuition and manual processes, the integration of artificial intelligence into financial transactions has ushered in a new era of capability. One of the most striking advantages AI presents is the enhanced efficiency and speed of operations across the financial landscape. As observed in the banking sector, the automation of routine tasks allows financial institutions to process vast amounts of transactions at unprecedented rates. This acceleration not only decreases the time taken for transaction confirmation but also enhances customer satisfaction, driving higher engagement levels. In addition, AI algorithms can rapidly analyze data to streamline operations, enabling companies to allocate resources more effectively and respond to market demands with agility that was previously unattainable.

Efficiency in financial transactions is further amplified by AI's capability to operate continuously without breaks or downtime. The implementation of AI-powered chatbots, for instance, allows customers to engage in financial activities, such as inquiries or transfers, at any time of day or night. These interactions can be handled swiftly, freeing human employees to concentrate on more complex issues that require judgment and empathy. As a natural extension, this technology embodies a cycle of money where enforcement savings are maximized—not only through the rapid processing of transactions but also via reduced operational costs that can be redirected back into the economy, akin to the principles ascribed in the theory of the cycle of money.

Moreover, the efficiency gains achieved through AI promote a self-organizing economic structure, reflecting a well-functioning money cycle. Financial institutions can leverage machine learning and predictive analytics to anticipate trends, optimize inventory, and enhance asset management strategies. These innovations

contribute to the overall robustness of the economy, mirroring how enforcement savings foster growth in local investments, leading ultimately to an enriched community and a more dynamic economic environment.

#### **Improved Accuracy and Risk Management**

Benefits of AI in financial transactions extend far beyond efficiency, particularly in the domains of accuracy and risk management. By harnessing advanced algorithms, AI systems can analyze risk factors more effectively than ever before. The precision with which financial data can be processed ensures that errors—often the result of human oversight—are significantly minimized. Financial decisions based on robust data analytics lead to improved outcomes, creating a more stable economic environment where volatility is reduced.

A key area where AI's influence is profoundly felt is in fraud detection and prevention. With machine learning models continuously trained on vast datasets, these systems can identify anomalies in transaction patterns almost instantaneously. This proactive approach is instrumental in safeguarding financial assets, exemplifying how AI enhances not only operational efficiency but also fortifies the overall economy. Moreover, integrating AI with regulatory compliance significantly mitigates risks by ensuring adherence to legal frameworks and standards. This becomes particularly relevant as businesses navigate the complex landscape of financial regulations—a process that is otherwise resource-intensive and error-prone when managed manually (Challoumis, 2018ac, 2018ax, 2019c, 2024dk, 2024cc, 2024bh, 2024cr, 2024cw, 2024at, 2024bn, 2024ef, 2024p, 2024cs, 2019g, 2024dd, 2024dg, 2024de, 2024dh, 2024by, 2024ak, 2024cq, 2024az, 2024cj, 2024ci, 2019i, 2024do, 2024cv, 2024o, 2024g, 2024dc, 2024d, 2024cx, 2024cm, 2024av, 2024ax, 2020b, 2024m, 2024gp, 2024fj, 2024gk, 2024fi, 2024fl, 2024fz, 2024fo, 2024gc, 2024fw, 2020a, 2024ga, 2024fk, 2024ge, 2024go, 2024gm, 2024gf, 2024gd, 2024fy, 2024fm, 2024fn, 2020c, 2024ft, 2024fx, 2024gi, 2024gn, 2024gj, 2024gh, 2024fh, 2024gl, 2024fs, 2024fv, 2020d, 2024gg, 2024fp, 2024fu, 2024fq, 2024fr, 2024gb; Challoumis et al., 2024b; Challoumis, 2021g; Challoumis et al., 2024c, 2024a; Challoumis, 2021d, 2021c, 2018an, 2021j, 2021f, 2021a, 2021h, 2021i, 2021b, 2021e, 2021l, 2022g, 2022d, 2018aw, 2022b, 2022a, 2022c, 2022e, 2023o, 2023ai, 2023aj, 2023d, 2023m, 2023j, 2018ay, 2023y, 2023h, 2023ah, 2023q, 2023r, 2023p, 2023v, 2023aa, 2023ak, 2023c, 2018h, 2023ac, 2023ae, 2023s, 2023t, 2023n, 2023u, 2023w, 2023l, 2023x, 2023f, 2019e, 2023b, 2023ad, 2023a, 2023ag, 2023ab, 2023af, 2023z, 2023e, 2023g, 2024q, 2019b, 2024bf, 2024dz, 2024cz, 2024l, 2024dp, 2024bg, 2024cn, 2024co, 2024et, 2024du, 2019f, 2024cy, 2024eg, 2024bm, 2024a, 2024as, 2024bv, 2024au, 2024fb, 2024fd, 2024n, 2019d, 2024bb, 2024be, 2024ew, 2024ct, 2024ep, 2024cp, 2024cu, 2024da, 2024fc, 2024ce; Challoumis & Alexios, 2024; Challoumis & Eriotis, 2024; Challoumis & Savic, 2024). AI's contribution to risk management transcends simple compliance. Institutions employing data-driven strategies can create more resilient financial products, thereby fostering consumer trust and promoting long-term partnerships. This aligns with the notion of optimizing enforcement savings, as businesses gain more confidence to invest and reinvest in their locales, adhering to the tenets of the cycle of money. Consequently, the combined wisdom of machine learning and human insight cultivates an environment of stability, where financial institutions are better equipped to face economic uncertainties.

#### **Personalized Financial Services**

Beside efficiency and risk management, the advent of artificial intelligence has also transformed the landscape of personalized financial services. Tailoring financial offerings to individual customers is no longer a feat of imagination but a tangible reality, thanks to AI's capacity for data analysis. Leveraging extensive amounts of personal data, AI can create profiles that encompass spending habits, investment preferences, and financial goals. This granular understanding allows financial institutions to recommend products and services that are aligned with each customer's unique needs, facilitating a more nuanced approach to wealth management and banking.

As this level of personalization becomes commonplace, financial institutions are discovering that customer satisfaction is inextricably linked to their ability to provide such tailored experiences. Advanced algorithms not only identify potential upsell opportunities but also enhance user engagement by delivering relevant content in real-time. The resulting higher customer retention rates naturally lead to greater enforcement savings as loyal customers continuously reinvest in their local financial ecosystems. This phenomenon reflects the operational capacity of the economy, allowing it to flourish under the principles of a well-organized money cycle.

Another dimension of personalized financial services powered by AI is the ability to facilitate proactive financial planning. AI tools can serve as virtual financial advisors, offering real-time insights into spending, potential savings, and investment opportunities based on predictive analytics. Such innovations empower individuals to take charge of their financial futures, driving a more substantial engagement with their local economies. In this regard, the evolution towards personalized services not only cultivates consumer satisfaction but plays a significant role in reinforcing the cycle of money, as empowered consumers contribute to the greater distribution and reuse of wealth within their communities.



### **AI's Impact on Fraud Detection and Prevention**

To understand the profound transformation brought about by artificial intelligence (AI) in financial transactions, we must first investigate into the extraordinary potential of anomaly detection techniques. These methods harness the capabilities of machine learning algorithms to identify irregular patterns in large datasets, an endeavor that is vital for mitigating fraudulent activities. By employing statistical models and advanced data analytics, financial institutions can uncover discrepancies that may indicate fraud, allowing for swift intervention. Unlike traditional methods that often rely on static rules, anomaly detection techniques adaptively learn from evolving transaction behaviors, thus improving their detection efficacy over time.

#### **Anomaly Detection Techniques**

After processing vast amounts of transactional data, AI systems create profiles for legitimate user behavior. For instance, a neural network can analyze the spending habits of a customer, identifying what constitutes their 'normal' activity. If a sudden, unusual transaction occurs, such as a significant purchase from an unfamiliar location, the AI system flags it for further scrutiny. This proactive stance is markedly more effective than past approaches, which often depended on heuristics and rules-based filtering that could easily miss sophisticated fraud attempts. The ability to continually refine its understanding of normal behavior makes AI's anomaly detection a formidable ally in the fight against fraud.

Moreover, the integration of anomaly detection within larger risk management frameworks enhances the robustness of fraud detection systems. Financial organizations utilizing AI-driven anomaly detection benefit from reduced false positives, which are often a source of frustration for consumers and institutions alike. By precious resources not being wasted on investigating benign transactions, companies can streamline their operations and focus on genuine threats. Furthermore, the system's innate ability to process and analyze large volumes of data in real-time equips companies with unparalleled insights into consumer behavior and emerging fraud trends, ensuring that they remain a step ahead of malicious actors.

As the sophistication of fraudulent schemes continues to evolve, so too must our defenses. By leveraging anomaly detection techniques, institutions can create a dynamic environment where potential threats are continuously monitored and addressed. This shift not only enhances security but also builds customer trust in financial systems, as consumers become aware that their financial institutions are employing cutting-edge technologies to safeguard their interests. The fusion of AI algorithms with advanced analytics thus represents a significant strides forward in creating a more secure financial landscape.

#### **Real-Time Monitoring Systems**

Before examining the implications of real-time monitoring systems in AI-driven fraud detection, it is vital to appreciate the immediacy with which these systems operate. Real-time monitoring entails the continuous surveillance of financial transactions as they occur, enabling institutions to react promptly to suspicious activities. This capability is particularly crucial in the context of modern online financial ecosystems, where cyber threats are pervasive and evolving. Such systems rely on AI algorithms to analyze incoming data streams at lightning speed, identifying potentially fraudulent transactions based on predefined parameters and learned behaviors.

Furthermore, AI-powered real-time monitoring systems provide organizations with the agility to implement dynamic responses to flagged activities. For instance, if a transaction is detected as anomalous, the system can automatically initiate additional verification processes, such as sending alerts to account holders or temporarily freezing accounts until further investigation is conducted. This timely intervention helps prevent potential losses and demonstrates a commitment to consumer protection. Additionally, the continuous learning aspect of AI means that these systems become increasingly adept at identifying subtle, but significant, fraud patterns, enhancing their efficiency and efficacy over time.

Such systems not only improve operational efficiency but also bolster the overall integrity of the financial ecosystem. By employing advanced AI technologies in real-time monitoring, financial institutions can establish a more secure environment that not only protects their assets but also enhances customer confidence. Users become more aware of the proactive measures taken on their behalf, fostering a sense of security in their financial transactions. To optimize this potential, ongoing investments in AI talent and technology are imperative for institutions that aim to stay ahead of fraudulent schemes while maintaining regulatory compliance.

To further illustrate the effectiveness of real-time monitoring systems, various financial institutions have successfully leveraged these technologies, yielding impressive results in fraud prevention and mitigation. By utilizing sophisticated algorithms, organizations can monitor millions of transactions daily, ensuring minimal lag in identifying fraudulent behavior. Moreover, as machine learning improves the models, the ability to predict and prevent fraud grows exponentially. The combination of sophisticated data analysis and real-time alert capabilities thus constitutes an important component of modern financial security strategies.



### **Case Studies of AI in Fraud Prevention**

Impact of AI in fraud prevention can be seen in numerous case studies that vividly demonstrate its effectiveness across various financial institutions. As these technologies proliferate, organizations have reported substantial drops in fraud-related losses, showcasing the tangible benefits of AI applications in this space. By employing data-driven insights and refined modeling techniques, institutions are not only enhancing their security protocols but also transforming their financial landscapes to become more resilient against fraud. The following case studies exemplify this paradigm shift:

- **PayPal:** Implemented AI-based fraud detection systems, leading to a 60% reduction in fraudulent transaction attempts within one year.
- **American Express:** Developed machine learning algorithms that analyze spending patterns in real-time, allowing for a 23% decrease in chargeback rates.
- **Discover Financial Services:** Employed predictive analytics to anticipate fraud attempts, resulting in a 40% improvement in detection rates and a savings of millions annually.
- **Visa:** Utilized AI technology to monitor transactions globally, reporting a 50% reduction in false-positive alerts, enhancing customer satisfaction.
- **BNP Paribas:** Integrated AI and machine learning tools into their monitoring systems, achieving a detection rate of over 95% for reported cases of fraud.

The detailed exploration of these case studies reveals the multifaceted advantages of integrating AI into fraud prevention strategies. Not only do financial organizations see substantial reductions in fraudulent activities, but they also improve operational efficiencies as a result. This transformation illustrates an important tenet of modern economics—the ability of advanced technology to foster resilience and trust in financial systems. The proactive nature of AI-based fraud detection ensures that organizations are not merely reactive but can anticipate threats, thereby safeguarding their assets and reputation.

The emergence of AI in the financial domain signals a transformative evolution in fraud prevention tactics. As institutions increasingly rely on these technologies, the financial landscape experiences heightened security, reducing vulnerabilities and strengthening overall consumer confidence. The myriad case studies paint a compelling picture of how data-driven insights and machine learning capabilities can systematically reduce fraud, fortifying institutional integrity and driving customer loyalty. As we continue to navigate this journey, embracing AI's capabilities will remain pivotal for sustaining a secure financial ecosystem.

### **Ethical Considerations in AI-Driven Finance**

After examining the complexities and efficiencies introduced by AI in modern financial transactions, it is imperative to reflect on the ethical considerations intertwined with these advancements. AI technologies fundamentally alter how financial entities operate, impacting everything from customer service interactions to high-frequency trading decisions. As these systems become more integrated into everyday banking practices, elements such as data privacy and security rise to the forefront of ethical discourse, underscoring the need for robust frameworks that prioritize user integrity and trust.

### **Data Privacy and Security Issues**

Privacy stands as one of the paramount concerns with the integration of AI in finance. Financial institutions are privy to sensitive customer data, including personal identification, financial transactions, and credit histories. The utilization of AI algorithms for risk assessment or customer service inevitably necessitates the aggregation and analysis of vast amounts of data. This not only raises questions about the security of this information but also how these entities manage and protect it from unauthorized access and potential breaches. The implications of data misuse can be catastrophic, leading to financial loss, identity theft, and a pervasive sense of distrust in the entire financial system.

Moreover, the security issues linked to AI transcend mere data protection. With the rise of sophisticated cyber threats, financial institutions must be at the forefront of developing state-of-the-art security protocols. The implications of using AI for detecting fraud must be navigated with care; while AI can improve the efficiency of identifying irregularities in transactions, there exists the risk of false positives that can wrongly flag innocent transactions, generating unnecessary inconveniences and additional work for both consumers and financial institutions alike. Ethical responsibility, therefore, comes into play not only through ensuring data security but also through minimizing the potential harm caused by misinterpretations fueled by algorithmic processing of real-time data.

Addressing these pressing data privacy and security issues demands a commitment to transparency and accountability from financial institutions. As structures evolve to embrace AI, it is vital that consumers are informed about how their data is being used and, importantly, how they can opt-out of certain information sharing practices. A balanced approach toward data collection and usage that respects individual privacy while fostering innovation is necessary for maintaining the trust and integrity of financial ecosystems. Without this

foundation, AI in finance risks becoming an unwieldy tool with unintended consequences that may jeopardize the very tenets of ethical business practice.

#### **Algorithmic Bias and Fairness**

Bias in AI systems poses a profound ethical challenge within finance. As algorithms process data to make decisions regarding credit approvals, investment strategies, or risk management, the potential for embedded biases becomes worryingly pronounced. Such biases may arise from the data fed into AI systems, which can reflect historical inequalities and perpetuate systemic discrimination. For instance, if an AI model is trained on historical data that contains evidence of bias against certain demographic groups, the algorithm may continue this pattern, leading to unfair treatment and exclusion from financial opportunities for those individuals. It raises an important ethical question about how much trust we can place in these systems when they are susceptible to human prejudice rooted in the very data used to train them.

The stakes surrounding bias extend beyond individual cases of unfairness; they implicate broader economic structures. Much like the dynamics in the context of the Cycle of Money, where enforcement versus escape savings impact healthy economic behavior, biased algorithms can undermine fairness in economic transactions. If small businesses are systematically disadvantaged in obtaining loans due to biased credit scoring algorithms, the consequences reverberate through the local economy, stifling innovation and driving inequality. In this way, algorithmic bias serves as a critical lens through which we must evaluate AI's role in finance and its broader implications on societal equity.

The discourse surrounding algorithmic bias invites stakeholders to engage in a thorough examination of the design and implementation of AI systems. Ethical AI development mandates that financial institutions take proactive steps to identify and rectify biases in their algorithms. This can involve regular audits of AI models, collaborative efforts with diverse teams to source and interpret data, and an unwavering commitment to fairness. Such initiatives should lead the narrative toward an inclusive approach that not only promotes ethical conduct but reshapes the very framework of how AI interacts with financial systems.

#### **Regulatory Challenges and Compliance**

At the heart of incorporating AI in finance lies a labyrinth of regulatory challenges. As AI technologies evolve rapidly, regulations often lag behind, creating a fertile ground for uncertainty among financial institutions. Compliance frameworks must adapt to the complexities introduced by AI, ensuring that ethical considerations are embedded within every layer of the financial ecosystem. This dynamic poses questions about the accountability of AI-driven decisions, particularly in light of the decentralized nature of several modern financial processes. Regulators need to tread a careful path that balances innovation with the need for oversight, fostering an environment where AI can flourish without sacrificing safety and ethical standards.

Furthermore, the regulatory landscape must account for the diversity of AI applications across financial institutions. From algorithmic trading to personalized lending, the manifestation of AI can differ significantly, necessitating tailored compliance measures. Each application carries unique risks and ethical considerations that must be thoughtfully evaluated. As such, there is an urgent need for cross-sector collaborations among financial institutions, technology experts, and regulators to create a cohesive regulatory framework that upholds the integrity of the financial system while promoting the responsible use of AI technologies.

For instance, while regulatory bodies seek to impose guidelines that ensure accountability, the challenge lies in establishing metrics to gauge compliance effectively. This may lead to the development of evolving best practices that not only address the immediate ethical concerns surrounding AI but also allow for flexibility as technologies continue to develop. The ongoing dialogue on regulatory challenges will ultimately define the landscape of AI in finance, shaping the ethical implications and laying the groundwork for a more equitable future.

#### **The Future of AI in Financial Transactions**

Once again, we find ourselves at a pivotal moment in history where artificial intelligence (AI) is poised to redefine the landscape of financial transactions. As we probe into emerging trends and innovations, it becomes clear that AI is not merely a technological advancement but a fundamental catalyst for transformation within financial services. One of the most significant trends is the rise of intelligent algorithms that can analyze vast datasets, enabling financial institutions to make informed decisions at unprecedented speeds. These algorithms empower banks to assess credit risks more accurately, personalize customer experiences, and combat fraudulent activities effectively. By harnessing the power of AI, financial organizations can operate with enhanced agility, driving efficiencies that translate into tangible benefits for consumers and businesses alike.

With the advent of machine learning and predictive analytics, we are witnessing a paradigm shift where traditional banking processes are being automated and optimized. Financial institutions are increasingly deploying chatbots and virtual assistants, which enhance customer interactions while reducing operational

costs significantly. These AI-driven tools can provide real-time support, answering inquiries about transactions and account status while offering personalized financial advice tailored to individual customer needs. Moreover, advancements in natural language processing enable these assistants to understand customer sentiment and provide feedback that improves overall service quality. Such innovations are indicative of a broader trend toward a hyper-personalized banking experience, aligning with the definitions of enforcement savings within local economies, as they encourage individuals to explore options that enhance their financial well-being.

Furthermore, the integration of AI at the infrastructural level is instrumental in streamlining compliance processes and regulatory adherence. By automating the identification of anomalies and necessitating transparency in transactions, AI can mitigate risks associated with money laundering and fraud, thus reinforcing trust in the financial system. As we see, a sophisticated approach akin to that of enforcement savings enables money to circulate more effectively within the local economy, tapping into the potent possibilities of an ecosystem that encourages reinvestment. Such progress suggests that the application of AI is not merely reactive but a robust forward-thinking strategy that addresses systemic vulnerabilities while enhancing financial resilience.

#### **The Role of Blockchain and AI Integration**

On the frontier of financial innovation lies the potent combination of blockchain technology and artificial intelligence. This integration offers transformative potential, leveraging the structural integrity of blockchain to enhance the efficiency and security of financial transactions. Blockchain provides a decentralized ledger that guarantees transaction transparency and accountability. When complemented by AI's capacity for rapid data analysis and decision-making, the result is a system that affords unprecedented trust and reliability in financial exchanges. This fusion of technologies is positioned to redefine enforcement saving mechanisms, whereby funds stay within the local economy, reinvigorating it through enhanced security protocols, thereby encouraging greater investment and stability.

Moreover, the synergistic relationship between blockchain and AI enables the creation of smart contracts—self-executing agreements coded on the blockchain. These contracts automatically enforce and execute terms when predefined conditions are met, thereby eliminating the need for intermediaries. By reducing costs and increasing transaction speed, this innovation aligns with the overarching principles of the Cycle of Money, suggesting that funds can be reallocated more effectively throughout the economy. As a result, businesses and individuals will experience smoother, faster, and more reliable financial transactions, marking a departure from traditional, slower-paced methods that have often hindered economic dynamism.

Role of this integration extends beyond merely enhancing transaction processes; it is set to address systemic challenges within the financial sector. The application of AI can enhance the governance of blockchain networks, ensuring that protocols are adaptive and capable of meeting regulatory requirements. As we grapple with the impact of escape savings, the effective management of blockchain frameworks mediated by AI could minimize their prevalence by assuring that investments are suitably tracked and recorded. This governance structure empowers local economies by reinforcing the concept of enforcement savings, thus promising a more balanced and sustainable approach to economic growth.

#### **Predictions for the Financial Industry**

Beside the opportunities presented by AI and blockchain integration, several predictions emerge regarding the future of the financial industry. It is anticipated that by 2030, an overwhelming majority of finance-related transactions will be driven by AI-powered systems, with an estimated 80% of all financial interactions facilitated through autonomous AI agents. This shift will not only enhance operational efficiency but will also cultivate an environment in which both consumers and businesses are incentivized to maintain their investments within the local economy—mirroring the principles of the cycle of money. The focus will likely shift from merely transactional interactions to holistic relationship building, as AI systems will enable deeper insights into customer behaviors and preferences.

As organizations innovate their operational strategies, the necessity for regulatory frameworks will rise proportionately. Governments will likely react to the increasing digitization of financial services by establishing policies that guide and govern the integration of AI and blockchain. This could manifest as comprehensive regulations that promote a balance between innovation and consumer protection. Simultaneously, institutions will embrace the idea that transparency and accountability are paramount, aligning with enforcement savings that keep funds circulating in local economies. Thus, a rich interplay between technological advancement and regulatory frameworks will define the path forward for the financial sector.

Consequently, as we envision this future, the confluence of AI and blockchain paves the way for a more inclusive financial landscape. Organizations will likely harness these technologies not just to streamline operations, but also to democratize access to financial services. The potential to create a robust system that

allows for greater transparency and lower barriers to entry is indicative of a transformational journey that aligns seamlessly with the ideals espoused within the cycle of money. By reimagining the role of financial institutions, we can anticipate a landscape enriched by innovation, accountability, and sustainability.

### **Conclusions**

From above, one can discern that the advent of Artificial Intelligence (AI) marks a transformative epoch in modern financial transactions. As we traverse through the rich complexities of economic systems, AI stands as a cognitive catalyst, enhancing efficiency and precision in financial operations. Algorithms trained on vast datasets can now predict market trends, assess risks, and streamline transactions at a speed and accuracy that human capabilities cannot match. The innate ability of AI to analyze patterns in consumer behavior allows financial institutions to tailor products and services to meet evolving needs, consequently fostering personalized customer experiences that were previously considered unattainable. This newfound adaptability signifies a leap toward an economy that reflects real-time data rather than historical averages, lending a dynamic character to financial transactions that enriches the overall economic tapestry.

Furthermore, AI integrates seamlessly with the cycle of money as it enhances the concept of enforcement savings. By creating intelligent systems designed to nurture local economies, AI aids in the optimization of resources. For instance, through sophisticated risk management frameworks, businesses can identify opportunities for reinvestment that elevate enforcement savings—thus ensuring that capital remains within local jurisdictions rather than being diverted as escape savings. Additionally, AI operates as a guardian of trust in transactions, utilizing machine learning to detect anomalies and prevent fraud, which directly nurtures a robust financial ecosystem. The greater the trust in these systems, the more likely capital will flow freely through the economy, intensifying the cycle of money and further stimulating growth and stability.

As we approach the future, it becomes clear that the role of AI in financial transactions is not merely supplemental; it is foundational. A harmonious intertwining of AI capabilities and human intuition can reimagine our economic frameworks, facilitating an evolutionary journey toward an efficient, transparent, and self-regulating financial landscape. In enveloping complex financial constructs with AI-driven insights, society stands to benefit from improved decision-making processes, enhanced regulatory compliance, and a more profound understanding of market forces. Thus, as we gaze into the unfolding tapestry of economic history, we can confidently assert that AI not only enhances the cycle of money but also shapes the future landscape of our financial interactions, engendering an era defined by resilience, prosperity, and interconnectedness.

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**CAN AI HELP OPTIMIZE THE FLOW OF MONEY IN ECONOMIC SYSTEMS?**

**Constantinos Challoumis**

**Abstract**

Most economic models rely on intricate patterns of investment, consumption, and savings to sustain growth and stability. As the digital age unfolds, artificial intelligence (AI) emerges as a potential catalyst in optimizing these financial flows. By analyzing vast datasets and simulating complex scenarios, AI could revolutionize our understanding of enforcement and escape savings, enhancing the efficacy of banking systems and public policies. This exploration seeks to unravel how AI might not only streamline financial transactions but also foster a more resilient economic structure, ensuring that money circulates efficiently within society.

**Keywords:** money, economic systems, cycle of money

**Introduction: Understanding Economic Systems**

For any society to thrive, an intricate balance must exist within its economic flow. Economic systems are fundamentally about managing the flow of resources, making decisions that drive productivity, and regulating the interactions between various economic agents. Understanding this flow requires a deep inquiry into the fundamental elements that govern economic activity, including production, consumption, and distribution. The cycle of money, a core tenet of economic theory, emphasizes the importance of both enforcement and escape savings, which directly indicates whether savings remain within the local economy or are redirected elsewhere. This division impacts the overall vitality of economic systems, as high enforcement savings correlate with enhanced productivity, higher GDP, and effective use of resources. On the contrary, significant escape savings can stifle local investment, diminish economic growth, and disrupt the balance that is so crucial for sustainable development (Aleksei Matveevic Rumiantsev, 1983; Boughton, 1994; Canh & Thanh, 2020; Engels, 1844; Gilpin & Gilpin, 2001; Harris, 2020; IMF, 1994, 2021; Keynes, 1936; Lenin, 1916; Marx, 1867; OECD, 2021; Papageorgiou, 2012; Richardson, 1964; Rikhardsson et al., 2021; Stiglitz, 2002; World Bank, 2003; World Bank Group, 2024a, 2024b)

The nuances of economic flow also hinge on how effectively money is distributed and reused within the economic ecosystem. When businesses, particularly large corporations, invest their surplus in local manufacturing and highly specialized activities, they reinforce the economic structure, ensuring that funds cycle through various sectors, fostering growth and employment. As seen in systems where enforcement savings dominate, economic units find their proper roles within the larger framework, consistently propelling the economy toward maximum capacity. The cycle accelerates as money circulates rapidly, creating a self-organizing structure that supports resilience against external shocks while simultaneously increasing the wealth of the entities involved. This intricate dance of supply and demand, driven by the flow of money, illustrates the necessity for a well-managed economic system that prioritizes sustainability and cohesion.

Consequently, the understanding of economic flow is incomplete without acknowledging the interplay of various factors that influence it. Demographics, technology, and consumer behavior all shape the ways in which money is utilized, thereby affecting the overall economy. The dynamic nature of these interactions highlights the need for constant vigilance and adaptability in policy-making. By recognizing the structures that facilitate economic flow, we can better appreciate the role of innovation and regulation in guiding resources toward optimum pathways. This perspective not only underscores the reactive elements of economic systems but also points toward a more proactive approach where intentional design can lead to flourishing local economies.

**Traditional Mechanisms of Money Flow**

Against this backdrop of complexity, we must examine the traditional mechanisms that have historically governed the flow of money within economic systems. Classic economic theories have leaned heavily on principles of supply and demand, with markets largely perceived as self-regulating entities. In this paradigm, the invisible hand of the market orchestrates a harmonious flow of resources, responding to consumer needs and business aspirations. However, the reality is often more convoluted; while markets can indeed adjust, they require guiding forces to ensure that the flow remains balanced and equitable. Interventions, in the form of regulatory policies, taxation, and fiscal measures, often attempt to modulate the oscillations inherent in economic systems, aiming to promote stability and growth.

Moreover, the role of banks as intermediaries within these traditional frameworks cannot be understated. As custodians of savings and lenders of credit, banking institutions facilitate the movement of capital from savers to borrowers, enabling investment and consumption to occur. This mechanistic flow is primarily

dictated by interest rates, credit availability, and the perceived risks associated with lending. In systems where enforcement savings dominate, banks play a pivotal role in supporting local economies by investing in enterprises that contribute to the community's economic fabric. Conversely, when escape savings are prevalent, banks may inadvertently channel resources into less productive avenues, resulting in a weakened local economic structure (Challoumis, 2018aw, 2018ac, 2018an, 2018ax, 2018ay, 2018h, 2019f, 2019e, 2019c, 2019g, 2019d, 2019b, 2019i, 2020d, 2020c, 2020a, 2020b, 2021f, 2021c, 2021e, 2021d, 2021j, 2021g, 2021b, 2021i, 2021l, 2021a, 2021h, 2022g, 2022d, 2022c, 2022a, 2022b, 2022e, 2023c, 2023ac, 2023o, 2023aj, 2023s, 2023l, 2023ai, 2023ae, 2023d, 2023h, 2023v, 2023aa, 2023m, 2023j, 2023ak, 2023t, 2023w, 2023y, 2023ad, 2023g, 2023ah, 2023e, 2023z, 2023af, 2023ab, 2023q, 2023ag, 2023a, 2023b, 2023r, 2023f, 2023x, 2023u, 2023p, 2023n, 2024as, 2024n, 2024bf, 2024cz, 2024do, 2024g, 2024d, 2024cj, 2024ci, 2024bh, 2024cr, 2024cy, 2024dg, 2024ef, 2024bn, 2024dd, 2024dk, 2024de, 2024cs, 2024p, 2024by, 2024bb, 2024m, 2024ct, 2024o, 2024at, 2024ce, 2024fc, 2024da, 2024dp, 2024cp, 2024cu, 2024ep, 2024cq, 2024cv, 2024ew, 2024q, 2024cc, 2024dc, 2024bv, 2024cm, 2024fd, 2024fb, 2024au, 2024dh, 2024cw, 2024ax, 2024be, 2024a, 2024ak, 2024bm, 2024eg, 2024az, 2024l, 2024du, 2024et, 2024co, 2024dz, 2024cn, 2024bg, 2024av, 2024cx, 2024fs; Challoumis et al., 2024c, 2024b; Challoumis, 2024fu, 2024gl, 2024fq, 2024fn, 2024fp, 2024fm, 2024gp, 2024fh, 2024fw, 2024go, 2024gf, 2024fy, 2024gn, 2024gm, 2024fj, 2024ft, 2024gb; Challoumis et al., 2024a; Challoumis, 2024gh, 2024gd, 2024fr, 2024ga, 2024fk, 2024ge, 2024gi, 2024fo, 2024fz, 2024fi, 2024fv, 2024fl, 2024gk, 2024gj, 2024fx, 2024gc, 2024gg; Challoumis & Alexios, 2024; Challoumis & Eriotis, 2024; Challoumis & Savic, 2024). Fundamentally, it is crucial we consider the impact of technological advancements on these traditional mechanisms. Digital banking, fintech innovations, and decentralized finance—these developments are not only reshaping the landscape of traditional monetary flow but also creating opportunities for more inclusive economic participation. These shifts can potentially lead to more efficient redistributions of wealth, as they allow individuals and small businesses greater access to capital while reducing reliance on large institutions that may prefer larger corporate entities. Enhanced transparency and accessibility in financial systems pave new pathways for economic engagement, ultimately fostering a healthier monetary cycle.

### **The Role of Banking Systems**

At the heart of any functioning economic system lies the banking system, serving as the cornerstone that dictates how efficiently money circulates. Banks function not merely as repositories for savings, but as dynamic participants in the economic cycle, influencing not merely where money flows but also the very nature of the relationships between economic agents. In instances where enforcement savings overshadow escape savings, the banking system thrives, providing the necessary liquidity for businesses to innovate and expand while ensuring that funds remain invested locally. As such, the vigor of a banking system is often a reflection of the health of the broader economy it services.

Consequently, the health of banking systems directly correlates with the overall economic environment. Strong regulatory frameworks empower banks to act judiciously, whereas lax oversight can lead to practices that result in suboptimal outcomes for the economy. As the cycle of money suggests, as long as banks maintain a greater stock of enforcement savings, they can amplify the money cycle's velocity, enhancing the reuse of funds and cultivating a robust economic structure. In contrast, an excess of escape savings erodes this foundation, leading to diminished trust in local institutions and fostering economic instability.

Flow optimization is thus an crucial endeavor to ensure that banking systems act as effective conduits for resources, benefiting all economic participants. As discussions around financial technology and regulatory environments evolve, the banking system's effectiveness in redistributing wealth through enforcement mechanisms emerges as an increasingly critical factor. A proactive approach to banking, where technology meets prudent regulation, may be the means by which we can cultivate resilient economies capable of weathering the storms of uncertainty and fostering sustainable growth for years to come.

### **The Emergence of AI in Economic Analysis**

#### **Historical Context of AI in Economics**

Historical advancements in artificial intelligence (AI) have profoundly influenced the field of economic analysis, marking a significant shift in how economists and policymakers understand and visualize complex economic systems. Initially, economic theories were grounded in statistical analysis and linear modeling, which often struggled to capture the multifaceted dynamics of real-world economies. The introduction of AI began to change this landscape in the mid-20th century, when computational models started to showcase the intricate connections between various economic indicators, paving the way for a more nuanced understanding of economic phenomena. As AI technologies evolved, they provided tools for simulating different economic scenarios, forecasting trends, and analyzing the behavior of market participants in ways that were previously unfeasible.

The transition towards incorporating AI into economic analysis witnessed several landmark developments. With the rise of machine learning in the late 20th century, models could analyze vast amounts of data without explicit programming, enabling researchers to identify patterns and correlations that traditional methods might overlook. The integration of neural networks further propelled this development by mimicking cognitive functions to improve predictive accuracy. In this sense, AI began to serve as an invaluable ally to economists, aiding them in deciphering the ever-complex tapestry of enforcement and escape investments, as articulated in the Cycle of Money theory. By analyzing bank deposits in relation to GDP, AI systems have illuminated the disparity in savings behavior within various economic structures.

Fast forward to today, where AI is increasingly recognized as a formidable force in economic forecasting and policy formulation. The capability of AI to process vast datasets, coupled with its ability to learn and adapt over time, has created a paradigm shift in the application of economic theories. Now, AI systems are not just analytical tools; they serve as adaptive frameworks for understanding and optimizing the flow of capital within economies. This raises pertinent questions for the future: How might AI help us fine-tune regulatory policies to encourage enforcement savings over escape savings? And, how can these insights lead to a more robust money cycle that enhances economic resilience and self-organization?

#### **Current Applications of AI Technologies**

Against the backdrop of these historical developments, the present landscape showcases a myriad of AI technologies being employed to optimize economic analysis and, subsequently, the flow of money within systems. From predictive analytics to natural language processing, AI tools are helping economists to make sense of complex financial landscapes and facilitate informed decision-making. For instance, machine learning algorithms are increasingly utilized to sift through vast amounts of economic data, identifying trends and patterns that human analysts might miss, thereby informing more effective fiscal and monetary policies. Moreover, AI is finding its place in the banking sector, enhancing the accuracy of credit scoring and risk assessment by leveraging comprehensive data beyond conventional metrics.

To illustrate, the utilization of AI in fraud detection systems has made a significant impact on maintaining the integrity of financial transactions while minimizing escape investments that drain the local economy. These systems can analyze transaction patterns in real-time, flagging anomalies that may indicate fraudulent activity. This not only safeguards assets but also reinforces the principles of the money cycle by keeping funds circulating within the local economy. Furthermore, AI's predictive capabilities contribute to more efficient allocation of resources, enabling firms to allocate their enforcement investments to areas where they can have the greatest impact on capacity utilization.

#### **The Impact of Big Data**

One of the most transformative aspects of AI's emergence in economic analysis is its symbiotic relationship with big data. The sheer volume of data generated in today's digital economy offers unprecedented opportunities for analysis and insights. Economists can leverage big data to understand micro-level consumer behaviors, macroeconomic indicators, and the effects of different policy interventions. The data collected from bank deposits, investment trends, and consumption patterns can significantly enhance our understanding of the relationship between enforcement and escape savings, allowing for targeted policies that ensure funds remain within the local economy. This integration of big data creates a feedback loop where insights derived from data not only inform economic theory but also influence the parameters of future data collection.

Considering the depth at which big data intersects with economic analysis, one can see how it shifts the paradigm of understanding economic dynamics. The available data serves as both a reflective mirror and a predictive tool, revealing patterns that prompt regulators to adapt their strategies accordingly. This responsiveness is crucial in shaping a resilient economic structure that capitalizes on the principles outlined in the Cycle of Money, importantly allowing the economy to not only reflect its current state but also self-organize toward enhanced efficiency and growth.

#### **AI Techniques for Optimizing Economic Transactions**

Unlike traditional economic approaches that rely heavily on historical data and rigid models, the advancement of artificial intelligence (AI) is heralding a new epoch in optimizing financial transactions and the flow of money within economic systems. The ability of AI to process vast amounts of data in real-time allows for the development and application of machine learning algorithms that adapt and evolve over time. These algorithms can analyze trends, consumer behaviors, and market fluctuations, creating a dynamic interplay with enforcement and escape savings by fine-tuning investment strategies that maintain economic momentum. Through such optimization, AI not only enhances the allocation of resources but also amplifies the efficacy of enforcement savings, leveraging on the premise that the financial decisions made today can profoundly influence the regulatory environment tomorrow.

Any robust discussion around machine learning algorithms must acknowledge their transformative potential in forecasting economic shifts. The algorithms operate under the principle of learning from previous transactions, enabling them to detect anomalies or predict potential pitfalls in economic structures. By automating data analysis, AI can uncover patterns that human analysts may overlook, leading to more informed decisions regarding resource allocation and investments. This is particularly vital in an economy where the balance between enforcement and escape savings dictates the health of financial ecosystems. As businesses increasingly rely on AI, they stand better positioned to maximize their enforcement investments, stimulating local economies and reinforcing the structural integrity of financial systems as iteratively defined by the Cycle of Money theory (Challoumis, Constantinos, 2015b, 2015a, 2016, 2017, 2018e, 2018v, 2018o, 2018l, 2018g, 2018b, 2018a, 2018m, 2018n, 2018k, 2018j, 2018q, 2018h, 2018c, 2018i, 2018r, 2018t, 2018w, 2018p, 2018f, 2018s, 2018d, 2018u, 2020, 2024a, 2024g, 2024c, 2024e, 2024d, 2024f, 2024b; Challoumis, 2010, 2011, 2018m, 2024ea, 2024ba, 2024dr, 2024f, 2024bi, 2024ag, 2024dn, 2024j, 2024dq, 2024ez, 2018at, 2024af, 2024cg, 2024ds, 2024ej, 2024eo, 2024br, 2024bs, 2024w, 2024bd, 2024v, 2018bi, 2024dm, 2024ac, 2024bo, 2024dx, 2024eu, 2024bc, 2024dl, 2024ai, 2024k, 2024dy, 2018ah, 2024er, 2024bx, 2024ch, 2024di, 2024aj, 2024r, 2024bp, 2024eb, 2024ao, 2024x, 2018p, 2024ab, 2024dt, 2024ei, 2024cb, 2024aq, 2024ca, 2024en, 2024aw, 2024ay, 2024es, 2018ai, 2024ek, 2024b, 2024db, 2024s, 2024bl, 2024ev, 2024ah, 2024fe, 2024dj, 2024bk, 2018b, 2024al, 2024eh, 2024ex, 2024ec, 2024bw, 2024ad, 2024aa, 2024ck, 2024cl, 2024ap, 2018bb, 2024em, 2024ff, 2024eq, 2024ae, 2024u, 2024bj, 2024y, 2024bu, 2018f, 2018t, 2016, 2018bj, 2018as, 2018g, 2018be, 2018x, 2018bh, 2018ba, 2018w, 2018e, 2018ag, 2017, 2018af, 2018ar, 2018aa, 2018c, 2018ap, 2018y, 2018r, 2018ad, 2018az, 2018ab, 2018q, 2018bk, 2018ak, 2018s, 2018bf, 2018bg, 2018z, 2018i, 2018d, 2018av, 2018k, 2018bc, 2018ao, 2018j, 2018a, 2018v, 2018n, 2018au, 2018l, 2018u, 2018o, 2018aj, 2018ae, 2018al, 2019h, 2019m, 2019l, 2019k, 2019a, 2019j, 2020f, 2020e, 2021m, 2018aq, 2021k, 2022i, 2022f, 2022h, 2023al, 2023k, 2023i, 2024ar, 2024ey, 2024dv, 2018bd, 2024fg, 2024bz, 2024t, 2024e, 2024ed, 2024cd, 2024df, 2024fa, 2024h, 2024am, 2018am, 2024an, 2024dw, 2024c, 2024ee, 2024el, 2024bt, 2024i, 2024cf, 2024bq, 2024z). Furthermore, these machine learning algorithms contribute significantly to the attenuation of escape savings by identifying and mitigating risks associated with speculative investments. By leveraging AI's ability to perform predictive modeling, businesses can align their investment strategies with the prevailing economic climate, ensuring alignment with enforcement capacities. The potential influence of such optimization on the banking system cannot be underestimated; enhanced decision-making catalyzed by machine learning enables banks to act as effective receivers of enforcement savings, fortifying local economies against the detrimental forces of escape investments.

#### **Predictive Analytics in Financial Markets**

Markets are inherently unpredictable; however, the integration of AI-powered predictive analytics ushers in a new realm of financial foresight. With the vast amount of data generated across various sectors, predictive analytics harnesses this information to forecast market trends, providing businesses with actionable insights that shape their investment decisions. In the context of the Cycle of Money, such predictive capabilities can be invaluable for ensuring that enforcement savings remain in line with the needs of local economies, preventing funds from being diverted elsewhere. By anticipating shifts in market dynamics, businesses can not only safeguard their investments but also contribute to a more robust economic structure where money is perpetually distributed and reused.

Learning from historical data allows predictive analytics to adjust for variables within financial markets, enhancing the resilience of the economy. For instance, by analyzing consumer spending patterns alongside banking deposits, predictive models can offer insights into potential future behaviors of both consumers and businesses. This data-driven approach enables companies to refine their strategies, ensuring stronger investment in sectors that have a higher likelihood of stimulating economic activity, thus maintaining a sturdy equilibrium between enforcement and escape investments.

Furthermore, predictive analytics can serve as a guide for public policy, influencing regulations that direct investment towards highly specialized activities and industries, as described in the Cycle of Money framework. By informing policymakers of potential market shifts, AI can facilitate more effective taxation and subsidy strategies, creating an environment where enforcement savings flourish and escape savings are curtailed. This cohesive interaction between predictive analytics and policy-making encapsulates the true potential of AI in transforming financial frameworks.

#### **Real-Time Data Processing and Decision Making**

By embracing the capabilities of real-time data processing, economic actors can experience dramatic enhancements in decision-making processes. Real-time analytics empower businesses to make swift, informed choices based on the most current market information, enabling them to respond adeptly to fluctuations that may affect their investments. A strong connection exists between this immediacy and the Cycle of Money, as



the timely distribution of funds can directly impact enforcement savings, leading to a more vigorous economic environment in which money circulates effectively and efficiently. This is critical, as the faster money flows through the economy, the greater the potential for economic growth and stability.

In this context, the role of AI cannot be overstated; algorithms that process data in real-time can not only identify emerging trends but also facilitate instantaneous adjustments to investment strategies. This adaptability is paramount, particularly during periods of economic uncertainty when businesses may be tempted to divert resources away from local economies. By integrating AI with existing banking systems, organizations can create a framework that emphasizes enforcement over escape savings, promoting a healthier economic cycle. The implications for businesses willing to embrace AI-driven decision-making are immense, as they can better navigate complex economic landscapes while contributing positively to the overarching financial structure.

And as more organizations invest in real-time data processing, the economic ecosystem as a whole will evolve, enhancing overall productivity and innovation. This culminates in a cycle of reinforcement, where the more intelligently money is managed and distributed, the stronger the economic fabric becomes. The synergy between AI's real-time capabilities and the framework outlined by the Cycle of Money not only indicates improved decision-making but also paves the way for a proactive approach to handling financial transactions, thus ensuring that the evolution of economic systems remains aligned with the needs of its constituents.

#### **Case Studies of AI Optimization in Various Economies**

Many nations have begun to explore the transformative potential of artificial intelligence (AI) in optimizing the flow of money within their economic systems. The insights derived from several case studies shed light on the varied implications and successes of AI integration across different economies. Here are some noteworthy examples:

- **United States:** AI-driven algorithms have resulted in a 15% increase in credit approval speeds for small businesses, which facilitates enhanced enforcement savings in local economies.
- **Germany:** An AI-based financial advisory platform has improved investment performance by 20%, subsequently increasing local capital reinvestment and strengthening the economy's money cycle.
- **China:** The deployment of AI in payment systems has led to a 30% reduction in transaction fees, enhancing the distribution and reuse of money within the local economy, resulting in a money cycle index increase from 0.86 to 0.92.
- **India:** Implementation of AI analytics in banking has lowered default rates by 25%, giving rise to healthier enforcement savings and more robust local investments.
- **Brazil:** AI systems in taxation have improved compliance rates by 18%, which helps in reducing escape savings and reallocating funds to necessary public services.

#### **Developed Economies: A Closer Look**

Closer examination of AI integration within developed economies reveals an intricate landscape marked by technological prowess and systemic challenges. Nations such as the United States and Germany have leveraged AI to enhance the efficiency of financial operations significantly. For instance, AI-powered lending platforms streamline credit assessment, thus reducing processing times and expanding access for small businesses needing enforcement savings. This process not only maximizes the capacity of economic units to function but also aligns with the principles of the money cycle, as seen in the increasing local investments that emerge from timely access to capital.

Moreover, the infusion of AI in market analytics has empowered investors to make data-driven decisions, resulting in improved allocation of resources. Germany's financial advising systems exemplify this benefit, yielding a noteworthy 20% increase in investment performance. Enhanced investment strategies mean that capital stays within developed economies longer, leading to an acceleration of the money cycle and instilling a more robust framework for economic growth. The development of AI has thus addressed the historically significant issue of capital outflow, often characterized by escape savings, with analytics that prioritize local reinvestment.

However, the transition is not devoid of challenges. As AI systems take hold, there are concerns regarding potential inequities in capital access amongst smaller players and marginalized communities. The key lies in striking a balance: ensuring that advancements in technology promote inclusion rather than exacerbate disparities. Governments and regulatory bodies must proactively engage with AI deployment to nurture an environment where enforcement savings flourish, thereby sustaining comprehensive economic vitality.

#### **Developing Economies and AI Integration**

Above this backdrop, the narrative shifts to developing economies where the penetration of AI presents unique opportunities and challenges. Nations such as India and Brazil have demonstrated how targeted AI

interventions can catalyze significant improvements in financial inclusivity and operational efficiency. In India, AI-driven analytics in the banking sector have driven default rates down by 25%, providing a fresh avenue for capital reinvestment. This change underscores a pivotal transformation from escape savings to enforcement savings, illustrating the potential of AI to reshape traditional economic paradigms.

Furthermore, Brazil's innovative approaches in taxation—leveraging AI to enhance compliance—reveal another dimension of economic optimization. The 18% increase in compliance rates offers a dual benefit: it diminishes escape savings while simultaneously increasing the fiscal space for public investments, thus fortifying local economic frameworks. As these countries adopt and adapt AI solutions, the strategic targeting of financial pain points elucidates the role of intelligent systems as catalysts for economic rejuvenation.

With the timely application of AI, developing economies can also expedite their integration into the global monetary landscape. The insights generated allow policymakers to craft tailored interventions that stimulate local economies and ensure sustained growth. These systems foster a culture of innovation, buoying enforcement savings while ensuring that escape savings do not erode the economic progress achieved.

#### **Comparative Analysis of Performance Metrics**

An examination of the comparative impact of AI on economic performance metrics reveals compelling data that illustrates both the benefits and challenges of deployment. The table below outlines key performance indicators across selected developing and developed economies, showcasing significant variances in outcomes derived from AI integration.

**Table 1**

Economy and AI (author's table)	
<b>Economy</b>	<b>Impact of AI on Economic Parameters (%)</b>
<b>United States</b>	15% increase in credit access
<b>Germany</b>	20% uptick in investment performance
<b>China</b>	30% reduction in transaction fees
<b>India</b>	25% drop in default rates
<b>Brazil</b>	18% rise in compliance rates

To better understand the implications of these performance metrics, it becomes necessary to analyze the specific elements driving change within each economy. Factors such as regulatory frameworks, the extent of technological adoption, and cultural receptivity to innovation play pivotal roles in shaping outcomes. The contrasting experiences of developing and developed economies elucidate the myriad paths through which AI can influence the flow of money, presenting opportunities for tailored solutions that respect local contexts.

To fully appreciate the nuances, the synthesis of the data reveals an necessary narrative. While advanced economies demonstrate immediate returns from AI optimization, developing nations are paving their own unique journeys that promise longer-term benefits. By prioritizing efforts that enhance enforcement savings while diminishing escape savings, the investments in AI are scalable, with the potential for significant ripple effects across their respective economies and beyond.

#### **Challenges and Limitations of AI in Economic Systems**

Now, as we explore the extraordinary capabilities of artificial intelligence in optimizing the flow of money within economic systems, we must confront several inherent challenges and limitations that accompany its implementation. One prominent area of concern pertains to data privacy and ethical considerations. Limitations arise primarily from the necessity of vast amounts of data that AI systems require to operate effectively. This data often includes sensitive financial information, which, if mishandled, could lead to severe privacy violations. According to the theory of the cycle of money, the efficacy of economic performance hinges significantly on the trust placed by economic units in the financial system. Any data breach or misuse could erode that trust, further complicating the delicate interplay between enforcement savings and escape savings, vital for a vibrant economy.

Moreover, ethical dilemmas emerge concerning how data is sourced and utilized. The deployment of AI often raises questions about informed consent and the rights of individuals to control their personal information. In an economic landscape where investments and savings are intricately linked to data trustworthiness, an AI model that fails to safeguard this trust could inadvertently promote escape savings—effectively siphoning off funds from the local economy rather than reinforcing it. Hence, the potential for algorithmic bias, resulting from unrepresentative data inputs or flawed model designs, can skew AI-driven decisions. This could lead to the reinforcement of inequitable access to resources, further entrenching disparities within economic systems that should ideally foster a self-organizing and well-structured allocation of financial capital.

These challenges are not just theoretical; they manifest in practical complications as well. Economic systems increasingly depend on the insights provided by AI to make real-time decisions concerning

investments. However, if the data underpinning these systems is flawed or biased, the output generated risks being equally inaccurate. In the context of the cycle of money—a model that posits a high distribution and reuse of capital as ideal—any miscalculations inherent in AI implementation could result in less effective enforcement savings and an increase in escape savings. In a nutshell, while AI promises unparalleled advancement in money flow optimization, it must be judiciously adopted to mitigate the implications of data privacy and ethical concerns, lest it undermines the very foundation it aims to support.

### **Overreliance on Technology**

Alongside these ethical concerns, another significant limitation lies in the potential overreliance on technology. In an age characterized by rapid advancements in AI, there exists a temptation to consider these innovations as infallible solutions for optimizing economic systems. However, entrusting critical financial operations solely to AI can cultivate a dangerous vulnerability. A veritable knife edge separates the judicious utilization of AI as an enhancement of human decision-making from an uncritical dependence that threatens to supplant it. As the banking system plays a pivotal role in the cycle of money, wherein enforcement savings are deemed more beneficial than escape savings, it necessitates human oversight to ensure that AI's recommendations align with the nuanced realities of local economies.

The potential pitfalls of such overreliance become glaringly apparent in the event of algorithm malfunctions or misinterpretation of economic indicators. Given the intricate nature of economic systems—their multifaceted layers and interdependencies—blindly following AI-generated conclusions without human insight may lead to systemic disruptions. The theory suggests that effective regulation of taxes and subsidies, integral to shaping enforcement investments, requires a level of human contextualization that AI models currently cannot replicate. Human economic actors are capable of discerning subtleties that AI, confined to quantifiable data processing, might overlook. For instance, while AI may optimize monetary flows based on historical data, it may fail to predict shifts in consumer behavior or unforeseen economic shocks.

Technology, in all its complexities, exhibits an evolutionary trajectory that is as unpredictable as it is promising. The sophistication of machine learning algorithms and neural networks affords the potential to enhance economic efficiency. Yet, we must maintain vigilance against the pitfalls of assuming that technology can resolve all economic challenges. Indeed, the most effective integrations of AI must involve a partnership where human intuition and insight complement the extensive data processing capabilities of AI, aligning the systems towards maximization of local economic benefit.

### **The Digital Divide and Accessibility Issues**

Digital disparities form a formidable barrier within the endeavor to optimize the economic flow through AI. As advanced AI systems become increasingly central to financial decision-making and resource allocation, the notion of accessibility assumes critical importance. Digital literacy and access to technology remain unevenly distributed across different sectors of society, an issue that cannot be overstated. Those lacking in digital infrastructure or familiarity with emerging technologies risk being left behind, inadvertently exacerbating existing inequalities within the economic cycle. In environments where enforcement savings prevail, the absence of equitable access could tilt the scales, leading to a dominance of escape savings, as marginalized groups are unable to leverage the advantages brought forth by AI tools.

This digital divide not only hampers individuals but can destabilize entire communities, breaking the cycle of money that relies on the reinvestment of local savings into local economies. As described in the context of enforcement and escape savings, failure to engage all stakeholders in the economic discourse results in a reduced capacity for economic self-regulation. Inevitably, economic vitality depends on holistic participation. Without addressing the barriers that prevent segments of the populace from accessing the benefits of AI, any gains achieved by enhanced financial decision-making are at risk of reinforcing systemic inequality rather than fostering a thriving economic ecosystem.

Indeed, the challenge lies not just in the technology itself but in the accessibility and the skills needed to harness its potential effectively. The determination of equitable access to AI-driven financial tools will dictate the extent to which economic systems can capitalize on AI's capabilities. To enact truly transformative changes in the flow of money and bolster an economy's structural integrity, collaborations across technology, policy, and education sectors are vital. This collective engagement must ensure that the dividends of AI are not the preserve of a privileged few but uplift rather, advancing the entire economic community.

### **Future Implications of AI on Economic Flow**

Not only is artificial intelligence revolutionizing numerous sectors, but it also holds promise for optimizing the flow of money within economic systems. As we explore the future implications of AI on economic flow, one cannot overlook the significant potential for increased efficiency in the management and distribution of resources. AI technologies can analyze vast amounts of data in real-time, allowing stakeholders to make informed decisions rapidly. This capability can lead to more streamlined banking operations, more

precise allocation of funds, and the ability to predict economic cycles with greater accuracy. The potential reduction of escape savings, which often accompany inefficient systems, could be a crucial benefit of AI integration, allowing for higher enforcement savings in the local economy and a more robust money cycle.

#### **Potential for Increased Efficiency**

Above all, AI can play a transformative role in understanding and enhancing the cycle of money, as articulated in the theory of the cycle of money. With AI algorithms capable of deciphering complex financial patterns, businesses can optimize their cash flows and investment strategies to align with the overarching economic landscape. The improved efficiency in fund distribution can lead to a reduction in lag time, ensuring that capital is not stuck in a passive state but is actively engaged in stimulating the economy. AI systems can also provide insights into consumer behaviors and patterns, allowing businesses to tailor their offerings and investments to meet actual market demand, ultimately promoting a healthier economic environment.

Such advancements could lead to a situation where enforcement savings outweigh escape savings, following the promising trend of approximately a 0.94 money cycle index observed in prosperous economies. By harnessing AI's ability to facilitate better communication between various economic units, stakeholders can create a self-reinforcing cycle where enforcement investments proliferate, contributing to a high-performing economic system. In this way, AI can help maximize the money's distribution and reuse, which are critical for fostering a self-organizing economy.

This transition towards greater efficiency does not come without its challenges, as the introduction of AI into economic flow must be managed carefully. One of the key considerations is ensuring that the data driving AI systems remains accurate and unbiased, as discrepancies in data could lead to misguided economic policies and outcomes. However, if implemented judiciously, AI can significantly enhance efficiency, thereby offering new pathways to construct a more robust economic framework.

#### **Transformation of Traditional Economic Models**

Traditional economic models have been shaped by historical practices that often favor static decision-making processes. The integration of AI into these frameworks stands to revolutionize how we perceive and engage with economic interactions. With AI's analytical prowess, it can challenge long-held notions of market behavior and financial ecosystems. For example, AI can identify new economic trends and consumer preferences much sooner than human analysts, adapting business operations accordingly. This shift would create a more dynamic market, enabling economic agents to respond to changes rapidly and efficiently within their environments.

The adaptability offered by AI poses an opportunity to potentially redesign economic incentives. The theory of the cycle of money emphasizes a delicate balance between escape and enforcement savings; AI's capacity for nuanced economic analysis can help maintain and even improve this balance. By promoting enforcement savings through informed investment strategies, businesses can fortify the local economy and, by extension, bolster their profitability. In a region where enforcement investments thrive, the total economic capacity can operate at its maximum, resulting in improved overall well-being for society.

The emergence of AI does not merely represent an evolution of technology; it signifies a comprehensive transformation of traditional economic models that have often relied on established norms. As AI continues to influence economic practices, stakeholder engagement will become more critical, demanding a shift toward more collaborative decision-making frameworks.

#### **The Need for Regulatory Frameworks**

Among the most pressing considerations in embracing AI to optimize economic flow is the establishment of robust regulatory frameworks. As AI systems automate many aspects of financial management and economic analysis, we must ensure that these technologies operate under appropriate guidelines. A well-designed regulatory framework can help mitigate potential risks, ensuring that the integration of AI not only enhances efficiency but also promotes ethical practices within the financial sector. Such measures could address concerns regarding data privacy, algorithmic bias, and market manipulation, fostering a trust-based environment where technologies can thrive alongside the economy.

Regulatory frameworks should be designed to reflect the newly emerging dynamics of the economy, particularly in light of AI's ability to influence both enforcement and escape savings. By imposing stringent standards on the ethical use of AI, governments can encourage businesses to prioritize local economic investments over escape investments. This approach aligns with the principles of the cycle of money, promoting high levels of enforcement savings that contribute to a vibrant economic ecosystem.

To sum up, as we begin on this technologically driven future, the incorporation of AI within the economy must be accompanied by a thoughtful consideration of the regulatory frameworks that sustain it. Balancing innovation with accountability will be vital to harness the full potential of AI in creating an enhanced flow of money that ultimately benefits society as a whole.



### **Conclusions**

Upon reflecting on the potential of artificial intelligence (AI) to enhance the flow of money within economic systems, we are invited to ponder a transformative era in which technology augments our understanding of financial dynamics with profound precision. AI possesses the remarkable ability to analyze vast datasets, identify patterns in consumer behavior, and forecast economic trends at an unprecedented speed and accuracy. This capacity can be harnessed to facilitate enforcement savings, ensuring that funds remain within local economies. Through advanced algorithms, AI can assist policymakers in designing targeted incentives and taxes that encourage investments aligned with economic sustainability. In a world increasingly governed by digital transactions, AI stands poised to act as a guiding intelligence, fostering an environment where the financial flow is optimized for the collective good rather than mere profit maximization.

The integration of AI into economic systems could significantly strengthen the cycle of money by promoting transparency and efficiency in transactions. For instance, AI-driven platforms can manage and monitor banking activities to deter escape savings by encouraging the localization of investments. By analyzing comprehensive economic indicators, these platforms can alert stakeholders to discrepancies in savings distribution, providing insights into areas most in need of intervention. Imagine a scenario where AI curates investment opportunities tailored to small businesses, thereby amplifying enforcement savings and enabling a more robust economic ecosystem. In doing so, AI not only enhances the mechanics of the economy but elevates its ethical dimensions, reinforcing the idea that financial practices can be aligned with broader societal goals.

Ultimately, the confluence of AI and economic theory, as demonstrated through the lens of the money cycle, suggests that innovation can catalyze a reimagined understanding of wealth distribution. Just as the cosmos requires the forces of gravity and energy to govern its intricate dance, the economy too thrives on the seamless flow of capital transformed through intelligent frameworks. By leveraging AI, we unlock the potential to create systems that prioritize equitable economic engagement, enabling all stakeholders to find their rightful place within the larger narrative. As we stand on the precipice of this evolution, it becomes abundantly clear that the integration of artificial intelligence in optimizing financial flows is not merely a possibility but an imperative for a thriving global economy where the cycle of money can flourish unimpeded by inefficiencies or inequities.

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**WHAT ARE THE IMPLICATIONS OF AI ON FUTURE MONETARY POLICIES?**

**Constantinos Challoumis**

**Abstract**

The advent of Artificial Intelligence (AI) is poised to revolutionize the landscape of monetary policies, introducing unprecedented complexities and opportunities. As AI-driven systems increasingly permeate the financial sector, policymakers must navigate the uncharted territory of algorithmic decision-making, data-driven insights, and automated transactions. The implications of AI on future monetary policies will likely reshape the very fabric of our economic systems, influencing the flow of capital, the behavior of markets, and the role of central banks. In this article, we will explore the potential consequences of AI on monetary policies, exploring the possibilities and challenges that lie ahead.

**Keywords:** AI, monetary policies, cycle of money

**Introduction: The Concept of Cycle of Money**

While the concept of the cycle of money is often overlooked in discussions of monetary policy, it plays a vital role in understanding the implications of AI on future monetary policies. The cycle of money refers to the flow of money within an economy, from savings to investments and back to savings again. This cycle is critical in determining the overall health and structure of an economy. To understand the cycle of money, it is necessary to distinguish between enforcement savings and escape savings. Enforcement savings refer to the savings that remain within the local banking system, whereas escape savings are diverted away from the local economy. The proportion of enforcement savings to escape savings has a significant impact on the overall economy. When enforcement savings dominate, businesses invest in manufacturing and highly specialized activities, leading to maximum capacity utilization and a well-structured economy. On the other hand, escape savings result in profits being taken out of the economy, leading to a weaker economic structure (Aleksei Matveevic Rumiantsev, 1983; Boughton, 1994; Canh & Thanh, 2020; Engels, 1844; Gilpin & Gilpin, 2001; Harris, 2020; IMF, 1994, 2021; Keynes, 1936; Lenin, 1916; Marx, 1867; OECD, 2021; Papageorgiou, 2012; Richardson, 1964; Rikhardsson et al., 2021; Stiglitz, 2002; World Bank, 2003; World Bank Group, 2024a, 2024b).

The distinction between enforcement and escape savings is critical in understanding the money cycle. In economies where enforcement savings dominate, the money cycle accelerates, and the economy operates at full capacity. Conversely, escape savings lead to a slower money cycle and a weaker economy. The data suggests that economies with high enforcement savings, such as, have a high distribution and reuse of money, leading to a well-structured economy.

The implications of enforcement and escape savings on the money cycle are far-reaching. A regulatory policy that imposes higher taxes on businesses that replace the economic tasks of small ones and provides subsidies for them to invest in factories and highly specialized activities can strengthen the money cycle. This, in turn, leads to a more robust economy with a suitable structure.

**The Role of Banking System in the Money Cycle**

Savings play a vital role in the money cycle, and the banking system is at the heart of this process. The banking system acts as a receiver of savings, channeling them into investments that stimulate economic growth. When the banking system functions effectively, it ensures that savings are distributed and reused efficiently, leading to a stronger economy.

The banking system's role in the money cycle is multifaceted. It not only receives savings but also provides loans to businesses and individuals, facilitating investments and consumption. A well-functioning banking system ensures that the money cycle accelerates, leading to a more robust economy.

The banking system's role in the money cycle is particularly important in the context of AI-driven monetary policies. As AI algorithms become increasingly prevalent in financial decision-making, the banking system must adapt to ensure that savings are channeled into productive investments that benefit the economy as a whole.

Role of the banking system in the money cycle cannot be overstated. It is the linchpin that connects savings to investments, ensuring that the economy operates at maximum capacity. As such, policymakers must prioritize the development of a robust banking system that facilitates the efficient distribution and reuse of money.

**The Impact of Enforcement Savings on the Economy**

Assuming the majority of savings are enforcement savings, the economy is likely to experience a significant boost. This is because enforcement savings are reinvested in the local economy, creating a multiplier effect that stimulates economic growth.

#### **Strengthening the Economy through Distribution and Reuse of Money**

An efficient distribution and reuse of money are imperative for a strong economy. When enforcement savings are high, money is circulated back into the economy, creating a self-reinforcing cycle of growth. This, in turn, leads to an increase in economic activity, job creation, and higher GDP. As a result, the economy becomes more resilient and better equipped to withstand external shocks.

Another benefit of high enforcement savings is that they promote investment in manufacturing and highly specialized activities. Large corporations are more likely to invest in these areas, leading to increased productivity and innovation. This, in turn, drives economic growth and development, creating a virtuous cycle of prosperity.

Furthermore, high enforcement savings indicate a well-functioning banking system that plays a critical role in the distribution and reuse of money. This ensures that money is allocated efficiently, and resources are utilized optimally, leading to a more efficient economy.

#### **Maximum Capacity Operation of the Economy**

An economy operating at maximum capacity is characterized by full employment, optimal resource allocation, and high productivity. When enforcement savings are high, businesses invest in capital-intensive projects, leading to increased capacity utilization. This, in turn, drives economic growth, as resources are utilized efficiently, and production reaches its maximum potential.

An economy operating at maximum capacity is also more resilient to external shocks, as it has a higher degree of flexibility and adaptability. This enables it to respond more effectively to changes in the market, reducing the risk of economic downturns.

In addition, an economy operating at maximum capacity is more likely to attract foreign investment, as investors are drawn to economies with high growth potential and efficient resource allocation. This leads to an influx of capital, further stimulating economic growth and development.

#### **The Consequences of Escape Savings on the Economy**

Some of the most significant implications of AI on future monetary policies can be seen in the consequences of escape savings on the economy.

#### **Diversion of Funds and Profits Outside the Economy**

Outside the local economy, escape savings divert funds and profits, leading to a reduction in the amount of money available for investment in domestic industries. This, in turn, results in a decrease in economic activity, as businesses and individuals have less access to capital. Furthermore, when profits are diverted outside the economy, they are not reinvested in the local community, leading to a lack of economic growth and development. As a result, the economy becomes reliant on external sources of capital, making it vulnerable to fluctuations in global markets.

Additionally, the diversion of funds and profits outside the economy can lead to a decrease in tax revenue for governments. When businesses and individuals invest their profits outside the economy, they are not subject to domestic taxation, resulting in a loss of revenue for governments. This can have significant implications for public policy, as governments may struggle to fund imperative services and infrastructure projects. Moreover, the lack of tax revenue can lead to an increase in public debt, further exacerbating the economic situation.

The diversion of funds and profits outside the economy can also have a negative impact on employment rates. When businesses invest their profits outside the economy, they are less likely to create new jobs or invest in employee development, leading to higher levels of unemployment. This can have a ripple effect throughout the economy, as unemployed individuals have less disposable income to spend on goods and services, leading to a decrease in economic activity.

#### **Weakening of the Economy through Reduced Distribution and Reuse of Money**

Reuse of money within the economy is imperative for economic growth and development. However, escape savings and investments result in a reduction in the distribution and reuse of money, leading to a weakening of the economy. When money is not distributed and reused within the economy, it leads to a decrease in economic activity, as businesses and individuals have less access to capital. Furthermore, the lack of money circulation can lead to a decrease in consumer spending, resulting in a decline in economic growth.

The reduction in the distribution and reuse of money can also lead to a decrease in the velocity of money, which is the rate at which money is spent and respent within the economy. A decrease in the velocity of money can have significant implications for economic growth, as it leads to a decrease in economic activity and a reduction in the overall level of economic output.

The weakening of the economy through reduced distribution and reuse of money can also have a negative impact on the overall structure of the economy. When money is not distributed and reused within the economy, it can lead to a lack of economic development, as businesses and individuals are unable to invest in new projects and initiatives. This can result in a stagnation of the economy, as it becomes reliant on external sources of capital and innovation (Challoumis, 2018aw, 2018ac, 2018an, 2018ax, 2018ay, 2018h, 2019f, 2019e, 2019c, 2019g, 2019d, 2019b, 2019i, 2020d, 2020c, 2020a, 2020b, 2021f, 2021c, 2021e, 2021d, 2021j, 2021g, 2021b, 2021i, 2021l, 2021a, 2021h, 2022g, 2022d, 2022c, 2022a, 2022b, 2022e, 2023c, 2023ac, 2023o, 2023aj, 2023s, 2023l, 2023ai, 2023ae, 2023d, 2023h, 2023v, 2023aa, 2023m, 2023j, 2023ak, 2023t, 2023w, 2023y, 2023ad, 2023g, 2023ah, 2023e, 2023z, 2023af, 2023ab, 2023q, 2023ag, 2023b, 2023f, 2023r, 2023x, 2023a, 2023u, 2023p, 2023n, 2024as, 2024n, 2024bf, 2024cz, 2024do, 2024g, 2024d, 2024cj, 2024ci, 2024bh, 2024cr, 2024cy, 2024dg, 2024ef, 2024bn, 2024dk, 2024dd, 2024cs, 2024p, 2024by, 2024ct, 2024bb, 2024m, 2024de, 2024o, 2024at, 2024ce, 2024fc, 2024da, 2024dp, 2024cp, 2024cu, 2024ep, 2024cq, 2024cv, 2024ew, 2024q, 2024cc, 2024dc, 2024bv, 2024dh, 2024fd, 2024fb, 2024au, 2024cm, 2024cw, 2024ax, 2024be, 2024a, 2024ak, 2024bm, 2024eg, 2024az, 2024l, 2024du, 2024et, 2024co, 2024dz, 2024cn, 2024bg, 2024av, 2024cx, 2024fs; Challoumis et al., 2024c, 2024b; Challoumis, 2024fu, 2024gl, 2024fq, 2024fn, 2024fp, 2024fm, 2024gp, 2024fh, 2024fw, 2024go, 2024gf, 2024fy, 2024gn, 2024gm, 2024gc, 2024ft, 2024gb; Challoumis et al., 2024a; Challoumis, 2024gh, 2024gd, 2024fr, 2024ga, 2024fk, 2024ge, 2024gi, 2024fv, 2024fo, 2024fz, 2024fi, 2024fl, 2024gk, 2024gj, 2024fx, 2024fj, 2024gg; Challoumis & Alexios, 2024; Challoumis & Eriotis, 2024; Challoumis & Savic, 2024). But, it is worth noting that the consequences of escape savings on the economy can be mitigated through the implementation of suitable regulatory policies. By imposing higher taxes on businesses that replace the economic tasks of small ones and providing subsidies for them to invest their capital in factories and highly specialized activities, governments can encourage the distribution and reuse of money within the economy. This can lead to an increase in economic activity, employment rates, and overall economic growth.

#### **The Importance of Regulatory Policy in the Money Cycle**

Now, as we investigate into the implications of AI on future monetary policies, it is important to understand the significance of regulatory policy in the money cycle. The money cycle, which encompasses the distribution and reuse of money, is critical in shaping the economy's structure and governing its operations. A well-functioning money cycle is characterized by high enforcement savings and investments, which lead to the economy operating at maximum capacity.

#### **Imposing Higher Taxes on Businesses that Replace Small Ones**

To promote a healthy money cycle, regulatory policy must impose higher taxes on businesses that replace the economic tasks of small ones. This approach discourages large corporations from assuming the financial roles of small businesses, thereby preventing the diversion of funds away from the local economy. By doing so, the regulatory policy encourages enforcement savings and investments, which are important for the economy's growth and development. In fact, data suggests that countries with high enforcement savings and investments tend to have a more robust economy, with a higher index money cycle and general index money cycle.

Furthermore, imposing higher taxes on businesses that replace small ones helps to maintain the diversity of economic units, which is vital for the economy's structure and governance. When large corporations dominate the market, they often lead to the displacement of small businesses, resulting in a loss of economic diversity and a decrease in enforcement savings and investments. By imposing higher taxes, regulatory policy can prevent this phenomenon and promote a more equitable distribution of economic resources.

In addition, higher taxes on businesses that replace small ones can also help to reduce income inequality, which is a pressing concern in many economies. By discouraging large corporations from dominating the market, regulatory policy can promote a more level playing field, where small businesses and entrepreneurs have a fair chance to compete and thrive.

#### **Providing Subsidies for Investments in Factories and Specialized Activities**

Around the same time, regulatory policy must also provide subsidies for investments in factories and specialized activities. This approach encourages businesses to invest in highly specialized activities, which are critical for the economy's growth and development. By providing subsidies, regulatory policy can incentivize businesses to invest in areas that are important for the economy's structure and governance.

Moreover, subsidies for investments in factories and specialized activities can also help to promote technological advancements and innovation. When businesses invest in research and development, they are more likely to develop new products and services, which can drive economic growth and development. By providing subsidies, regulatory policy can encourage businesses to invest in research and development, leading to technological advancements and innovation (Challoumis, Constantinos, 2015a, 2015b, 2016, 2017, 2018o,



2018c, 2018l, 2018g, 2018v, 2018b, 2018a, 2018m, 2018n, 2018j, 2018q, 2018h, 2018e, 2018k, 2018i, 2018r, 2018t, 2018w, 2018p, 2018f, 2018s, 2018d, 2018u, 2020, 2024a, 2024g, 2024b, 2024c, 2024e, 2024d, 2024f; Challoumis, 2010, 2011, 2018m, 2024ea, 2024ba, 2024dr, 2024f, 2024bi, 2024ag, 2024dn, 2024ar, 2024dq, 2024ez, 2018at, 2024af, 2024cg, 2024ds, 2024ej, 2024eo, 2024br, 2024bs, 2024w, 2024bd, 2024v, 2018bi, 2024dm, 2024ac, 2024bo, 2024dx, 2024eu, 2024bc, 2024dl, 2024ai, 2024k, 2024dy, 2018ah, 2024er, 2024bx, 2024ch, 2024di, 2024aj, 2024r, 2024bp, 2024eb, 2024ei, 2024ao, 2018p, 2024x, 2024cb, 2024dt, 2024en, 2024aw, 2024aq, 2024ca, 2024ek, 2024es, 2024ay, 2018ai, 2024db, 2024s, 2024b, 2024ah, 2024bl, 2024ev, 2024bk, 2024fe, 2024dj, 2024eh, 2018b, 2024al, 2024ap, 2024ex, 2024ec, 2024bw, 2024ad, 2024aa, 2024ck, 2024cl, 2024ff, 2018bb, 2024em, 2024eq, 2024bu, 2024ae, 2024u, 2024bj, 2024y, 2024j, 2018f, 2018t, 2016, 2018bj, 2018as, 2018g, 2018be, 2018x, 2018bh, 2018ba, 2018e, 2018af, 2018ag, 2017, 2018ar, 2018aa, 2018ap, 2018c, 2018y, 2018w, 2018r, 2018ad, 2018az, 2018ab, 2018q, 2018bk, 2018ak, 2018s, 2018bf, 2018bg, 2018z, 2018i, 2018d, 2018av, 2018k, 2018bc, 2018ao, 2018j, 2018a, 2018v, 2018n, 2018au, 2018l, 2018u, 2018o, 2018aj, 2018ae, 2018al, 2019h, 2019m, 2019l, 2019k, 2019a, 2019j, 2020f, 2020e, 2021m, 2018aq, 2021k, 2022i, 2022f, 2022h, 2023al, 2023k, 2023i, 2024ab, 2024ey, 2024dv, 2018bd, 2024fg, 2024bz, 2024t, 2024e, 2024ed, 2024cd, 2024df, 2024fa, 2024h, 2024am, 2018am, 2024an, 2024dw, 2024c, 2024ee, 2024el, 2024bt, 2024i, 2024cf, 2024bq, 2024z). Furthermore, subsidies for investments in factories and specialized activities can also help to create jobs and stimulate economic growth. By incentivizing businesses to invest in these areas, regulatory policy can promote job creation and stimulate economic growth, leading to a more robust economy.

Plus, providing subsidies for investments in factories and specialized activities can also help to promote sustainable development. By incentivizing businesses to invest in environmentally friendly technologies and practices, regulatory policy can promote sustainable development and reduce the economy's environmental footprint.

#### **The Role of Taxation in the Money Cycle**

For a comprehensive understanding of the implications of AI on future monetary policies, it is vital to examine the role of taxation in the money cycle. The money cycle, as previously discussed, is a critical concept that highlights the importance of the distribution and reuse of money in the economy. Taxation plays a vital role in this cycle, as it can either strengthen or weaken the economy's qualitative attributes.

#### **Impact of Taxes on the Economy's Qualitative Attributes**

To understand the impact of taxes on the economy's qualitative attributes, it is necessary to analyze the effects of taxation on enforcement and escape savings. Taxes imposed on businesses that replace the economic tasks of small ones can lead to a decrease in enforcement savings, resulting in a weaker money cycle. On the other hand, subsidies provided to these businesses to invest in factories and highly specialized activities can increase enforcement savings, strengthening the money cycle. The regulatory policy that imposes higher taxes on escape investments and provides low taxes on enforcement investments can create an appropriate money cycle, leading to a more robust economy.

The data suggests that the economy with a high index money cycle and a general index money cycle of approximately 0.94 has a high distribution and reuse of money, leading to an appropriate structure of the economy. This is achieved through the imposition of higher taxes on businesses that replace the economic tasks of small ones and providing subsidies for them to invest their capital in factories and highly specialized activities. The low taxes imposed on enforcement investments further strengthen the money cycle, resulting in a more robust economy.

The consequences of interventionism on monetary and public policy, as well as free market autoregulation, are eliminated by the money cycle. The money cycle replaces both of the above policies with suitable regulatory public and tax policy via an appropriate banking system, which works as a receiver (more enforcement than escape savings) not as a giver (more escape than enforcement savings). This highlights the importance of taxation in shaping the economy's qualitative attributes and the money cycle.

#### **Focus on Healthcare and Education Systems**

After examining the impact of taxes on the economy's qualitative attributes, it is vital to focus on the healthcare and education systems. The money cycle theory suggests that the only taxes that have an impact on the economy, and particularly its qualitative attributes, are those related to the healthcare and education systems. The imposition of taxes on these systems can lead to a decrease in enforcement savings, resulting in a weaker money cycle. On the other hand, subsidies provided to these systems can increase enforcement savings, strengthening the money cycle.

The data suggests that the economy with a high index money cycle and a general index money cycle of approximately 0.94 has a high distribution and reuse of money, leading to an appropriate structure of the economy. This is achieved through the imposition of higher taxes on businesses that replace the economic

tasks of small ones and providing subsidies for them to invest their capital in factories and highly specialized activities. The low taxes imposed on enforcement investments in the healthcare and education systems further strengthen the money cycle, resulting in a more robust economy.

The focus on healthcare and education systems is critical, as these systems play a vital role in the economy's qualitative attributes. The imposition of taxes on these systems can have a ripple effect on the entire economy, leading to a decrease in enforcement savings and a weaker money cycle. Therefore, it is vital to implement a regulatory policy that provides subsidies to these systems, increasing enforcement savings and strengthening the money cycle.

Economy's structure is developed and suitably governed simultaneously as each economic unit finds its place. The focus on healthcare and education systems ensures that the economy operates at maximum capacity, leading to a more robust economy. The money cycle theory highlights the importance of taxation in shaping the economy's qualitative attributes, particularly in the healthcare and education systems.

#### **The Banking System as a Critical Component of the Money Cycle**

Unlike other components of the economy, the banking system plays a vital role in facilitating the distribution and reuse of money, which is important for the proper functioning of the money cycle.

#### **Facilitating the Distribution and Reuse of Money**

Component to the money cycle, the banking system acts as a receiver, ensuring that more enforcement savings are generated than escape savings. This enables the distribution and reuse of money within the local economy, strengthening the economy as a whole. As the data suggests, a high distribution and reuse of money lead to an appropriate structure of the economy, where each economic unit finds its place, and the economy operates at maximum capacity.

In this context, the banking system facilitates the distribution and reuse of money by channeling enforcement savings into investments that support the local economy. This is achieved through subsidies for businesses that invest in manufacturing and highly specialized activities, which in turn, create jobs and stimulate economic growth. Furthermore, the imposition of low taxes on these businesses encourages them to invest their capital within the economy, rather than diverting it elsewhere.

As a result, the banking system enables the money cycle to accelerate, leading to an economy that operates at full capacity, with a well-structured economic system. This is evident in economies where the enforcement savings and investments are high, resulting in a high index money cycle and a general index money cycle close to the theoretical ideal value of 1.

#### **Reflecting and Identifying the State of the Economy**

After all economic units are operational, the role of money – namely, its distribution and reuse – makes the structure of the economy more apparent. The banking system, as a critical component of the money cycle, reflects and identifies the state of the economy, providing valuable insights into its qualitative attributes.

The banking system's ability to reflect and identify the state of the economy is rooted in its role as a facilitator of the money cycle. By channeling enforcement savings into investments that support the local economy, the banking system enables the economy to operate at maximum capacity, revealing its underlying structure and qualitative attributes.

Facilitating the distribution and reuse of money, the banking system provides a window into the economy's performance, allowing policymakers to make informed decisions about regulatory public and tax policies. By imposing higher taxes on businesses that replace the economic tasks of small ones and providing subsidies for investments in factories and highly specialized activities, policymakers can strengthen the money cycle, leading to a more robust and efficient economy.

#### **Conclusions**

From above, it is evident that the implications of AI on future monetary policies are far-reaching and multifaceted. The theory of the Cycle of Money provides a framework for understanding the dynamics of money distribution and reuse in an economy, highlighting the importance of enforcement savings and investments in maintaining a healthy economic structure. As AI continues to transform the financial sector, policymakers must consider the potential consequences of its integration on the money cycle, including the risk of increased escape savings and investments that could lead to a decrease in the distribution and reuse of money.

In this context, the role of regulatory policy becomes critical in shaping the money cycle and promoting an appropriate structure of the economy. By imposing higher taxes on businesses that replace the economic tasks of small ones and providing subsidies for investments in factories and highly specialized activities, policymakers can encourage enforcement savings and investments. Moreover, the imposition of low taxes can strengthen the money cycle, while taxes related to healthcare and education systems have a direct impact on

the economy's qualitative attributes. As AI assumes an increasingly prominent role in the financial sector, policymakers must be mindful of these dynamics and adapt their regulatory policies accordingly.

Ultimately, the integration of AI into the financial sector presents both opportunities and challenges for monetary policymakers. While AI has the potential to increase efficiency and accuracy in financial transactions, it also risks disrupting the delicate balance of the money cycle. By understanding the implications of AI on the money cycle and adapting regulatory policies to promote enforcement savings and investments, policymakers can harness the benefits of AI while mitigating its potential risks. As the economy continues to evolve, it is necessary to remain vigilant and adapt to the changing landscape, ensuring that the money cycle remains a vital component of a healthy and thriving economy.

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**HOW IS THE INTEGRATION OF AI CHANGING THE WAY WE UNDERSTAND MONEY?**

**Constantinos Challoumis**

**Abstract**

The intricate dance of money circulation has long been the backbone of modern economies, with each transaction, investment, and savings decision influencing the delicate balance of growth and stability. However, the integration of artificial intelligence (AI) is poised to revolutionize our understanding of money, disrupting traditional notions of value, exchange, and wealth creation. As AI-driven systems begin to optimize financial flows, predict market trends, and automate decision-making processes, we are forced to reexamine the fundamental principles governing the flow of money and its impact on the economy.

**Keywords:** AI, money, cycle of money

**Introduction: The Evolution of Money - From Bartering to Digital Transactions**

Among the most significant transformations in human history is the evolution of money, which has undergone a remarkable journey from its earliest forms to the digital transactions of today. Among the earliest forms of exchange, bartering played a vital role in facilitating trade between individuals and communities. This system, based on the principle of reciprocity, allowed people to exchange goods and services without the need for a medium of exchange. As societies grew and trade expanded, the need for a more efficient system became apparent, leading to the emergence of commodity-based currencies like gold and silver. These precious metals were valued for their rarity, durability, and portability, making them an ideal medium of exchange. The introduction of coins in ancient civilizations like Greece and Rome further simplified trade, as they provided a standardized unit of value (Aleksei Matveevic Rumiantsev, 1983; Boughton, 1994; Canh & Thanh, 2020; Engels, 1844; Gilpin & Gilpin, 2001; Harris, 2020; IMF, 1994, 2021; Keynes, 1936; Lenin, 1916; Marx, 1867; OECD, 2021; Papageorgiou, 2012; Richardson, 1964; Rikhardsson et al., 2021; Stiglitz, 2002; World Bank, 2003; World Bank Group, 2024a, 2024b).

As economies continued to evolve, the need for more sophisticated financial systems became apparent. The introduction of paper money in China during the Tang Dynasty (618-907 CE) marked a significant milestone in the evolution of money. Paper money, backed by gold reserves, enabled governments to control the money supply and stimulate economic growth. The development of banking systems in medieval Europe further facilitated trade and commerce, as merchants and traders could store and transfer value more efficiently.

The advent of digital technology has revolutionized the way we understand and interact with money. Electronic payment systems, online banking, and mobile wallets have transformed the way we make transactions, enabling fast, secure, and convenient exchange of value. The rise of cryptocurrencies like Bitcoin has also challenged traditional notions of money, offering a decentralized and autonomous alternative to fiat currencies.

**The Rise of Fintech and AI Integration**

Any discussion of the evolution of money would be incomplete without acknowledging the transformative impact of fintech and AI integration. The convergence of finance and technology has given rise to innovative payment systems, lending platforms, and investment tools that have democratized access to financial services. Fintech companies have leveraged AI and machine learning to develop sophisticated risk assessment models, enabling them to offer personalized financial products and services to underserved populations.

The integration of AI in fintech has also enabled the development of chatbots, virtual assistants, and robo-advisors that provide personalized financial advice and portfolio management services. AI-powered fraud detection systems have improved the security of online transactions, while blockchain technology has enabled secure, transparent, and tamper-proof record-keeping.

Any examination of the fintech landscape would reveal the profound impact of AI integration on the financial services sector. According to a report by Accenture, the global fintech market is projected to reach \$305 billion by 2025, with AI-powered solutions driving growth and innovation in the industry.

Integration of AI in fintech has also led to the development of more accurate credit scoring models, enabling lenders to make informed decisions and reduce default rates. AI-powered lending platforms have expanded access to credit for small businesses and individuals, promoting financial inclusion and economic growth.

**The Impact of AI on Financial Systems**

Even as the world grapples with the implications of artificial intelligence (AI) on various industries, the financial sector is undergoing a significant transformation. The integration of AI is revolutionizing the way financial systems operate, making them more efficient, secure, and customer-centric. Banking institutions are leveraging AI to automate repetitive tasks, freeing up human resources to focus on more complex and creative endeavors. AI-powered chatbots, for instance, are being used to provide 24/7 customer support, helping banks reduce operational costs and improve response times. According to a report by Accenture, AI can help banks reduce costs by up to 22% by automating tasks such as data entry, document processing, and compliance checks. By automating routine tasks, banks can redirect their resources towards more strategic initiatives, such as developing personalized financial products and services. AI-powered analytics can help banks gain deeper insights into customer behavior, enabling them to offer targeted marketing campaigns and tailored financial advice. Moreover, AI-driven automation can help banks reduce errors and improve compliance, reducing the risk of fines and reputational damage. The impact of AI on banking efficiency is already being felt. A study by McKinsey found that AI-powered automation can help banks reduce their operating costs by up to 30%. As AI continues to evolve, we can expect to see even more innovative applications of automation in banking, from AI-powered loan processing to intelligent fraud detection. Automation is also transforming the world of investment management, as AI-powered algorithms are being used to develop sophisticated investment strategies and manage risk. AI-driven investment platforms can analyze vast amounts of data, identifying patterns and trends that human analysts may miss. This enables investors to make more informed decisions, reducing the risk of losses and improving returns. In fact, AI-driven investment strategies are becoming increasingly popular, with many investors turning to robo-advisors and AI-powered wealth management platforms. According to a report by Deloitte, AI-powered investment platforms are expected to manage over \$1 trillion in assets by 2025. An area where AI is having a significant impact is fraud detection and prevention. AI-powered systems can analyze vast amounts of data in real-time, identifying patterns and anomalies that may indicate fraudulent activity (Challoumis, 2018aw, 2018ac, 2018an, 2018ax, 2018ay, 2018h, 2019f, 2019e, 2019c, 2019g, 2019d, 2019b, 2019i, 2020d, 2020c, 2020a, 2020b, 2021f, 2021c, 2021e, 2021d, 2021j, 2021g, 2021b, 2021i, 2021l, 2021a, 2021h, 2022g, 2022d, 2022c, 2022a, 2022b, 2022e, 2023c, 2023ac, 2023o, 2023aj, 2023s, 2023l, 2023ai, 2023ae, 2023d, 2023h, 2023v, 2023aa, 2023m, 2023j, 2023ak, 2023t, 2023w, 2023y, 2023ad, 2023g, 2023ah, 2023e, 2023z, 2023af, 2023ab, 2023q, 2023ag, 2023a, 2023b, 2023r, 2023f, 2023x, 2023u, 2023p, 2023n, 2024as, 2024n, 2024bf, 2024cz, 2024do, 2024g, 2024d, 2024cj, 2024ci, 2024bh, 2024cr, 2024cy, 2024dg, 2024ef, 2024bn, 2024dd, 2024dk, 2024de, 2024cs, 2024p, 2024by, 2024bb, 2024m, 2024ct, 2024o, 2024at, 2024ce, 2024fc, 2024da, 2024dp, 2024cp, 2024cu, 2024ep, 2024cq, 2024cv, 2024ew, 2024q, 2024cc, 2024dc, 2024bv, 2024cm, 2024fd, 2024fb, 2024au, 2024dh, 2024cw, 2024ax, 2024be, 2024a, 2024ak, 2024bm, 2024eg, 2024az, 2024l, 2024du, 2024et, 2024co, 2024dz, 2024cn, 2024bg, 2024av, 2024cx, 2024fs; Challoumis et al., 2024c, 2024b; Challoumis, 2024fu, 2024gl, 2024fq, 2024fn, 2024fp, 2024fm, 2024gp, 2024fh, 2024fw, 2024go, 2024gf, 2024fy, 2024gn, 2024gm, 2024fj, 2024ft, 2024gb; Challoumis et al., 2024a; Challoumis, 2024gh, 2024gd, 2024fr, 2024ga, 2024fk, 2024ge, 2024gi, 2024fo, 2024fz, 2024fi, 2024fv, 2024fl, 2024gk, 2024gj, 2024fx, 2024gc, 2024gg; Challoumis & Alexios, 2024; Challoumis & Eriotis, 2024; Challoumis & Savic, 2024). This enables financial institutions to respond quickly to potential threats, reducing the risk of losses and improving customer trust. AI-driven fraud detection systems can analyze a wide range of data, including transaction history, IP addresses, and device fingerprints. This enables them to identify complex fraud patterns that may evade human analysts. According to a report by LexisNexis, AI-powered fraud detection systems can reduce false positives by up to 70%, while improving detection rates by up to 50%. Impact of AI on fraud detection is significant, as it enables financial institutions to respond quickly to emerging threats. By leveraging AI-powered analytics, financial institutions can stay one step ahead of fraudsters, reducing the risk of losses and improving customer trust. In brief, the integration of AI is transforming the financial sector, driving automation, efficiency, and innovation. As AI continues to evolve, we can expect to see even more exciting developments in areas such as investment management, fraud detection, and customer service.

### **The Changing Landscape of Money: Cryptocurrencies and Blockchain Technology**

Once again, the world of finance is undergoing a significant transformation, and this time, it's being driven by the integration of Artificial Intelligence (AI). The way we understand and interact with money is changing rapidly, and it's important to explore the various facets of this transformation.

By leveraging the power of blockchain technology, cryptocurrencies have emerged as a viable alternative to traditional fiat currencies. The decentralized nature of blockchain enables secure, transparent, and efficient transactions, reducing the need for intermediaries like banks. This has led to the proliferation of cryptocurrencies like Bitcoin, Ethereum, and others, which have gained widespread acceptance globally. According to a report by Cambridge University, the number of cryptocurrency users has grown from 1.3



million in 2014 to over 100 million in 2020. The underlying blockchain technology has also given rise to new business models and applications, such as smart contracts, decentralized finance (DeFi), and non-fungible tokens (NFTs) (Challoumis, Constantinos, 2015b, 2015a, 2016, 2017, 2018e, 2018v, 2018o, 2018l, 2018g, 2018b, 2018a, 2018m, 2018n, 2018k, 2018j, 2018q, 2018h, 2018c, 2018i, 2018r, 2018t, 2018w, 2018p, 2018f, 2018s, 2018d, 2018u, 2020, 2024a, 2024g, 2024c, 2024e, 2024d, 2024f, 2024b; Challoumis, 2010, 2011, 2018m, 2024ea, 2024ba, 2024dr, 2024f, 2024bi, 2024ag, 2024dn, 2024j, 2024dq, 2024ez, 2018at, 2024af, 2024cg, 2024ds, 2024ej, 2024eo, 2024br, 2024bs, 2024w, 2024bd, 2024v, 2018bi, 2024dm, 2024ac, 2024bo, 2024dx, 2024eu, 2024bc, 2024dl, 2024ai, 2024k, 2024dy, 2018ah, 2024er, 2024bx, 2024ch, 2024di, 2024aj, 2024r, 2024bp, 2024eb, 2024ao, 2024x, 2018p, 2024ab, 2024dt, 2024ei, 2024cb, 2024aq, 2024ca, 2024en, 2024aw, 2024ay, 2024es, 2018ai, 2024ek, 2024b, 2024db, 2024s, 2024bl, 2024ev, 2024ah, 2024fe, 2024dj, 2024bk, 2018b, 2024al, 2024eh, 2024ex, 2024ec, 2024bw, 2024ad, 2024aa, 2024ck, 2024cl, 2024ap, 2018bb, 2024em, 2024ff, 2024eq, 2024ae, 2024u, 2024bj, 2024y, 2024bu, 2018f, 2018t, 2016, 2018bj, 2018as, 2018g, 2018be, 2018x, 2018bh, 2018ba, 2018w, 2018e, 2018ag, 2017, 2018af, 2018ar, 2018aa, 2018c, 2018ap, 2018y, 2018r, 2018ad, 2018az, 2018ab, 2018q, 2018bk, 2018ak, 2018s, 2018bf, 2018bg, 2018z, 2018i, 2018d, 2018av, 2018k, 2018bc, 2018ao, 2018j, 2018a, 2018v, 2018n, 2018au, 2018l, 2018u, 2018o, 2018aj, 2018ae, 2018al, 2019h, 2019m, 2019l, 2019k, 2019a, 2019j, 2020f, 2020e, 2021m, 2018aq, 2021k, 2022i, 2022f, 2022h, 2023al, 2023k, 2023i, 2024ar, 2024ey, 2024dv, 2018bd, 2024fg, 2024bz, 2024t, 2024e, 2024ed, 2024cd, 2024df, 2024fa, 2024h, 2024am, 2018am, 2024an, 2024dw, 2024c, 2024ee, 2024el, 2024bt, 2024i, 2024cf, 2024bq, 2024z). These innovations have opened up new avenues for investment, fundraising, and value exchange, further expanding the scope of the digital economy. Moreover, the use of blockchain technology has improved the efficiency and security of traditional financial systems, making them more resilient to fraud and cyber threats. As the adoption of cryptocurrencies and blockchain technology continues to grow, it's likely to have a profound impact on the way we understand money. The decentralized nature of these systems challenges traditional notions of currency, ownership, and control, paving the way for a more democratized and inclusive financial system.

#### **The Emergence of Digital Currencies and Tokens**

Cryptocurrencies have paved the way for the emergence of digital currencies and tokens, which are being used for a wide range of purposes, from fundraising to loyalty programs. These digital assets have enabled businesses to create new revenue streams, improve customer engagement, and increase operational efficiency. For instance, companies like Facebook and JP Morgan have launched their own digital currencies, while others are using tokens to reward customers for their loyalty and participation. The rise of digital currencies and tokens has also led to the development of new investment opportunities, such as tokenized assets and security tokens. These innovative instruments have opened up new avenues for investors, enabling them to participate in a broader range of investment opportunities. Moreover, the use of digital currencies and tokens has improved the efficiency and transparency of financial transactions, reducing costs and increasing speed. Indeed, the emergence of digital currencies and tokens has expanded the scope of the digital economy, enabling businesses and individuals to create new value streams and opportunities. As the adoption of these digital assets continues to grow, it's likely to have a profound impact on the way we understand money and conduct financial transactions. In addition to the emergence of digital currencies and tokens, the integration of AI has also enabled the development of more sophisticated payment systems, such as contactless payments and mobile wallets. These innovations have improved the convenience, speed, and security of financial transactions, making it easier for people to manage their finances and make payments.

#### **The Future of Cashless Transactions**

One of the most significant implications of the integration of AI in finance is the rise of cashless transactions. With the proliferation of mobile payments, contactless cards, and digital wallets, the need for physical cash is dwindling rapidly. According to a report by the World Bank, the number of cashless transactions has grown from 12% of total transactions in 2014 to over 40% in 2020. The shift towards cashless transactions has significant implications for the economy, as it reduces the need for physical currency and improves the efficiency of financial transactions. Moreover, cashless transactions enable governments to track financial activities more effectively, reducing the risk of tax evasion and money laundering. The use of AI-powered algorithms also enables real-time monitoring and analysis of financial transactions, improving the detection and prevention of fraud. As the adoption of cashless transactions continues to grow, it's likely to have a profound impact on the way we understand money and conduct financial transactions. The integration of AI has enabled the development of more sophisticated payment systems, improving the convenience, speed, and security of financial transactions. The rise of cashless transactions has also led to the development of new business models and applications, such as mobile payments and digital wallets. These innovations have opened

up new avenues for revenue generation, customer engagement, and operational efficiency, further expanding the scope of the digital economy.

### **AI and the Cycle of Money**

To understand how AI is changing the way we understand money, it's vital to explore the concept of the cycle of money. The cycle of money is a fundamental theory that explains how money flows within an economy, and how it affects the overall structure and performance of the economy.

### **Enforcement Savings and Investments**

Below the surface of the cycle of money lies the distinction between enforcement savings and escape savings. Enforcement savings refer to the savings that remain within the local banking system, whereas escape savings are diverted away from the local economy. According to data, countries with high enforcement savings, such as Norway and Switzerland, have a more robust economy, with a higher GDP per capita. This is because enforcement savings are invested in manufacturing and highly specialized activities, which leads to a more efficient allocation of resources and a stronger economy.

In an economy with high enforcement savings, businesses invest capital in activities that create value, such as research and development, innovation, and infrastructure development. This leads to a more diversified economy, with a higher level of specialization, which in turn increases productivity and competitiveness. As a result, the economy operates at maximum capacity, and the structure of the economy is developed and suitably governed simultaneously.

Moreover, enforcement savings and investments indicate that as money is distributed and reused more, the economy is strengthened. This is because money is being invested in activities that create value, rather than being diverted away from the economy. As a result, the money cycle has accelerated, the economy is operating at full capacity, and the economy's structure has self-organized.

### **Escape Savings and Investments**

Below the surface of the cycle of money lies another type of savings, known as escape savings. Escape savings are those that take the place of small businesses, lead profits outside the economy, or divert funds for investments outside the framework of the economy. In an economy with high escape savings, businesses tend to invest in activities that do not create value, such as speculation, rent-seeking, and tax avoidance.

As a result, the economy operates below its maximum capacity, and the structure of the economy is distorted. Escape savings and investments lead to a less efficient allocation of resources, which in turn reduces productivity and competitiveness. Moreover, escape savings and investments result in the least amount of money being distributed and used again, which weakens the economy.

A striking example of the consequences of escape savings and investments is the case of Greece, which has a high level of escape savings. According to data, Greece has a low level of investment in manufacturing and highly specialized activities, which has led to a weak economy, with a low GDP per capita.

A closer look at the data reveals that escape savings and investments are often the result of poor regulatory policies, which favor large corporations over small businesses. This leads to a distortion of the economy, where large corporations dominate the market, and small businesses are squeezed out.

### **The Importance of an Appropriate Banking System**

Across the globe, banking systems play a critical role in the cycle of money. An appropriate banking system is vital for the distribution and reuse of money, which in turn affects the overall structure and performance of the economy. A banking system that favors enforcement savings over escape savings is vital for a strong economy.

In an economy with an appropriate banking system, businesses invest capital in activities that create value, such as manufacturing and highly specialized activities. This leads to a more diversified economy, with a higher level of specialization, which in turn increases productivity and competitiveness. As a result, the economy operates at maximum capacity, and the structure of the economy is developed and suitably governed simultaneously.

Moreover, an appropriate banking system is vital for the implementation of regulatory policies that favor small businesses over large corporations. This leads to a more level playing field, where small businesses can thrive, and the economy can operate at its full potential.

Another key aspect of an appropriate banking system is its ability to impose taxes that have a positive impact on the economy. According to the theory of the cycle of money, taxes related to healthcare and education systems have a positive impact on the economy, as they lead to a more educated and healthy workforce, which in turn increases productivity and competitiveness.

### **The Consequences of Interventionism and Free Market Autoregulation**

Keep in mind that the integration of AI in the financial sector has far-reaching implications for our understanding of money and its role in the economy. One of the most significant consequences is the need to

reevaluate the traditional approaches to monetary and public policy, as well as the role of free market autoregulation.

### **The Limitations of Monetary and Public Policy**

The traditional approach to monetary and public policy is based on the idea that the government and central banks can control the economy through targeted interventions. However, this approach has several limitations. For instance, it assumes that policymakers have complete knowledge of the economy and can accurately predict the outcomes of their actions. Moreover, it ignores the complexity of the economy and the interactions between different economic agents. The theory of the cycle of money highlights the importance of the distribution and reuse of money in the economy, which is often overlooked by traditional monetary and public policy approaches.

The enforcement and escape savings concept further illustrates the limitations of traditional policy approaches. Enforcement savings, which remain in the local banking system, are necessary for the economy's growth and development. On the other hand, escape savings, which are diverted away from the local economy, can have negative consequences. Traditional policy approaches often fail to distinguish between these two types of savings, leading to ineffective and sometimes counterproductive policies.

The limitations of traditional policy approaches are also evident in the context of free market autoregulation. The idea that the market can self-regulate and correct its own imbalances is based on the assumption that economic agents have perfect information and act rationally. However, this assumption is often unrealistic, and the market can be prone to failures and inefficiencies. The integration of AI in the financial sector has the potential to exacerbate these limitations, as it can create new opportunities for manipulation and exploitation.

### **The Benefits of Regulatory Policy and Taxation**

With the integration of AI in the financial sector, there is a growing need for a more nuanced approach to regulatory policy and taxation. A regulatory policy that imposes higher taxes on businesses that replace the economic tasks of small ones and provides subsidies for them to invest their capital in factories and highly specialized activities can help to promote enforcement savings and investments. This approach can also help to reduce the negative consequences of escape savings and investments.

Moreover, a taxation system that focuses on healthcare and education can have a positive impact on the economy's qualitative attributes. According to the theory of the cycle of money, these taxes are the only ones that have a significant impact on the economy. By targeting these areas, policymakers can create a more equitable and sustainable economy.

With the help of AI, regulatory policy and taxation can become more targeted and effective. AI can provide policymakers with real-time data and insights, enabling them to make more informed decisions. Additionally, AI can help to identify areas where enforcement savings and investments are lacking, allowing policymakers to develop targeted interventions to promote economic growth and development.

Consequently, the integration of AI in the financial sector offers a unique opportunity to rethink our approach to regulatory policy and taxation. By leveraging the power of AI, we can create a more efficient, equitable, and sustainable economy that benefits all economic agents.

### **The Role of AI in Strengthening the Money Cycle**

Many experts believe that the integration of Artificial Intelligence (AI) has the potential to revolutionize the way we understand and interact with money. By optimizing the distribution and reuse of money, enhancing the structure of the economy, and improving healthcare and education systems, AI can play a vital role in strengthening the money cycle.

#### **Optimizing Distribution and Reuse of Money**

An efficient distribution and reuse of money is important for a thriving economy. AI can help achieve this by identifying patterns and anomalies in financial transactions, allowing for more accurate predictions and informed decisions. For instance, AI-powered systems can analyze data on enforcement and escape savings, enabling policymakers to create targeted interventions that promote the former and discourage the latter. This can lead to a more robust money cycle, where money is distributed and reused more effectively, and the economy operates at maximum capacity.

Moreover, AI can help optimize the banking system, which plays a critical role in the money cycle. By analyzing data on bank deposits per GDP, AI can identify areas where enforcement savings can be increased, and escape savings reduced. This can lead to a more efficient allocation of resources, and a stronger economy. Additionally, AI-powered systems can help identify opportunities for investment in manufacturing and highly specialized activities, leading to a more diversified economy.

Furthermore, AI can help reduce the consequences of interventionism on monetary and public policy, by providing a more nuanced understanding of the economy. By analyzing data on the money cycle, AI can

identify areas where regulatory policy can be improved, leading to a more effective allocation of resources, and a stronger economy.

#### **Enhancing the Structure of the Economy**

By analyzing data on the money cycle, AI can help identify areas where the structure of the economy can be improved. For instance, AI can help identify industries where enforcement investments can be increased, leading to a more diversified economy. Additionally, AI can help identify areas where escape investments can be reduced, leading to a more robust money cycle.

Moreover, AI can help policymakers create targeted interventions that promote economic growth and development. By analyzing data on the money cycle, AI can identify areas where subsidies can be provided, and taxes can be reduced, leading to a more favorable business environment. This can lead to a more robust economy, where businesses are incentivized to invest in manufacturing and highly specialized activities.

Furthermore, AI can help policymakers create a more effective regulatory policy, by providing a more nuanced understanding of the economy. By analyzing data on the money cycle, AI can identify areas where taxes can be reduced, and subsidies can be provided, leading to a more favorable business environment.

Even more, AI can help policymakers create a more effective tax policy, by providing a more nuanced understanding of the economy. By analyzing data on the money cycle, AI can identify areas where taxes can be reduced, and subsidies can be provided, leading to a more favorable business environment.

#### **Improving Healthcare and Education Systems**

Structure of the economy is closely linked to the healthcare and education systems. AI can help improve these systems by analyzing data on the money cycle, and identifying areas where investments can be made. For instance, AI can help identify areas where investments in healthcare can lead to improved outcomes, and increased economic productivity. Additionally, AI can help identify areas where investments in education can lead to a more skilled workforce, and increased economic growth.

Moreover, AI can help policymakers create targeted interventions that promote investments in healthcare and education. By analyzing data on the money cycle, AI can identify areas where subsidies can be provided, and taxes can be reduced, leading to a more favorable environment for investments in these sectors.

Furthermore, AI can help policymakers create a more effective regulatory policy, by providing a more nuanced understanding of the economy. By analyzing data on the money cycle, AI can identify areas where regulations can be improved, leading to a more favorable environment for investments in healthcare and education.

Role of AI in improving healthcare and education systems cannot be overstated. By providing a more nuanced understanding of the economy, AI can help policymakers create targeted interventions that promote investments in these sectors, leading to improved outcomes, and increased economic productivity.

#### **Conclusions**

Considering all points, it's clear that the integration of AI is revolutionizing the way we understand money. The traditional Cycle of Money theory, which highlights the distinction between enforcement and escape savings, is being disrupted by AI-driven innovations. With AI-powered systems capable of processing vast amounts of data, we're gaining unprecedented insights into the flow of money and its impact on the economy. This newfound understanding is enabling policymakers and financial institutions to create more effective regulatory frameworks, taxes, and subsidies that promote a healthy money cycle.

The implications of AI-driven changes to the money cycle are far-reaching. By identifying areas where money is being diverted away from the local economy, policymakers can implement targeted interventions to encourage enforcement savings and investments. This, in turn, can lead to a more robust economy, operating at maximum capacity, with a self-organized structure. Furthermore, AI's ability to analyze complex data sets is helping to eliminate the consequences of interventionism and free market autoregulation, replacing them with evidence-based public and tax policies that promote economic growth.

As we move forward, it's crucial to recognize the critical role AI will play in shaping our understanding of money and the economy. By harnessing the power of AI, we can create a more efficient, equitable, and sustainable financial system. The integration of AI is not only changing the way we understand money but also empowering us to build a better future for generations to come. As we continue to navigate the complexities of the money cycle, AI will be an indispensable tool, illuminating the path towards a brighter economic future.

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**PROSPECTS OF POPULARITY AND DEVELOPMENT OF ECOTOURISM IN GEORGIA**

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**Abstract**

In today's world, the development of the tourism business is becoming increasingly important from both socio-economic and ecological points of view. Against this background, all studies confirm that one of the most popular types of tourism is ecotourism—a dynamically developing direction of the world tourism industry, which accounts for 7-8% of the world capital turnover in the tourism business.

Georgia has great potential for ecotourism to become a leading type of tourism, which can stop the migration from the mountainous regions to the lowlands and preserve the country's beautiful villages with their special traditions and customs. Ecotourism provides great public benefits and investments, and many problems need to be solved at the governmental level for its development, as well as providing the participation and interest of the private sector, attraction, and placement of foreign investment in the development of ecotourism at the same time. The country has the prospects for development. The main thing is how correctly they will be used.

**Keywords:** tourism business, ecotourism, protected areas, correlation, analyze.

**Discussion**

Global tourism is expanding astoundingly, targeting new, unexplored regions. This triggers various environmental problems. Nature must therefore be conserved, and a vast network of protected areas is being established.

The most promising directions of tourism in the XXI century have been identified according to the forecast of the UN World Tourism Organization (UNWTO) (Tourism 2020 Vision). This enables us to state that ecotourism, one of the rapidly growing segments of the global tourist sector, is among the most popular forms of travel. It is estimated to account for 7-8% of global tourism revenue.

The development of tourism business is becoming increasingly important from the socio-economic and environmental point of view. The trend of dramatic growth in tourism increases its economic benefits. It should be noted that last year the direct contribution of tourism to the GDP of Georgia amounted to 7.2% and this figure is expected to increase to 10.5% by 2028<sup>1</sup>. In many countries, tourism creates additional jobs, fills the state budget, and increases the gross domestic product, although tourist centers and regions care not only about the income from tourism, but they allocate huge funds for the harmonious development of the tourism industry, especially for ecotourism.

Our country has great potential and ecotourism may become the leading type of tourism, bringing much more benefits than economic income. In particular, it can stop migration from the mountains to the plain and preserve the country's beautiful villages with their special traditions and customs.

The cultural and natural heritage of the world is one of the main factors in the development of ecotourism, and its reasonable utilization is not only a prerequisite for the economic growth of the country but also for the harmonious development of regions. 'Ecotourism - Green Industry' is a new concept in the tourism industry. Its area of interest is the preservation and improvement of the natural environment with proper organization.

Ecotourism should be considered as an important component of sustainable development. Its sustainable development is a continuous process of change that utilizes resources and makes investments. The 21st century has seen a rapid growth of ecotourism and ecology has taken a central place in tourism development.

Georgia has great potential for tourism business development based on its natural, geographical, climatic, and recreational opportunities and historical and cultural heritage. Georgia ranks 12<sup>th</sup> in the list of 36 important and outstanding places in the world for its unique biodiversity and beautiful landscapes. There are not many countries in the world with such a diverse range of landscapes in such a small area: the Caucasus Range covered with eternal snow and glaciers, the subtropical zone of the Black Sea coast, abundant rivers and waterfalls, karst caves, resorts and mineral springs, unique monuments of history, culture, and nature, i.e. recreational resources - all this contributes to the development of ecotourism in Georgia and shows great

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<sup>1</sup>Collection of the Conference of the National Tourism Administration of Georgia "Prospects of Tourism Development in Georgia". Tbilisi 2022, p. 23

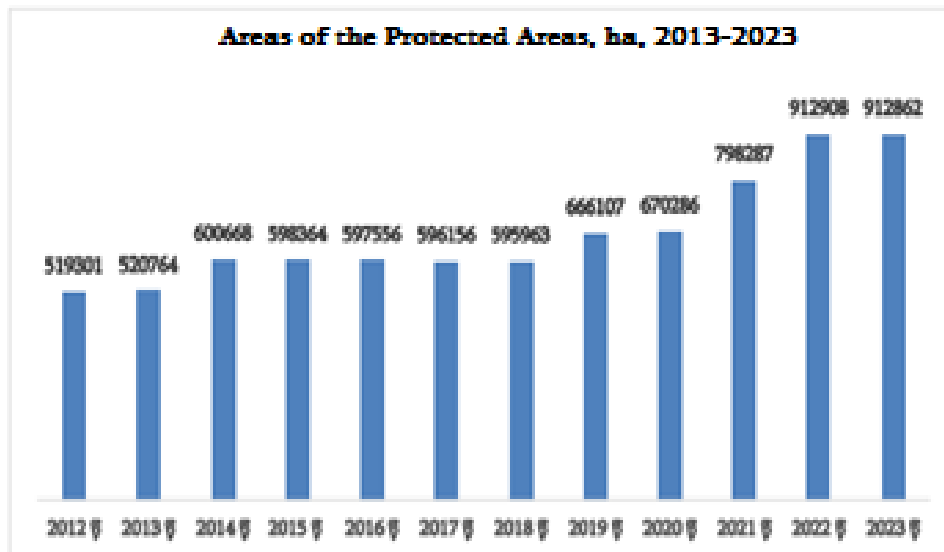
promise. The touristic area of the country is 69.7 thousand square kilometers, with 102 resorts and 182 resort sites. There are 14 state natural reserves (139,048 hectares); 14 national parks (445,767 hectares); 26 managed reserves (75,207 hectares); 40 natural monuments (2748.99 hectares); and 5 protected landscapes (138,327 hectares). Ecotourists are drawn to the richness of ethno-culture, people's traditional hospitality, variety of state holidays, peculiar Georgian cuisine, customs, and crafts, but ecotourism in Georgia has not yet reached its full potential.

As already mentioned, ecotourism is one of the most popular and fastest growing industries that aims to interact with wildlife. The development of ecotourism contributes to the economic income of the population in the protected areas and regions.

Protected territories in Georgia have more than a century of history. The first reserve was established in Lagodekhi in 1912. This is where the development of the network of protected areas in Georgia began. For this purpose, on March 7, 1996, the Parliament of Georgia adopted the Law on the System of Protected Areas<sup>2</sup>. Protected areas are established to protect and restore unique, rare and representative ecosystems, plant and animal species, natural formations and cultural areas, which are the most important national treasures. The main function of protected areas is to protect the country's natural heritage. They also have many other functions, one of which is to promote tourism development.

The Ministry of Environment and Natural Resources of Georgia, the Department of Protected Territories, Reserves and Hunting Farms, and the Forestry Department have laid the foundation for the undertaking of creating a new system of protected areas. The Georgian office of the Worldwide Fund for Nature Conservation took the initiative. The Government of Georgia adopted an important decree on measures to promote the establishment of the protected area system and the Borjomi-Kharagauli National Park and a concept for the development of ecotourism in its support zone was developed.

In Georgia (according to IUCN criteria) 100 protected areas of six different categories occupy 13% (912,908) of the total area of the country,<sup>3</sup> Showing a 38% increase compared to 2012 in dynamics.

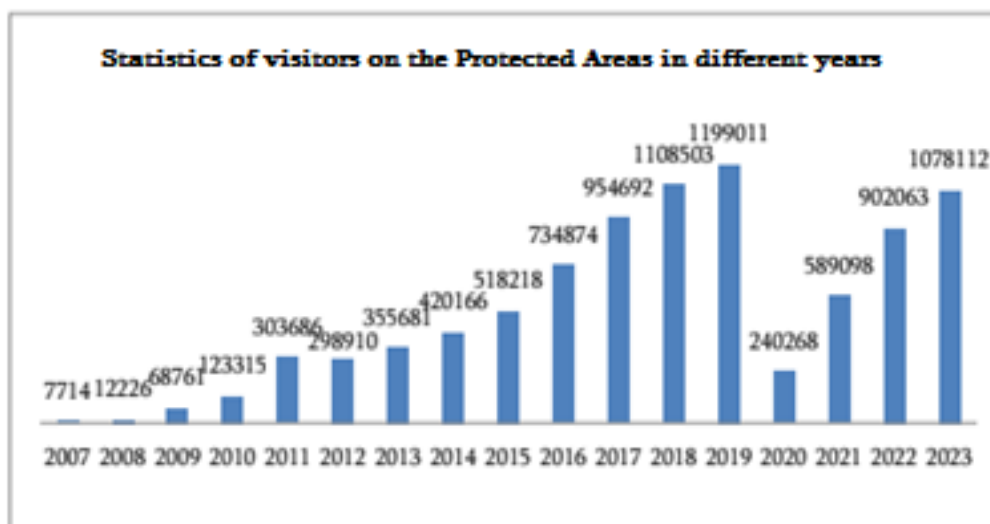


Source: [www.apa.gov.ge](http://www.apa.gov.ge)

In 2023, there were 1,078,112 visitors recorded in Georgia's protected areas, a 19% increase over 2022 data (902,063 visitors).

<sup>2</sup>Collection of the Conference of the National Tourism Administration of Georgia "Prospects of Tourism Development in Georgia". Tbilisi 2020, pp. 66

<sup>3</sup>[www.Apa.gov.ge](http://www.Apa.gov.ge) 2023 Report, p. 79



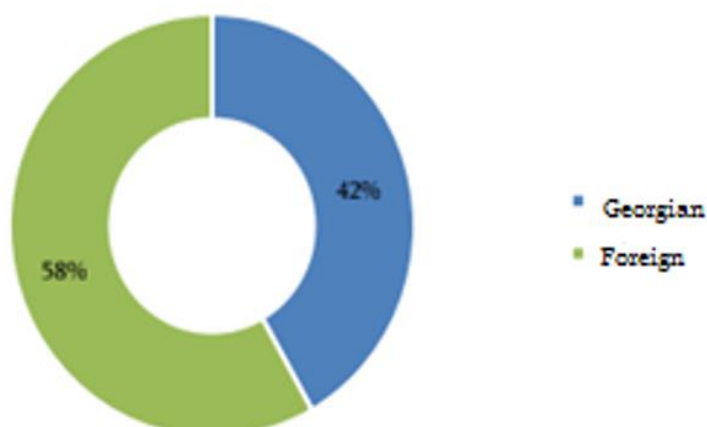
Source: [www.apa.gov.ge](http://www.apa.gov.ge)

In 2023, 42% of visitors were Georgians (450,615 visitors), showing an increase of 9% compared to 2022 data (413,655 visitors), and 58% were foreigners (627,497 visitors), showing an increase of 28% compared to 2022 data (488,408 visitors).

The number of visitors recorded in 2023 compared to 2019 data (1,199,011 visitors) decreased by 10%.

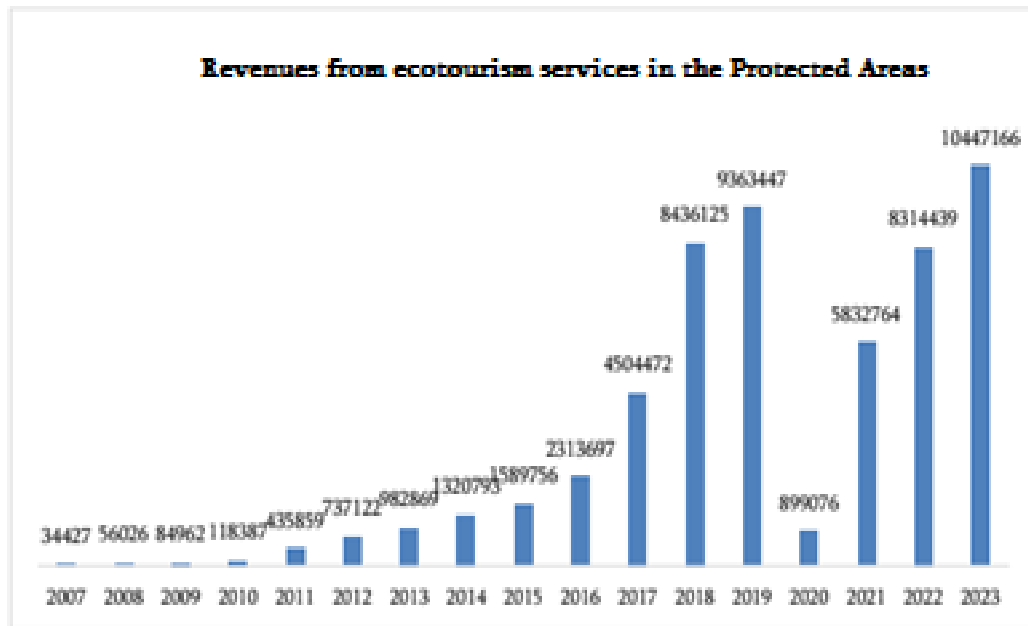
The number of Georgian visitors recorded in 2023 compared to 2019 data (587,022 visitors) decreased by 23% and the number of international visitors compared to 2019 data (611,989 visitors) increased by 2.5%.

**Statistics of Georgian and foreign visitors, 2023**



Source: [www.apa.gov.ge](http://www.apa.gov.ge)

Georgia's national parks had a record 1,199,011 visitors in 2019, the highest number of visitors in the history of the Protected Areas Agency.



Source: [www.apa.gov.ge](http://www.apa.gov.ge)

Increased visitor numbers in recent years have also had an impact on protected area revenues. In 2023, the revenues generated from ecotourism services amounted to a record GEL 10,447,166, an increase of about 26% compared to the previous 2022 (GEL 8,314,439). In 2023, revenues from ecotourism services increased by 12% compared to 2019 (GEL 9,363,447).

Increased visitor numbers in recent years have also had an impact on protected area revenues. In 2023, the revenues generated from ecotourism services amounted to a record GEL 10,447,166, an increase of about 26% compared to the previous 2022 (GEL 8,314,439). In 2023, revenues from ecotourism services increased by 12% compared to 2019 (GEL 9,363,447).

It should be noted that the presence of PAs has a positive impact on the local population living near them: the number of employees in the settlements increases (mostly guides, escorts, vehicle owners, people engaged in catering services, hotel owners, people engaged in horse rental or other services, etc.), tourism infrastructure and tourism services develop and their incomes increase.

As of 2023, there are 780 employees in the PA system, including 116 in the central offices and 664 in the territorial offices; of the 780 employees, 640 are male and 140 are female. The total ranger staff is 400 people, including 4 women. As a result of the establishment and development of protected areas, the population living in the vicinity is actively involved in providing various tourist services to visitors of protected areas, which significantly increases the economic income of the local population. There are 1853 people working in the vicinity of the protected areas, 576 hotels, 276 stores, and 222 catering enterprises, the income of the local population is approximately 9,052,614 GEL<sup>4</sup>.

The income from ecotourism services is a multifactorial indicator, which is influenced by the number of visitors, investments, infrastructure, economic and political stability of the country, as well as other primary and secondary factors. We cannot estimate the magnitude of the impact of all of them, but we will highlight the main ones and try to make the most accurate calculation.

In today's Georgia, the study of tourism, first of all, the relationship between the number of visitors to protected areas and the income of the people living in the vicinity of the protected area is of great interest. For this purpose, we conducted a one-factor correlation-regression analysis based on 2007-2023 data and estimated the magnitude of the influence between the number of visitors to the protected area and the income received from ecotourism services. The data are summarized in the table below.

For the analysis, we used a linear function and performed calculations from which we obtained the following equation:

$$y = 8.4751 x - 1181564.2931$$

As a result, we obtained the following economic interpretation of the model parameters: an increase in the number of visitors (X) to the protected area by 1 unit leads to an increase in income from ecotourism services (Y) by an average of **8.475** units. The linear correlation coefficient is 0.915, so the relationship

<sup>4</sup>[www.apa.gov.ge](http://www.apa.gov.ge)



between factors X and Y is quite high and direct. The statistical significance of the equation was tested using the coefficient of determination and Fisher's criterion. It was determined that 83.79% of the total variation in income in the study situation is explained by the change in the factor of number of visitors.

Table N 1

<b>Year</b>	<b>Number of visitors to PAs (x)</b>	<b>Incomes from ecotourism services (y)</b>
<b>2007</b>	7714	34427
<b>2008</b>	12226	56026
<b>2009</b>	68761	84962
<b>2010</b>	123315	118387
<b>2011</b>	303686	435859
<b>2012</b>	298910	737122
<b>2013</b>	355681	982869
<b>2014</b>	420166	1320793
<b>2015</b>	518218	1589756
<b>2016</b>	734874	2313697
<b>2017</b>	954692	4504472
<b>2018</b>	1108503	8436125
<b>2019</b>	1199011	9363447
<b>2020</b>	240268	899076
<b>2021</b>	589098	5832764
<b>2022</b>	902063	8314439
<b>2023</b>	1078112	10447166
<b>Total</b>	<b>8915298</b>	<b>55471387</b>

Any type of ecotourism has a limit of pressure on the natural environment and it can cause serious damage from economic, social, and environmental points of view. For example, due to construction work, sand has disappeared from the shoreline of Hawaii. Similar problems occur on other continents, e. g. in Antarctica, where the number of tourists has increased by thousands resulting in increased amounts of waste. To solve this problem, the International Association of Antarctic Tour Operators was established in 1991. They take care of tourists' safety and environmental protection as much as possible.

To achieve sustainable development of ecotourism, tourism activities should match the capacity of existing natural and man-made resources.

There were many problems hindering tourism and especially ecotourism in Georgia, including the fact that in no other post-socialist country has the tourism industry suffered such losses as it did in Georgia, where the state had to accommodate up to 300,000 people relocated from Abkhazia and Samachablo in the best sanatoriums, hotels and boarding houses and resort accommodations. This has led to a complete paralysis of the tourist and resort infrastructure.

Lack of human resources is one of the important problems in tourism. Along with the growth of tourist flows, the number of hotels and national parks, and the need for competent human resources are increasing. Even though the majority of higher educational institutions in Georgia today train tourism specialists with higher education, in our country, as well as in the whole South Caucasus, there was almost no school of tourism professions oriented to the training of low- and middle-tier personnel, while the demand for such personnel is the greatest.

There are many vacancies in travel agencies and there is a lack of qualified staff to fill them. The state takes due care of this and gradually opens vocational schools in different areas of tourism.

To solve environmental problems caused by tourism development, tourism development programs and construction processes of tourist facilities should undergo environmental impact assessment. This will allow us to achieve sustainable tourism development in such a way that we receive economic benefits from tourism and do not harm the environment.

Based on the above, we consider it advisable to recognize the priorities of ecotourism development by states and environmental programs and integrate ecotourism companies into environmental programs, develop recommendations for ecotourism development in priority regions as a way to solve the problems facing ecotourism. All this should take into account the experience of existing ecotourism development sites (national parks) in the world, as well as the proper elaboration of the main directions of the state policy of tourism development.

According to studies by the International Ecotourism Organization, the tourism industry worldwide generates \$8.8 trillion in revenue, of which ecotourism accounts for about 10% (\$800 billion to \$1 trillion).

Ecotourism employs more than 11 million people. Its annual growth ranges from 10% to 12%, hence it is the fastest-growing segment of tourism.

There are two models of ecotourism worldwide: Australian and Western European (German), and the third one is "Georgian". At the stage of ecotourism formation, it is similar to the Australian model and has features of the Western European model. Its important distinguishing feature is the social factor, i. e. ecotourism is aimed at minimizing the anthropogenic load, improving the welfare of the local population, and increasing the level of environmental education and general culture of both visitors and residents. Many specially protected natural areas of Georgia have used this model in the realization of ecotourism. Every year several million tourists visit protected areas abroad. For European and American ecotourists, ecotourism in strictly protected areas is the most popular way of recreation. In Georgia, ecotourism is relatively new, and many people do not know how this type of tourism differs from ordinary recreation in nature. The development of ecotourism in protected areas greatly contributes to the economic development of tourism and the country as a whole, especially positively affecting the socio-economic status of the local population. Every year the number of tourist infrastructure facilities and employed population in the vicinity of protected areas increases. In 2017, according to a study conducted by German experts, the effect of just 5 protected areas in the economy of Georgia amounted to 87 million GEL.

According to 2023 data, the most visited were Martvili Canyon (21%), Prometheus Cave (21%), Sataplia (9%), Mtirala National Park (9%), Tsalka Canyon (8%), Okatse Canyon (8%), Tbilisi National Park (5%), Borjomi-Kharagauli National Park (4%), Kazbegi National Park (3%), Kinchkha Waterfall (3%), and the remaining 9% visited Algeti, Tusheti, Kolkheti, Lagodekhi, Tetra, Javakheti, Vashlovani, Navenakhevi, Kobuleti, Kintrishi, Chachuna, Machakhela, Pshav-Khevsureti, Ajameti and Mariamjvari protected areas.

Because ecotourism provides great public benefits and investments, it is advisable to increase budget expenditures in this field. In recent years, many ecotourism attractions have been established in Georgia and a lot of investments have been made. However, there is a need to focus more attention at the governmental level and to establish integrated and coordinated cooperation between ministries in the field of ecotourism. It is very important to involve and interest the private sector in tourism as a whole so that investments can be made appropriate infrastructure (trails, visitor centers, village houses, etc.) can be developed, the environment can be preserved, and residents, businesses, and the state can receive economic benefits.

In 2019, for the first time, private international investments were made in the development of ecotourism in protected areas, which amounted to more than 40 million GEL. In 2023, the value of a portfolio of grant projects of the Agency of Protected Areas unprecedentedly exceeded GEL 100 million. However, this is not sufficient and it is necessary to create even better conditions, legal framework, strategy, and business environment on the part of the state, in which the activities of private businesses will yield substantial profits. There are prospects for development as evidenced by the diversity and beauty of Georgia's nature, on the one hand, and geographical proximity to the main tourist market - Europe, on the other hand.

### **Conclusion**

As we mentioned in the article, ecotourism is an important part of the tourism sector, one of the fundamental principles of which is the protection and preservation of the environment. Because ecotourism provides great public benefit and investment, it is advisable to increase budgetary allocations in this area. In recent years, many ecotourism attractions have been established in Georgia and a lot of investments have been made. However, there is a need to focus more attention at the governmental level and to establish comprehensive and coordinated cooperation between ministries in ecotourism. It is very important to involve and interest the private sector in tourism as a whole so that investments can be made appropriate infrastructure (trails, visitor centers, village houses, etc.) can be developed, the environment can be preserved, and residents, businesses, and the state can receive economic benefits.

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## **Geological and mineralogical sciences**

### **ON THE CONDITIONS OF FORMATION OF BIOTITE GRANITES OF THE ZARKAYNAR INTRUSIVE (SOUTHERN NURATAU, UZBEKISTAN)**

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### **ЗАРҚАЙНАР ИНТРУЗИВИ БИОТИТЛИ ГРАНИТЛАРИНИНГ ҲОСИЛ БЎЛИШ ШАРОИТИ ҲАҚИДА (ЖАНУБИЙ НУРОТА, ЎЗБЕКИСТОН)**

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#### **Abstract**

The Zarkainar intrusion is composed of S-type granitoids (quartz-diorite, granodiorite, biotite granite, etc.), formed due to sedimentary-metamorphic rocks as a result of plate collision. Most of it is composed of biotite granites. As a result of the research, complex blocks of gabbro-diorites, diorites and quartz diorite bodies, granodiorites-adamellites, tonalites, double-mica granites and vein rocks were identified. The granitoids of the Zarkainar intrusion form a consistent (homodromous) series - monzodiorites, monzonites and normal biotite granites.

#### **Аннотация**

Зарқайнар интрузиви плиталар тўқнашуви (коллизия) натижасида чўкинди-метаморфик жинслар ҳисобида ҳосил бўлган S-турдаги гранитоидлардан (кварцли диорит, гранодиорит, биотитли гранит ва б.) ташкил топган. Унинг аксарият қисми биотитли гранитдан ташкил топган. Интрузивни ўрганиш натижасида габбро-диорит, диорит ва кварцли диорит таналарининг мураккаб блоклари, гранодиорит-адамеллитлар, тоналитлар, қўш слюдали гранитлар ва томир жинслар ажратилган. Зарқайнар интрузиви гранитоидлари монцодиорит, монзонит, нормал гранитлар кетма-кет (гомодром) қаторини ҳосил қилади.

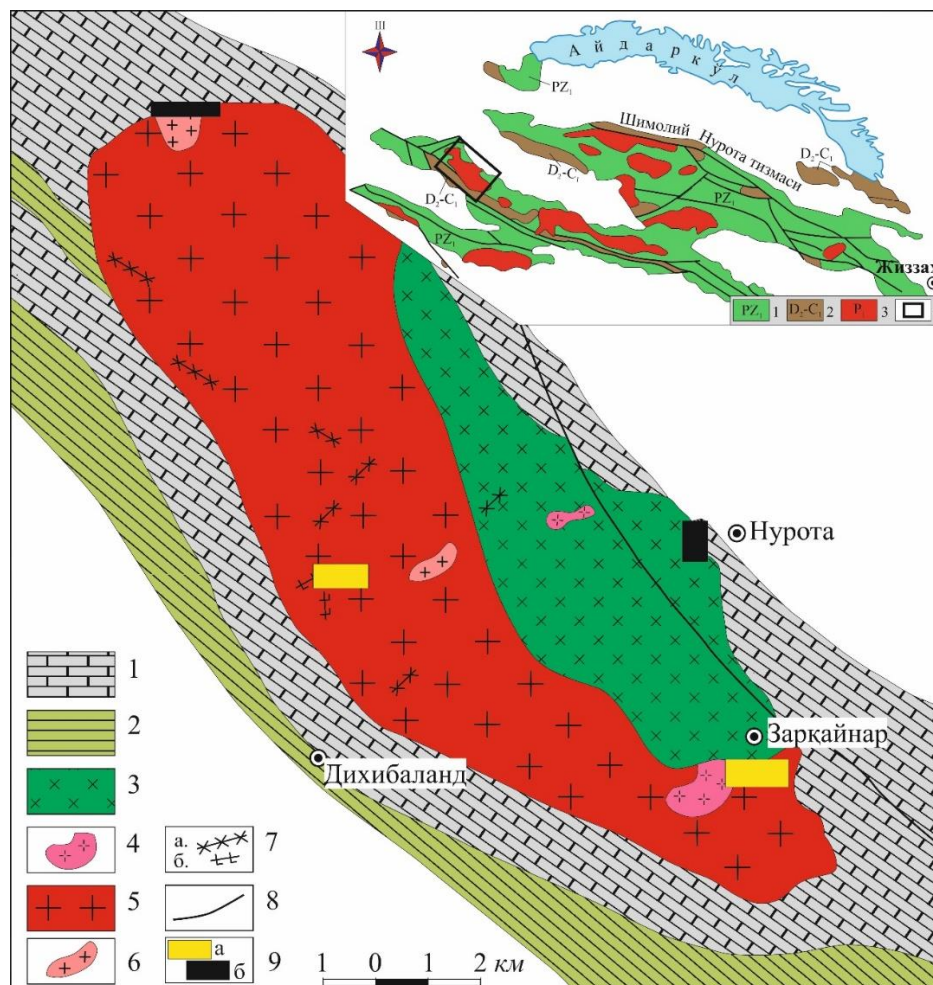
**Keywords:** Zarkainar intrusion, S-type granitoids, biotite granite, double-mica granites, monzodiorites.

**Калит сўзлар:** Зарқайнар интрузиви, S-турдаги гранитоидлар, биотитли гранит, қўш слюдали гранитлар, монцодиоритлар.

**Қириш.** Нурута минтақасида бир қатор гранитоидли интрузивлар мавжуд, улар геодинамик нуқтаи назардан коллизия ривожланиш босқичида (“S”-туридаги гранитоидлар), яъни шимолда қозоғистон, жанубда қорақум-тожик плиталарининг тўқнашуви натижасида ҳосил бўлган деган қарашлар мавжуд (Долимов, Ганиев, 2010). Бу гранитоидли интрузивларнинг тоғ жинслари гранодиорит-адамеллит-гранитли формацияга мансуб адамеллит-гранитли – шурак мажмуасига бирлаштирилган ( $C_3-P_1$ ; 260-290 млн. йил, K-Ar, биотит, амфибол). Мажмуа вольфрам ва қалайга ихтисослашган ва скарн-шеелитли маъданлашуви намоёнларини ҳосил қилади (Лянгар, Қўйтош конлари).

Зарқайнар интрузиви Жанубий Нурута тоғ тизмасининг ғарбий тугалланиш қисмида жойлашган (1-расм). Интрузив майдони 170 кв км атрофида бўлиб, силур-девон даври оҳактошлари ва сланецларини ёриб чиқади. И.М.Исамухамедов (1955), Э.П.Изох, З.А.Юдалевич ва бошқалар (1967-1968) тадқиқотларидан сўнг уни ҳеч ким махсус ўрганмаган. Охириги йилларда Р.С.Хан ва б. (2006 й.) 1:100 000 миқёсда хариталаш ишларини ўтказишган.



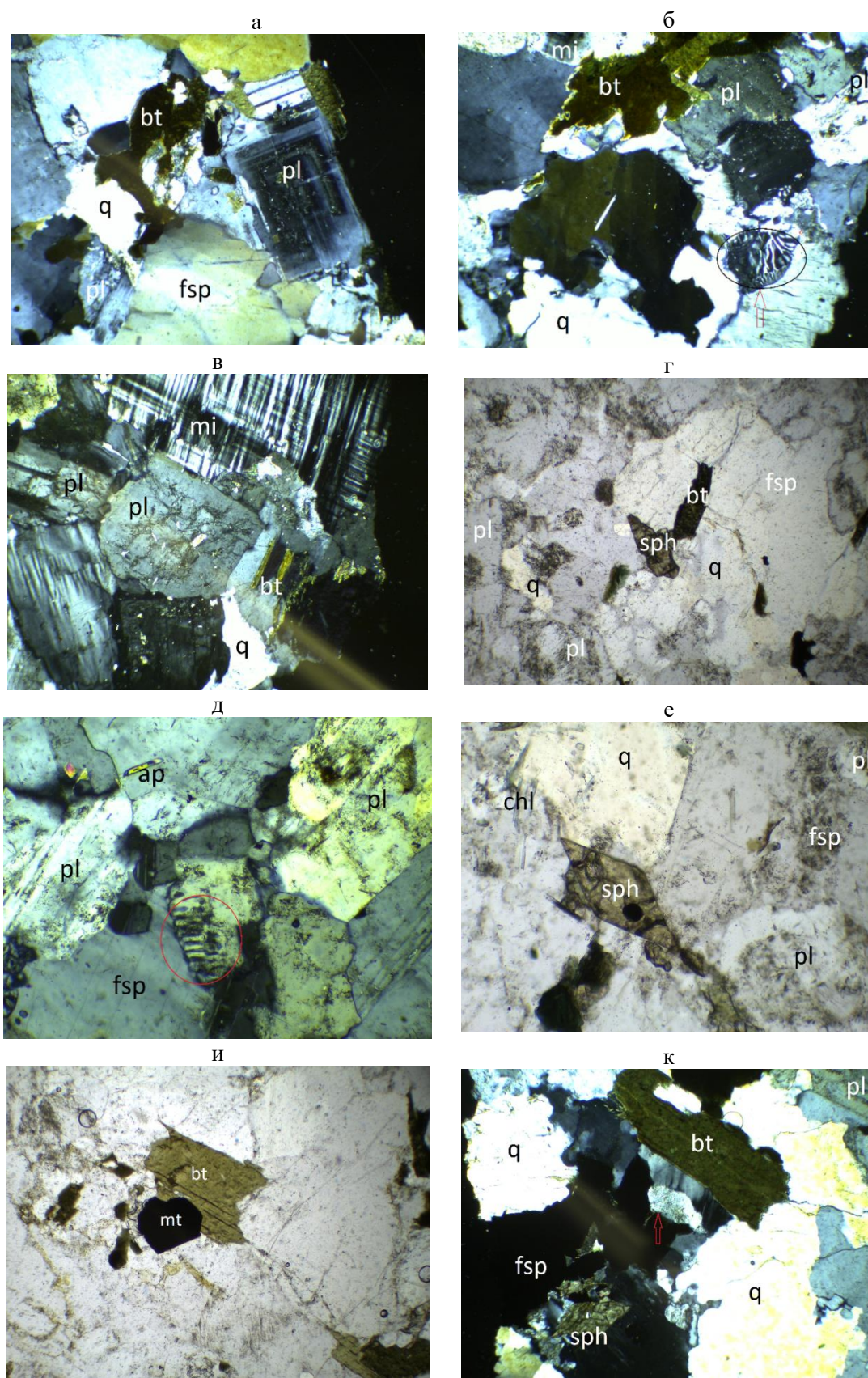


1 – расм. Зарқайнар интрузивининг Нурота минтақасидаги жойлашган ўрни (И.М.Исамухамедов бўйича, 1955). 1 – қуйи палеозой чўкинди-метаморфик ётқизиклари, 2 – девон-қуйи тошқўмир карбонат ётқизиклари, 3 – карбон-перм даври гранитоидли массивлар, 4 – Зарқайнар интрузивининг ўрни. Зарқайнар интрузиви: 1 – дарасой ( $C_2dr$ ) ва октов сериясига ( $D-C_2 ak$ ) мансуб мармарлашган оҳактошлар, кремнийли ва брекчияли катламлар, 2 – калсара ( $C_{2-3} kl$ ) свитасининг карбонатли флиш ётқизиклари, кварц-кумтошли оҳактошлар, мергел ва аргиллитлар ва накрут свитаси ( $S_1nkr$ ) кўмир-кремнийли сланецлар, алевролитлар, кумтошлар, 3 – габбро-диорит ва кварцли диоритлар, 4 – тоналитлар, адамеллитлар, 5 – гранодиоритлар, гранитлар, 6 – лейкократли гранитлар, 7 – гранит-порфирлар, лейкогранитлар (а) ва лампрофир (б) дайкалари, 8 – ер ёриги, 9 – скарнлашув намоёнлари (а) ва нодир ер элементлари намоёнлари (б).

Зарқайнар интрузивининг геологик тузилишида ўрта рифейдан то ўрта карбонгача бўлган давр чўкинди-метаморфик ва флиш ётқизиклари иштирок этади (Р.С.Хан ва б., 2006 й.).

**Петрография.** Зарқайнар интрузивида кенг тарқалган биотитли гранитлар – текис кристалланган, ўрта ва майда донали, гранитли, базан пойкилитли тузилишга эга (2-расм). Таркибида плагиоклаз, калишпат, кварц ва биотит учрайди. Калий-натрийли дала шпати аниқ панжарасимон тузилишли микроклиндан иборат. У пелитлашагнлиги учун ранги оч жигаррангга эга. Кўпинча альбит билан микопертитли ўсимталар ҳосил қилади (2-расм). Микроклиннинг майда доналари билан бирга нисбатан йирик (1,5-1,0 см) ўлчамдаги пойкилитли қўшимталар билан бирга йирик доналари учрайди (2-расм). Пойкилитли қўшимталар плагиоклазнинг майда доначалари ва биотит варақачаларидан иборат. Улар одатда микроклиннинг четки қисмларида учрайди. Кварц тўлқинсимон сўниш характерига эга бўлган ксеноморф шаклларда учрайди. Микроклин билан мирмекит ёки микропегмати ўзаро ўсимталар ҳосил қилади. Кварц камдан кам ҳолларда дала шпатлари ва биотит пойкилитли қўшимталари билан 2 мм катталиқдаги шаклларни ҳосил қилади. Биотит қўнғир, оч сариқ, хлоритлашган варақачалар кўринишида келади. Плагиоклаз зоналли (2-расм), унинг марказий қисмларида майда кварц доначалари учрайди. Калишпат майда доначалар ҳосил қилади.





2-расм. Зарқайнар интрузиви гранитоидларининг петрографик хусусиятлари: а, б, – 3С-1 – биотитли гранодиорит; в г, – 3С-21 – гранодиорит; д е - 3С-33 бу ҳам, и, к – 3С-16 - гранит. Николлар кесишган ва параллел (г, д, к, л). кат.50<sup>х</sup>.

**Петрокимё.** Биотитли гранитларнинг кимёвий таркиби 1-жадвалда келтирилган. Уларнинг таркиби таснифий диаграммада ( $\text{SiO}_2 - \text{Na}_2\text{O} + \text{K}_2\text{O}$ ) монцодиорит, монцограно-диорит, граносиенит, гранит ва лейкократли гранитлар майдонига тушади ва ўрта ишқорли ўрта жинслардан нормал қаторли

нордон жинслар томон ишқорларни пасайиши ва кремний оксидининг кўпайиши билан характерланади (3-расм). Эрта ва охириги фазаларда натрий калийга нисбатан устунлик қилади. Глинозёмлик коэффиценти бўйича ўта юкори глинозёмли ҳисобланади ( $a'=2-10$ , 1-жадвал). Агпатлик коэффиценти  $Ka < 1$  ( $Ka=0,41-0,58$ ), демак ишқорли металллар фақат калий-натрийли дала шпатларида ва қисман биотитларда мужассамлашган.

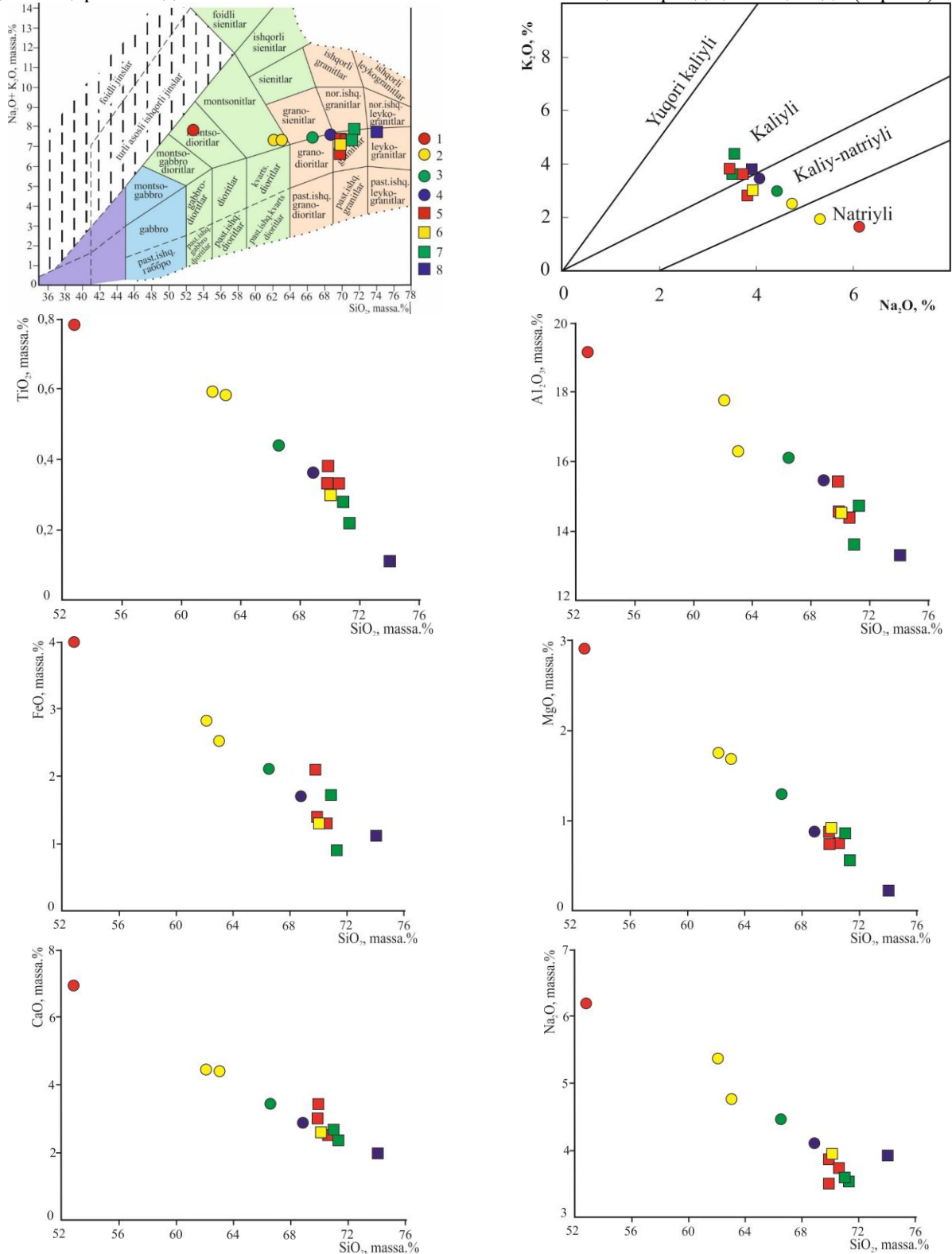
1-жадвал

Зарқайнар интрузиви гранитоидларининг кимёвий таркиби (% ҳисобида)

Окисел	1	2	3	4	5	6	7	8	9	10	11	12
SiO <sub>2</sub>	52,87	62,20	63,13	66,60	68,93	69,89	69,95	70,08	70,63	70,98	71,35	74,14
TiO <sub>2</sub>	0,78	0,59	0,58	0,44	0,36	0,38	0,33	0,30	0,33	0,28	0,22	0,11
Al <sub>2</sub> O <sub>3</sub>	19,11	17,74	16,30	16,12	15,43	15,43	14,56	14,53	14,39	13,59	14,75	13,31
Fe <sub>2</sub> O <sub>3</sub>	2,96	1,83	1,24	1,23	0,99	0,45	0,28	1,22	0,93	0,56	1,00	1,07
FeO	3,99	2,82	2,51	2,10	1,69	2,08	1,40	1,29	1,27	1,72	0,90	1,10
MnO	0,07	0,08	0,07	0,06	0,05	0,05	0,05	0,05	0,03	0,05	0,03	0,04
MgO	2,90	1,75	1,68	1,28	0,86	0,85	0,73	0,90	0,75	0,85	0,55	0,22
CaO	6,92	4,43	4,39	3,44	2,86	3,01	3,43	2,59	2,54	2,66	2,36	1,94
Na <sub>2</sub> O	6,18	5,36	4,76	4,45	4,10	3,86	3,50	3,94	3,73	3,60	3,54	3,92
K <sub>2</sub> O	1,66	1,93	2,56	2,98	3,45	2,85	3,84	3,10	3,62	3,68	4,39	3,80
H <sub>2</sub> O	0,20	0,07	0,11	0,09	0,12	0,10	0,11	0,10	0,10	0,10	0,04	0,07
П.п.п.	2,52	0,93	1,50	0,85	0,94	0,60	0,79	0,93	0,68	0,92	0,65	0,28
P <sub>2</sub> O <sub>5</sub>	0,45	0,28	0,31	0,16	0,15	0,18	0,17	0,14	0,11	0,11	0,04	0,06
CO <sub>2</sub>	1,18	-	0,69	-	-	0,41	0,10	0,10	0,10	0,27	-	-
Сумма	100,26	100,02	99,83	99,80	99,93	100,14	99,24	99,27	99,21	99,37	99,80	100,06
al'	1,94	2,77	3,00	3,50	4,36	4,57	6,04	4,26	4,88	4,34	6,02	5,57
f'	10,63	6,99	6,01	5,05	3,9	3,76	2,74	3,71	3,28	3,41	2,67	2,5
Kф	70,56	72,66	69,06	72,23	75,71	74,85	69,71	73,61	74,58	72,84	77,55	90,79
Na <sub>2</sub> O+K <sub>2</sub> O	7,84	7,29	7,32	7,43	7,55	6,71	7,34	7,04	7,35	7,28	7,93	7,72
Na <sub>2</sub> O/ K <sub>2</sub> O	3,72	2,78	1,86	1,49	1,19	1,35	0,91	1,27	1,03	0,98	0,81	1,03
Fe <sub>2</sub> O <sub>3</sub> /FeO	0,74	0,65	0,49	0,59	0,59	0,22	0,20	0,95	0,73	0,33	1,11	0,97

Изох. 1 – диоритлар (2), 2 – кварцли диоритлар (3), 3 – кварцли диорит (ЗС-38), 4 – тоналитлар, гранодиоритлар (12), 5 – адамеллитлар (6), 6 – биотитли гранит (ЗС-1), интрузивнинг шарқий эндоконтакти, Қабристон атрофи; 7 – гранит (ЗС-33), плутоннинг жанубий қисми, Зарқайнар қишлоғи; 8 – биотитли гранит (ЗС-21), интрузивнинг шарқий эндоконтакти, Зиёратгоҳ атрофи; 9 – гранит (ЗС-66), Чўллубулок; 10 – гранит (ЗС-16), интрузивнинг шимолий-шарқий эндоконтакти, Пашшот; 11 – гранитлар (14), 12 – лейкогранитлар (7). Қавс ичида анализлар сони. Анализлар И.М.Исамухамедов (1955), Э.П.Изох ва б., (1975) ҳамда муаллифлар бўйича (3, 6, 7, 8, 9, 10) келтирилган.

Калий-натрийли муносабатда ва Харкер диаграммаларида интрузив тоғ жинсларининг таркиби оҳақ-ишқорли майдоннинг кетма-кет жойлашган ягона эволюцион тренд ҳосил қилади (3-расм).

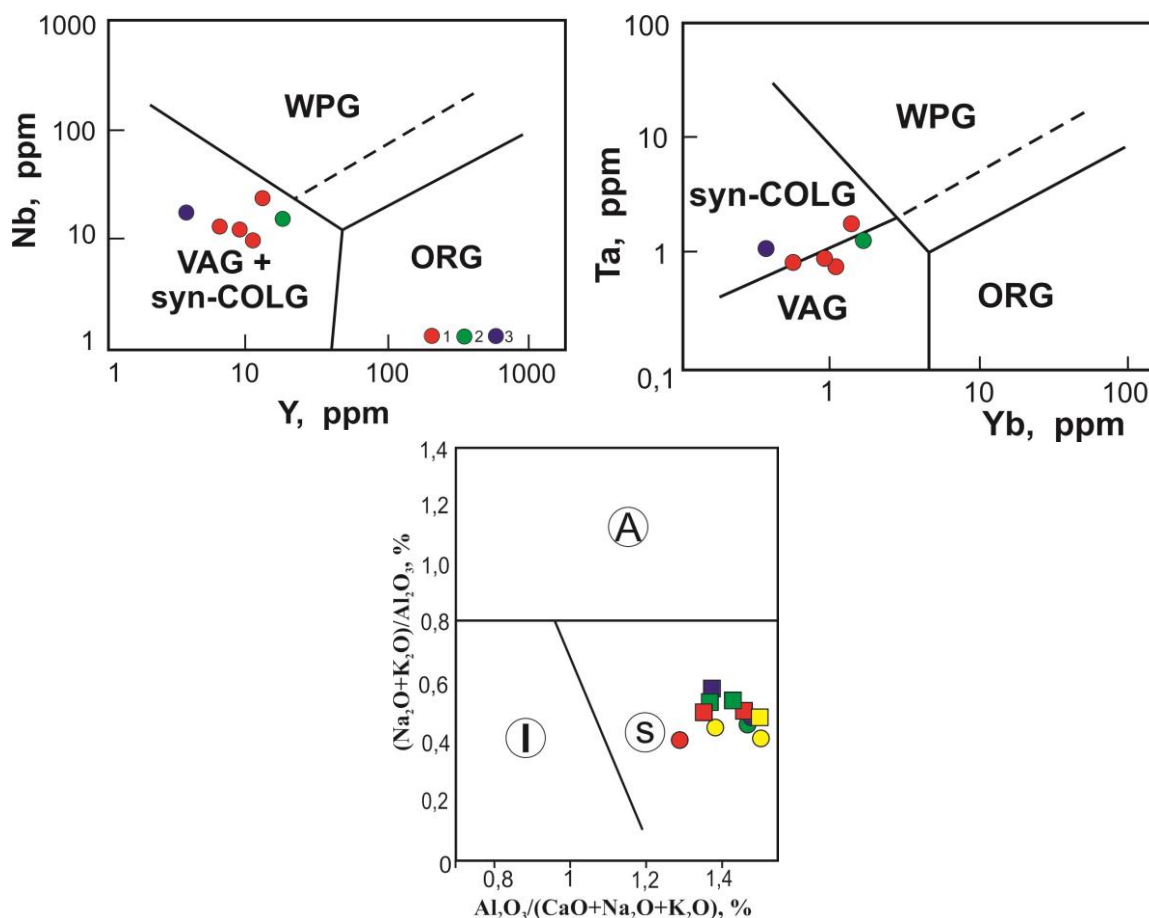


3-расм. Зарқайнар интрузивининг гранитоилари учун TAS, AFM, K<sub>2</sub>O-Na<sub>2</sub>O ва Харкер диаграммалари. 1 – диорит, 2 – кварцли диорит, 3 – тоналит, гранодиорит, 4 – адамеллит, 5, 6 – биотитли гранитлар гранодиорит, 7 – гранит, 8 – лейкогранит.

Зарқайнар гранитоидларининг таркиби турли геодинамик диаграммаларда таҳлил қилинди, улар Пирс ва б. (1984) диаграммаларида орол ёйлари ва синколлизиян гранитлар ривожланган майдонларда

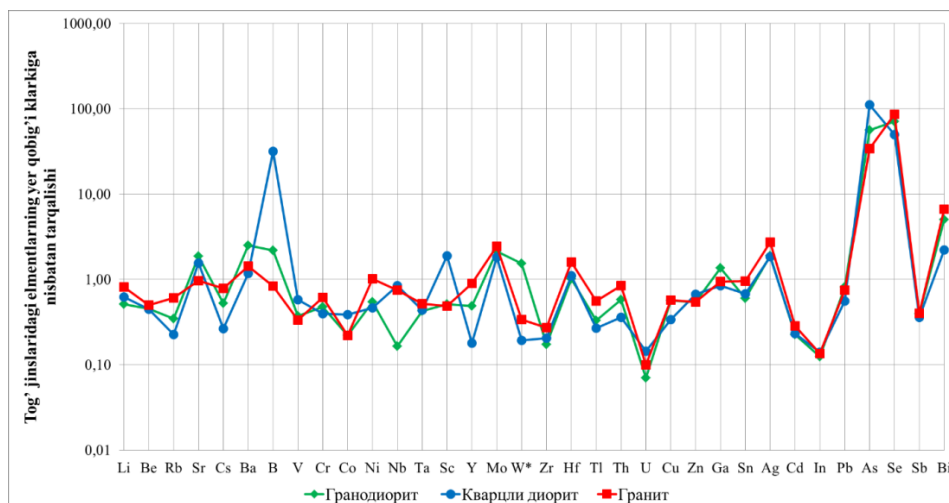


жойлашади (4-расм). Бу ҳолат Мида (1990) диаграммасида ҳам ўз тасдиғини топди, яъни интрузив гранитоидлари коллизион гранитлар (S-тури) майдонига тушган.



4-расм. Зарқайнар интрузиви гранитоидлари учун дискриминацион геодинамик диаграммалар: Nb-Y, Ta-Yb [Pearce, Harris, Tindle, 1984], WPG – плитаиحي гранитлари, VAG – вулқон орол ёйлари гранитлари, syn-COLG – синколлизсион гранитлари, ORG – океан тизмалари гранитлари;  $(\text{Na}_2\text{O} + \text{K}_2\text{O})/\text{Al}_2\text{O}_3 - \text{Al}_2\text{O}_3/(\text{CaO} + \text{Na}_2\text{O} + \text{K}_2\text{O})$  [Maeda, 1990]. S-, I-, A-турдаги гранит майдонлари. 1 – гранодиорит, 2 – гранит, 3 – кварцли диорит.

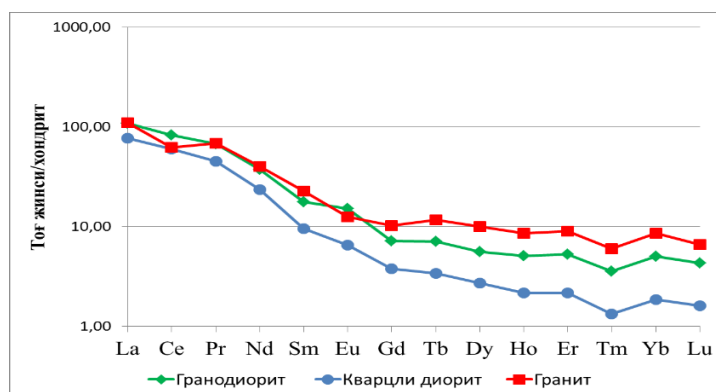
Интрузив гранитоидлари элементлар-аралашмасининг миқдорий тарқалиши спайдер-диаграммаларга туширилди (5-расм). Диаграммада барча гранитоидлар таркибидаги элементлар-аралашмаси деярли бир хил, аммо диоритларда бўр элементи кларкка нисбатан 50 баробар, маргимушнинг миқдори тахминан 80-100 баробар, гранитда селен 90 баробар, висмут 9-10 баробар, кумушнинг миқдори 5-6 баробар юқорилиги аниқ кўринади (5-расм). Ўзбекистон худудидаги гранитоидлар учун учувчи компонентлар, кремнезем, натрий, калий, ноёб ишқорли металллар, нодир, нодир ер элементлари ва радиоактив элементлар (Li, Be, Rb, Cs, B, Nb, Ta, РЗЭ, W, Mo, Re, Zr, Hf, U, Th, Ga, Sn) миқдори дастлабки фаза жинсларидан (диоритлар, кварцли диоритлар) гранодиоритларга, гранитларга ва лейкократли гранитларга қараб кўпаяди, аксинча темир гуруҳи элементлари ва металл маъдан элементлари миқдори камаяди.



5-расм. Зарқайнар гранитоилари таркибида элементлар-аралашмасининг миқдорий тарқалиш спайдер-диаграммаси.

Магматик ўчоқларнинг ҳосил бўлиши, мантиянинг фаоллашуви натижасида F, B, CO<sub>2</sub>, S, Au, Ag, Mo, W, Sn, U, PЗЭ ва бошқа элементлар билан бойиган флюидлар мантиянинг чуқур қисмларидан чиқиб келиши метамагматик турнинг якуни ҳисобланади. Ва бу, интрузив магматизм билан боғолик маъданлашувнинг полихрон ва полигенлигини кўрсатади (Ахунджанов, 2019).

Зарқайнар гранитоидлари таркибидаги НЕЭ миқдори монзонитоидлардан нордон гранитларга қараб ошиб боради (69,16 дан 147,27 г/т гача). Спайдер-диаграммада НЕЭ миқдори ўзгарувчан, аммо миқдорий чизиклар деярли бир хил тарқалган (6-расм). Энг муҳими, лантоноидлар кварцли диоритларда анча паст, аксинча гранитларда юқори (6-расм), бу яна бир марта мавжуд қонуниятни тасдиқлайди.



6-расм. Зарқайнар гранитоилари таркибида нодир ер элементларининг миқдорий тарқалиш спайдер-диаграммаси.

**Хулоса.** Зарқайнар интрузиви гранитоидлари монцодиорит, монзонит нормал гранитлар кетма-кет қаторини ҳосил қилади. Улар геодинамик нуқтаи назардан коллизион ва синколлизион туридаги гранитларга мансуб бўлиб, биотитли гранитлар таркибида нодир ер элементлари юқорилиги билан изоҳланади.

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# **Historical sciences**

## **THE SOVIET AGRARIAN POLICY AND THE COLLAPSE OF NOMADIC ETHNOECOLOGICAL TRADITIONS**

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## **КЕҢЕСТІК БИЛІКТІҢ АГРАРЛЫҚ САЯСАТЫ ЖӘНЕ КӨШПЕЛІЛЕРДІҢ ЭТНОЭКОЛОГИЯЛЫҚ ДӘСТҮРЛЕРІНІҢ КҮЙРЕУІ**

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### **Abstract**

The ecosystem and natural-climatic features create preconditions for the production relations of any people. That is, the natural-climatic characteristics of the steppe regions of Eurasia laid the foundation for the development of nomadic animal husbandry. These factors contributed to the adaptation of local populations to a nomadic lifestyle and shaped values that met the needs of that society.

The sharp continentality and aridity typical of the climate in the steppe regions, along with the scarcity of water resources, low levels of atmospheric precipitation, and the seasonal characteristics of plant growth in relation to the unique structure of the soil, set the premise that other forms of economic activity, besides nomadic animal husbandry, were both ecologically and economically unviable in these areas.

Neglecting or completely disregarding humanity's historical ecological experience in the utilization of natural resources can lead to irreversible ecological consequences and disasters.

### **Аннотация**

Экожүйе мен табиғи-климаттық ерекшеліктер кез келген халықтың өндірістік қатынастарына алғышарт жасайды. Яғни Еуразияның далалық аймақтарының табиғи-климаттық ерекшеліктеріне сәйкес онда көшпелі мал шаруашылығының қалыптасуын негіздеді. Бұл факторлар жергілікті халықтардың көшпенді өмір-салтына икемделуіне және сол қоғамның сұранысын қанағаттандыратын құндылықтардың қалыптасуына алғышарт болды.

Далалық аймақтардың климатына тән шұғыл құрлықтығы мен құрғақшылығы, су ресурстары мен атмосфералық жауын-шашынның тапшылығы, топырақ құрылымының ерекшеліктеріне сәйкес өсімдік түрлерінің жетілуіндегі маусымдық ерекшеліктері сияқты табиғи құбылыстар бұл аймақтарда көшпелі мал шаруашылығынан басқа шаруашылық түрлерінің экологиялық тұрғыда да, экономикалық тұрғыда да тиімсіз екеніне алғышарт болды.

Адамзаттың экологиялық тарихи тәжірибесіне жете көңіл бөлмеу немесе оны мүлде ескермеу табиғи ресурстарды игеру кезінде орны толмас экологиялық зардаптар мен апаттарға әкеп соқтыруы әбден мүмкін.

**Keywords:** ethnoecology, steppe region, Eurasian nomads, agrarian policy, ethnoecological traditions

**Кілт сөздер:** этноэкология, далалы аймақ, Еуразия көшпелілері, аграрлық саясат, этноэкологиялық дәстүрлер

### **Kіріспе**

Еуразияның далалық, орманды таулы, шөлді шөлейтті болып келетін кеңістігін мекендеген көшпелі халықтар мыңжылдықтар бойы табиғи ортасына зиянсыз бейімделудің тәжірибесін, табиғи ресурстарға көздің қарашығындай қарап, оны шектеулі және тиімді пайдаланудың ерекше моделін қалыптастырып, толыққанды экологиялық мәнге ие өмір салтын XX ғ. 30 жылдарына дейін ұстанып келді.

Қазіргі кезеңде күллі әлем индустриалды-инновациялық саясатын қарқынды түрде жүзеге асыруды маңызды міндеттердің бірі ретінде алға қойып отырғаны белгілі. Мұндай технологиялық қарқынды өзгерістер жағдайында табиғат пен қоғам арасындағы өзара байланыстың тарихи тәжірибесін зерттеп-зерделеу және бүгінгі күні жаһандық экологиялық дағдарыс алдында тұрғанда адамзаттың табиғи орта игіліктерін тиімді пайдалану тәжірибесі аса қажет құндылық.



### **Талқылау**

Білім, ғылым және технологиялар табиғатқа пайда келтірумен қатар, теңдесіз зиян әкеліп отырғандығы тарихтың тәжірибесінен белгілі. Эколог-ғалымдардың тұжырымы бойынша, ғылым мен техниканың дамуы адамзаттың әлеуметтік жағдайын жақсартуға және өркениетті дамытуға күшті әсер ететіні сөзсіз, алайда ол бұрын болып көрмеген масштабтағы табиғи ресурстар мен энергияны тұтынуды талап етеді.

Адамзаттың қоршаған ортаға бұлай әсер етуі табиғи орта тепе-теңдігінің бұзылуына, табиғи экожүйенің жедел өзгеруіне, биологиялық әртүрліліктің біршама әлсіреуіне және, ең бастысы, адам шығынына алып келу мүмкіндігін кеңіте түседі. Бұл жағдайды 1920-1930 жылдардағы кеңестік аграрлық саясаттың нәтижелері анық көрсетіп берді.

### **Материалдар мен әдістер**

Тарихи-экологиялық дерек көзі ретінде мәліметтер мен материалдарды іріктеу, топтау, жүйелеу, жіктеу әдісі қолданылды.

Тақырыпты ашуда пәнаралық зерттеу әдістеріне сүйендік.

– жалпы әдістер: дүниетанымдық, логикалық, тарихилық, ғылыми таным, объективтілік ұстанымдары;

– ғылыми-зерттеу әдістері: талдау және қорыту, аймақтық зерттеу әдісі.

Талдау әдісі бойынша библиографиялық талдау, тарихи-салыстырмалы талдау, дискурстық талдау, сыни талдау жүзеге асырылды.

Арнайы тарихи әдістерге тоқталатын болсақ, тарихи-жүйелілік, типологиялық, тарихи-салыстырмалы әдістері қолданылды.

Зерттеу барысында пәнаралық ұстанымға негізделген тарихи-экологиялық талдау әдісі де қолданылды. Бұл әдіс бойынша қоғамның даму процесіне тарихи дәуір немесе кезең заңдылықтарының ықпалы ғана емес, сонымен бірге қоршаған орта заңдылықтарын да бірге зерттеуге мүмкіндік береді.

Тақырыпты ашуда қолданылған келесі әдіс - аймақтық зерттеу әдісі.

Бұл әдіс белгілі бір аймаққа немесе аумаққа бағытталған нақты құбылыстарды, проблемаларды немесе процестерді зерттеу тәсілі. Талдаудың бұл әдісі Еуразияның далалық аймақтарына сипаттамаларды, ерекшеліктерді және өзара әрекеттесуді тереңірек зерттеуді қамтиды.

Аймақтық зерттеу әдісін қолдану арқылы Еуразияның далалық аймақтарына тән шаруашылық және әлеуметтік-мәдени бірегейліктерді, өзара әрекеттестіктер мен динамикаларды жақсырақ түсінуге мүмкіндік береді.

### **Нәтижелер**

Еуразия көшпелі халықтарының этноэкологиялық тәжірибесі табиғи ресурстарды пайдалану мен оны басқарудың ғасырлар бойы жинақталған, сынақтан өткен дағдылар жиынтығы ретінде қалыптасты. Сонымен бірге, олар этноэкологиялық тәжірибелерінің бірегей үлгілерін дәстүрлі өмір салтының негізінде қалыптастырған болатын. Алайда экологиялық ұтымдылық экономикалық мақсатпен жиі қайшылыққа түседі, көп жағдайда соңғысы басшылыққа алынады [1].

Дәл осы жағдай кеңес үкіметінің көшпелі және жартылай көшпелі халықтарды күштеп ұжымдастыру мен отырықшыландыру арқылы ауыл шаруашылығымен айналысатын отырықшы қоғам қалыптастыруға бағытталған саясатынан айқын көрініс тапты [2 с. 112-113].

Седентаризация, яғни көшпелі өмір салтында болған адамдардың отырықшылыққа көшуі олардың ойлау стереотиптерін, күнделікті дағдыларын, дәстүрлі құндылықтар жүйесін өзгерту немесе бұзу дегенге сайып келеді [3, с. 324].

Жалпы, кеңес билігі орнағаннан кейін де 1920-жылдары Еуразияның көшпелі халықтары өздерінің дәстүрлі өмір салтында тіршілік етті. Мәселен, Кеңес Одағындағы көшпелілерінің 70% құраған қазақ халқының түрлі деректерге қарағанда 55-60% тен 90% дейін көшпелі және жартылай көшпелі өмір салтында болған және соған сәйкес халықтың 85-90% мал шаруашылығымен айналысқан [4].

Қазақ халқы сияқты сол тарихи кезеңде қырғыз, түркмен, қалмақ, қарақалпақ, бурят халықтары да көшпелі өмір салтында болды және мал шаруашылығымен айналысуды табысты жалғастыруда болды. Оларда дәстүрлі құқық нормалары, рулық қауымдар, көшпелі жайылымдық шаруашылық берік сақталды. Сонымен бірге, буряттар мен қалмақтарда буддизмнің ықпалы күшті болды [4, с. 19-21].

Кеңестік билік тарапынан жүргізілген күштеп ұжымдастыру саясаты Еуразия көшпелі халықтарының этноэкологиялық тәжірибелерін қолданыс аясынан бірте бірте ығыстырып жіберді.

Еуразияның құрғақ далалық аймақтарын мекендеген көшпелі халықтарын күштеп ұжымдастыру арқылы колхоздарға біріктіруі ғасырлар бойы қалыптасқан этноэкологиялық дағдылары мен тәжірибелерін бұзды. Бұл саясат арқылы кеңес үкіметі дәстүрлі жайылымдарды тәркілеп, оны мемлекеттік меншікке алып, колхоздарға үлестіріп берді. Өз кезегінде бұл отырықшы колхоздардың меншігіне орай аумақтық тұрғыда шектелген жайылымдардың шектен тыс қолданылуына алып келді. Ол топырақ эрозиясы көлемінің артуына, жайылымдық ресурстардың тозуына, судың ластануына, өсімдік түрлерінің азаюына әкелді. Аталған жағдай Қазақ жерін, Сібірдің бірқатар халықтарын қамтыған 1920-1930 жылдардағы ірі көлемдегі аштықтан кейін, күрт кеміп кеткен мал санының қалпына келе бастағанынан кейін орын алды.

Кеңес үкіметінің орталықтан басқару әдістері мен жоспарлы экономика жүйесі ауыл шаруашылығын дамыту мен басқаруда жергілікті халықтың этноэкологиялық дәстүрлері мен тәжірибелерін, далалық құрғақ аймақтардың табиғи ерекшеліктерін ешбір ескерусіз қалдырып отырды.

Ал дәстүрлі көшпелі жүйелер қоршаған орта өзгерістеріне оңтайлы бейімделіп, тиімді басқарылып отыратын еді. Өкінішке орай, орталықтан басқару, яғни алыстағы Мәскеу кабинеттерінен басқаруды жүзеге асыру ауыл шаруашылығын жүргізу мен табиғи ресурстарды басқаруда өрескел қателіктерге жол беріп отырды. Бұл қателіктер орны толмас шығындарға: адам шығыны, материалдық шығындар, сонымен бірге, экологиялық салдарға алып келді.

Этноэкологиялық тәжірибелерді ескермеу үлкен экологиялық зардаптарға негіз болды. Жайылымдарды шектен тыс қолдану, орман шаруашылығын өндірістік жолға қою, жер ресурстарын тиімсіз басқару биоалуандықтың бірте бірте қысқаруына жағдай жасаған еді.

Аталмыш экологиялық зардаптарды қалпына келтіру ұзақ мерзімді талап етті және экологиялық тепе теңдіктің бұзылуына алғышарт болды.

Кеңес билігінің күштеп ұжымдастыру саясатының демографиялық және экологиялық зардаптары мен салдары бүгінгі күнге дейін сезіліп отыр.

Сталиндік эксперименттердің бағасы Еуразия көшпелі халықтары үшін орны толмас қасіреттермен байланысты өлшенеді. Тарихшы мамандардың пікіріне сүйенсек, сталиндік бес жылдық жоспарлардың бірде бірі орындалмаған [5].

Ал ауыл шаруашылығында малдың күшін трактор мен машиналар арқылы ауыстырамыз деген жоспар 1950-жылдарға дейін орындалған жоқ еді. Өндірістік дамуда елеулі жетістіктер болды деп саналатын болса, онда ол халықтан алынған қаражат арқылы, яғни 1929-1932 жылдардағы жаппай күштеп ұжымдастыру және халыққа арақ сату көлемін арттыру, қосымша ақша басу жолдары арқылы мүмкін болды [6].

Күштеп тәркілеу мен ұжымдастыру және соның салдарынан бірнеше жылдарға созылған аштықтың Еуразия көшпелілерінде ментальдық әрі психологиялық салдары да өте ауыр болған еді. Оның көшпелі халықтардың этноэкологиялық дәстүрлерінің құлдырауына тікелей әсері болды. Колхоз тұрғындарының өз еңбегінің түпкі нәтижесіне мүдделі болмауы, колхоз үшін еңбектің өзіне деген тікелей пайдасын көре алмауы олардың ортақ мүлікке деген, қоршаған табиғи ортаға деген немқұрайдылықты күшейтіп жіберді. Қысқа уақыт ішінде көшпелі халықтардың этноэкологиялық дағдылары керексіз болып қалды. Бұл халықтың әл-ауқатының күрт төмендеуіне алып келді.

Еңбегінің түпкі нәтижесін көре алмаған ауылдардағы, яғни ауыл шаруашылығы саласындағы белсенді адамдар мен жастар өндіріс ошақтары мен қалаларға қоныс аудара бастады. Бұл процесс этноэкологиялық дағдылар мен дәстүрлердің қажеттілігін төмендетіп жіберді және олардың ұрпақтан ұрпаққа жалғасу, берілу механизмдерін үзді. Тиісінше, Еуразия көшпелілерінің этноэкологиялық дәстүріндегі ұрпақ сабақтастығы үзіліп, шектеліп қалды.

1920-1930 жылдары Кеңес Одағында жүргізілген күштеп ұжымдастыру саясаты Еуразия көшпелілерінің өмір салты мен шаруашылығын түбегейлі өзгертті. Бұл өзгерістер орны толмас трагедиялық жолмен жүзеге асырылғаны белгілі. Өйткені, Кеңестік биліктің үлкен проблемасы оны басқарып отырғандардың көшпелі халықтар туралы білімінің болмауы еді [4, с. 24].

1930-1932 жылдары индустриаландыру қажеттілігі үшін колхоздардан, жалпы ауыл шаруашылығынан 4,7 млрд пұт астық алынған (бұл жеті жылға созылған ЖЭС кезіндегіден 1,3 есе көп). Шаруадан тартып алынған астық Батысқа экспортқа шығарылған. Өйткені, индустриаландыру үшін алынған шетелдік станоктардың, технологиялардың және шақырылған мамандардың ақысын төлеу үшін валюта қажет болған еді. Сол себепті, индустриаландыруды қамтамасыз ету үшін қажетті валюталық қаражат көлеміне тек астық сатуды ұлғайту арқылы қол жеткізуге болатын еді. Егер 1926 жылы КСРО-дан сыртқа 0,1 млн. т. астық шығарылса, 1929 жылы – 1,3 млн. т.; 1930 жылы – 4,8 млн. т.; 1931 жылы – 5,2 млн. т. астық шығарылды [2, б. 257].

Сонымен бірге, бұл астықты завод-фабрикаларды салуға тартылған жұмысшыларды нанмен қамтамасыз ету үшін жұмсады. Дегенмен, индустриаландыру жетістіктерінің бағасы аштық пен оның салдарынан қырылған миллиондаған адамдардың өмірі арқылы, қуғын-сүргінге ұшыраған миллиондаған бай-кулактардың өлімі мен ауыр тағдыры арқылы айқындалды.

Индустриаландыруды қаржыландыру үшін Кеңестік билік «нан дайындау» (хлебозаготовка) науқанын жүзеге асырды. Шаруалар мемлекетке төмендетілген баға бойынша астық сатуға құлықты болмады әрі оны нарықта жоғары бағаға сатуға мүдделі еді.

1927 жылдың соңына қарай нанның бағасы күрт қымбаттап, қалаларда нанның жетіспеушілігі 128 млн. пұтты құраған. Ал астық экспорты 1926 жылмен салыстырғанда 27 есе төмендеген, яғни 150 млн. пұттан 5,6 млн. пұтқа дейін төмендеген.

Бұл азық-түлік дағдарысынан шығудың жолы ретінде сталиндік билік күштеп тәркілеу, ұжымдастыру және «нан дайындауға» мәжбүрлеу саясатын жүзеге асырды. «Бай – кулактарды тап ретінде жою» шешімі қабылданды. Сонымен бірге, индустриаландыру бағытынан шегінбеу үшін жаппай күштеп ұжымдастыру саясатын адам өмірі мен оның құқықтарын аяқ асты ете отырып жүзеге асырды [7].

«Нан дайындау» науқаны барысында астықтың барлық қоры тартып алынғаннан кейін Батыс Сібірдегі деревнялар мен ауылдарда аштық басталды.

Колхозға алынған малдар үшін де азық жетіспеді. Ол малдың қырылуына алып келді. Мысалы, Барнаул округінде тұрғын үйлердің төбесіндегі солом шөпті де күштеп жинап алып, колхоз малдарына азық ретінде берген. Мал шығыны көп болғандықтан егіс науқаны кезінде күш-көлік ретінде де пайдаланатын малдар күрт азайып кеткен. Колхозшылар енді жерді күрекпен қопсытып, соқаға сиыр жегетін жағдайға жеткен. Ең сорақысы, соқаны ерлер мен әйелдер, тіпті балалар тартатын фактілер де тіркелген [8].

Келесі деректерге назар аударсақ, кеңестік билік тарапынан жіберілген өрескел асыра сілтеулер ұжымдастыру науқаны, мал-ет өнімдерін дайындау барысында және малды қоғамдық меншікке алуда орын алды. Мысалы, жергілікті билік өкілдері шаруалардың қолындағы үй құстары мен қояндарын да ортақ меншікке тартып алған. Мұндай шектен тыс асыра сілтеулер шаруа қожалықтарының басқа аймақтарға көшіп кетуі мен малды жаппай сою фактілеріне алып келді. Тұтас ауылдар мен орыс колхоздары басқа аудандарға көшіп кетіп отырған. Ал шаруалардың жан сақтау үшін малды жаппай союын кеңестік билік өкілдері “жыртқыштық” деп бағалаған [9, с.8].

Еуразия халықтарының этноэкологиялық дәстүрлерінің дағдарысы мен күйреуін жеделдеткен – күштеп ұжымдастыру нәтижесінде орын алған үлкен көлемдегі аштық. Аштық бүкіл Кеңес Одағын қамтығаны белгілі, соның ішінде Еуразия көшпелілеріне қатты соққы болды. Әсіресе, қазақ халқы бұл аштықтан ең ауыр зардап шеккен халық болғаны аян. Зерттеушілердің мәліметтері бойынша, қазақ халқының жартысына жуығы осы аштықтан өлді, яғни 2,5-3 млн. адам қаза болды.

Аштықтың салдарынан Еуразия халықтары экожүйені пайдаланудың дәстүрлі білімдері мен дағдыларынан айырыла бастады. Табиғаттың биоритмдеріне қатаң бағынатын көшпелі өмір салтындағы халықтар енді орталықтан басқарылатын жүйе арқылы отырықшы өмір салты мен ұжымдық шаруашылықтың заңдылықтары бойынша өмір сүрді. Бұл заңдылықтар сапалық тұрғыда мүлде басқа экологиялық дағдылар мен білімді қажет етті. Халыққа ендігі кезекте отырықшы шаруашылық тәсілдеріне бейімделу керек болды. Соған сәйкес дәстүрлі этноэкологиялық дағдылардан бірте бірте бас тартуға тура келді.

Кеңес үкіметі мемлекеттің мүддесі үшін табиғи ресурстарды пайдаланудың тиімді жолдарын ұсыну бағытында саясат жүргізді. Оны жоққа шығаруға болмайды. Бірақ табиғи орта туралы көшпелі халықтардың дәстүрлі білімдерін лайықты бағаламады, оған немқұрайды қарады. Мысалы, жайылымдарды пайдаланудың, балық аулау мен аңшылықтың ғасырлар бойы қалыптасқан дәстүрлі әдіс-тәсілдеріне ескіліктің сарыны деген ұстанымда болды.

Кеңестік индустриаландыру мен инфрақұрылымдарды дамыту барысында, мысалы тас жол, темір жолдарды салу кезінде жергілікті экожүйе мен табиғат өзгеріске ұшырып, аңдардың табиғи миграциялық бағыттарына нұқсан келді. Бұл жағдай аңшылардың тұрмыс жағдайына тікелей әсер етті.

Жерге, қоршаған ортаға жанашырылықпен қарайтын адам болмаса, жоғары өнімді ауыл шаруашылығын құру мүмкін емес екенін кеңестік күштеп ұжымдастыру практикасы да, одан кейінгі кеңестік аграрлық саладағы тарихи тәжірибелер де айқын көрсетіп берді.

Жалпылай алғанда, оның салдары бойынша бүкіл аграрлық сала үлкен дағдарысқа ұшырады. Ол елді азық-түлікпен қамтамасыз ете алмайтын жағдайға алып келді. Кеңестер Одағы үнемі миллиондаған тонна астық мен етті және басқа да ауыл шаруашылық өнімдерін шет елдерден сатып алуға мәжбүр болды. Мәселен, зерттеушілердің деректеріне қарағанда, аграрлық саладағы кеңестік

тәжірибелердің сәтсіз болғандығы сондай, кеңестік билік елді азық-түлікпен қамтамасыз ету үшін миллиардтаған долларға минералды ресурстарды сатаып отырды. 1954-1980 жылдар аралығында Кеңес Одағында тек алты рет ғана ішкі сұраныс үшін жеткілікті астық өндіруге қол жеткізген. Ал 1977-1980 жылдары Кеңес үкіметі шет елден 47,4 млн. тонна астық сатып алған. Ал 1977 жылы ет сатып алу үшін Саяси Бюроның шешімімен 42 тонна алтын сатуға мәжбүр болған [10].

Қазіргі кезде жоғары өнімді ауыл шаруашылығын қалыптастыру үшін заманауи ғылыми технологиялық жетістіктер мен этноэкологиялық дәстүрлерді өзара үйлестіріп дамыту қажеттілігі туындап отыр.

Кеңестік күштеп ұжымдастыру саясаты Еуразияның далалық кеңістігін мекендеген халықтарда ғасырлар бойы қалыптасқан шаруашылық жүргізу дағдыларын түбегейлі өзгертіп, этноэкологиялық дәстүрлерін санасынан өшіре бастады. Бұл процесс ұжымдастыру салдарынан халық санының күрт азаюына байланысты қысқа мерзімде жүзеге асырылды. Осы жағдай көшпелі халықтардың экологиялық көзқарасы мен табиғи ортаға деген қатынасына елеулі түрде әсер етті.

Мемлекеттік меншікке негізделген ұжымдық шаруашылықтардың құрылуы мен көшпелілерді отырықшылық өмір салтына түбегейлі көшіру жерді пайдалану жүйесінің өзгеруін талап етті. Ал көшпелі мал шаруашылығынан, аңшылық, балықшылық сияқты дәстүрлі кәсіптерінен бас тартып, отырықшы мал шаруашылығы мен егіншілікке жедел көшіру жерді пайдалану тәсілдерін отырықшылыққа бейімдеуді қажет етті [11]. Ол, бірінші кезекте, экожүйенің өзгерісіне, екіншіден, дәстүрлі этноэкологиялық дағдылардың дағдарысына, оған деген сұраныстың төмендеуіне алып келді. Отырықшы шаруашылық тәсілдері көшпелі мал шаруашылығымен салыстырғанда жер ресурстары мен қоршаған ортаға экологиялық тұрғыда салмақты анағұрлым көбірек түсіретіні айқын. Сол себепті, қаратопырағы шектеулі әрі терең емес, шөбі сиректеу өсетін, құрғақшылық тән далалық кеңістіктің топырақ қабатына, орман алқаптарына кері әсерін тигізіп, экологиялық тепе теңдіктің бұзылуына алғышарт жасады.

Көшпелі мал шаруашылығы мен өмір салтынан қол үзгеннен кейін соған бейімделген дәстүрлі экологиялық дағдылар мен білімдер қажеттілігін жоғалта бастады. Бұл жағдай табиғи ресурстарды тиімді пайдалану мен басқарудағы қайшылықтарға алып келді.

Қоршаған орта мен табиғи ресурстарға құндылық ретінде емес, байлық көзі, табыс көзі ретінде қарау көзқарасы қалыптаса бастады.

Көшпелі халықтардың колхоздарға бірігуі мен отырықшы өмір салтына көшуі дәстүрлі қоғамның жойылуына шешуші ықпал етті. Бұл дәстүрлі этноэкологиялық білімдер мен дағдылардың ұрпақтан ұрпаққа берілу жүйесін тоқтатты. Этноэкологиялық дәстүрлердегі ұрпақ сабақтастығының үзілуі көшпелі халықтардағы этникалық бірегейлігінің әлсіреуіне елеулі әсер еткен фактор болды.

Кеңестік билік жүзеге асырған ұжымдастыру, индустриаландыру, инфрақұрылымдарды дамыту сияқты аса ірі экономикалық жобалар елдің жаңғыруы үшін, қоғамның алға басуы үшін өте қажет екеніне дау жоқ. Алайда егер бұл жобаларға жетуде, орындауда адам шығынына жол берілетін болса, тіршілік ету ортасы мен дәстүрлі кәсібінен күштеп айыратын болса, онда олардың ешбір құндылығы болуы мүмкін емес. Экономикалық, әлеуметтік және мәдени жетістіктердің бағасы адам шығындары мен қоршаған ортаны ластау, бұзу арқылы өлшенетін болса және ол солай болуы тиіс деп қабылданатын болған жағдайда, олардың мәні мен мазмұны жоғалады.

Кеңестік биліктің көшпелі өркениетпен күресі және оны отырықшы-егінші етіп өзгертуге ұмтылысы шын мәнінде алғанда табиғатпен күресу болып табылады [4, с. 115].

Түйіндей айтқанда, экономикалық жетістіктер мен адам шығынын өзара салыстырып қарау [5], сонымен бірге, күштеп мүлікті тәркілеу мен ұжымдастыру және индустриаландыру кезіндегі адам шығынын экономикалық әрі индустриалдық-технологиялық жетістіктер арқылы ақтап алу ешбір ғылыми қағидаларға сәйкес келмейді.

### **Қорытынды**

Еуразияның далалық аймақтарын мекен еткен халықтардың этноэкологиялық дәстүрлерін танып-білу жер мен су ресурстарын неғұрлым тиімдірек пайдалануға, табиғи-климаттық ерекшеліктерді есепке алуға, қоғамның сұраныстары мен табиғат ресурстарының қайта қалпына келу мүмкіндіктерінің арақатынасын үйлестіріп отыру үшін маңызды болмақ.

Қоғамның қай саласында болмасын кез келген жаңа бастамалар мен реформаларды жүзеге асырмас бұрын, алдымен оның экологиялық бағдарының тарихи тәжірибесі зерттеліп, жан жақты сараптамалық талдаудан өтуі тиіс.



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# **Journalism**

## **MEDIA TECHNOLOGIES AND RHETORICAL INNOVATIONS: TRANSFORMING PUBLIC ENGAGEMENT**

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### **Abstract**

In today's society, public opinion is primarily shaped by mass media, which has evolved into what can be described as the Habermasian 'public sphere.' This environment is marked by a tension between market-driven interests and democratic values, along with the competing agendas of politicians and media entities. As a result, the presentation of information for public debate becomes distorted. Rather than being formed through genuine deliberation, public opinion is increasingly constructed through various communication systems that often clash with political actors, who aim to maintain control over the flow of information. Furthermore, the rise of the internet as a new communication channel poses a significant challenge to the traditional media and political parties, undermining their dominance in shaping public opinion.

### **Introduction**

Public opinion plays a vital role in ensuring that political actors maintain their legitimacy and authority. In contemporary liberal democratic societies, this opinion is predominantly shaped by mass media, which often presents opinion polls and reflects or constructs public sentiment. Jürgen Habermas offers a framework for analyzing how media influences public opinion formation, emphasizing ideals rooted in rational-critical debate and universal accessibility within the public sphere. However, the contemporary mass media landscape complicates this ideal. The public sphere is now marked by a tension between market-driven interests and democratic values, where the media often distorts the presentation of issues to capture attention rather than to inform. As a result, public opinion is not formed through authentic deliberation anymore; rather, it is shaped by diverse communication systems that often clash with political actors aiming to manage the flow of information.

Traditionally, political parties set the context and boundaries of public opinion debates. In today's political environment, however, strategies are increasingly influenced by their media presentation and impact. Technological advancements have significantly altered political activities and messaging (Blumler and McQuail, 1968; Mancini and Swanson, 1996, pp. 4–6). Each new communication technology raises concerns about its effects on public opinion. The internet, in particular, presents an opportunity for individuals to engage in political discourse that is largely outside the control of traditional elites. This medium challenges existing forums of debate and offers greater chances for participation. This article employs a Habermasian lens to explore normative theoretical questions regarding the internet's role in political communication and the shaping of public opinion. Does the internet offer a chance to revitalize democracy and enhance meaningful participation? Or does it serve merely as a tool for both established and emerging elites, used to further their own interests and uphold the status quo?

### **Public opinion**

In modern liberal democratic states, a legitimate government is ideally one that represents, reflects, and responds to public opinion. However, the definition of public opinion is a subject of considerable debate. The term is often used broadly to encapsulate public consciousness or will—essentially anything that is acted upon or expressed in a public setting.

Micro-level psychological perspectives focus on the individual processes involved in opinion formation (Festinger, 1957, p. 3), while macro-level approaches provide a holistic view of opinion dynamics (Lippmann, 1954 [1922], p. 11; Noelle-Neuman, 1984, p. 6), often attempting to quantify opinions through polls (see, for instance, Moon, 1999, pp. 2–4). From a normative standpoint, Habermas offers a framework for understanding public opinion formation. He posits that the 'public sphere' is the arena where public opinion is both formed and expressed. This public sphere represents the intersection of the state and civil society, where individuals come together to engage in reasoned debate about themselves and state practices (Habermas, 1996 [1962], p. 24). Through deliberation and justification, the underlying norms and values that govern society emerge and gain validity, provided they receive consent from the community, thus fostering consensus and cohesion rather than fragmentation.

This rational deliberation is characterized by principles of freedom of speech, universal access, and inclusiveness, operating independently of both state and market control. Habermas details how this site of rational-critical debate has evolved, showing that the political role of the public sphere shifted toward regulating civil society (Habermas, 1996 [1962], p. 52). As mass media increasingly occupies this 'public sphere' (ibid., p. 188), significant implications arise for public opinion formation. While enhanced access to media and favorable market conditions were thought to guard against state and institutional domination, the reality has seen a complex intertwining of media and state interests. Contemporary media face the challenge of balancing market demands with the democratic imperatives of modern governance.

This ongoing tension between state attempts to shape public opinion and the media's role—which, despite their democratic function, is often driven by profit—defines the character of the public sphere in today's liberal democracies. Consequently, media entities have evolved from mere informers of public debate to active constructors of that debate.

### **Political communication**

Political communication encompasses both verbal and non-verbal methods of signification. Denton and Woodward (1990, p. 11) characterize it as a process where the senders aim to influence the political environment, which Brian McNair defines as purposeful communication regarding politics (1999, p. 3). Public opinion, by its very nature, involves communication. In a context of expanded franchise and participation, mass communication methods are essential for informing the public and conveying opinions to political elites. Walter Lippmann pointed out in 1922 that public opinion is often manufactured and can be shaped and manipulated by those with vested interests.

In today's society, media play a central role in determining what constitutes public opinion, as they provide much of the information that shapes public understanding of political issues and actors. Through media channels, public debate is organized, elections are conducted, and political (as well as social) realities are constructed. Ideally, the media should promote active citizenship by delivering free and accurate information, enabling citizens to participate in democratic processes informed enough to engage in discussions about political choices. However, the public typically lacks control over the information presented, often reacting to media content rather than actively participating in shaping it (Negrine, 1989, p. 11). The manner and substance of media communication significantly influence the electorate's understanding and interpretation of public life, events, and issues (see Lasswell, 1948; McQuail, 1987, p. 7). Media scholars have long debated the effects of media on audiences (Klapper, 1960, p. 15; McCombs and Shaw, 1972; Dahlgren, 1992, p. 201), while political elites recognize the media's importance and may attempt to 'frame' issues to influence the context of media presentations, sometimes leading to certain issues being prioritized over others (Entman, 1993, p. 293). Traditional media, primarily motivated by audience attraction, shape the news and political communication agenda based on what they believe their audience wants or needs.

For public opinion to be rational and deliberative, aligning with the Habermasian ideal, the process of becoming informed and the quality of that information are paramount. While the press is institutionally separate from state control, market pressures can still restrict its freedom. The rise of television has often been accompanied by state oversight, and the nature of this medium tends to discourage robust debate, interaction, and dissent, promoting a passive reception of information. Modern models of mass communication suggest that media now prioritize attracting attention over informing or persuading (McQuail, 1987, p. 310). As television's role in political engagement, opinion formation, and expression has grown, the public has increasingly transformed into an audience of consumers rather than active participants (Franklin, 1994, pp. 9–12). This shift distances the public experience from the Habermasian concept of a public sphere. The ongoing tension between media's profit-driven audience desires and political actors' attempts to manipulate messaging creates significant distortions in the landscape of rational-critical debate.

### **Political parties and the media**

Public opinion is vital for political elites, serving not only to rally support during elections but also to maintain political authority and legitimacy throughout their tenure. Political parties rely on effective communication processes to connect with potential voters and affirm their legitimacy. A fundamental role of these parties is to facilitate communication between the rulers and the ruled, ensuring that the public is informed about political issues.

The rise of mass media has transformed how citizens access political information, making it the primary source for many. Scholars in media-effects literature examine how different communication mediums shape the messages they disseminate, with notable works by Klapper (1960) and McCombs and Shaw (1972) illustrating this impact. Understanding the significance of media, political actors actively attempt to shape the

information available to the public. The expansion of the electorate and the diversification of communication channels have resulted in a highly “mediatised” political environment, where media coverage, particularly during elections, often defines the political agenda (Kavanagh, 1995, pp. 177–197). During election periods, politicians increasingly see television as a tool for persuasion rather than as a platform for fostering informed public debate (Blumler and Gurevitch, 1981, pp. 489–491).

One prominent strategy employed by political parties to control the public message is the use of spin-doctors. The New Labour government, for example, recognized the need for effective media management and appointed numerous advisors to oversee communications (Franklin, 1998, p. 835). These spin-doctors not only present events to the media but also frame their interpretations, influencing public perception significantly. By acknowledging the importance of visuals in communication, parties often create “media events” that secure free publicity beyond the control of traditional media outlets. Additionally, the use of “soundbites”—short, catchy phrases summarizing policies—has become a common tactic to capture media attention, although this trend has contributed to a decline in substantive political discourse (Kavanagh, 1995, p. 246).

Moreover, the landscape of political journalism has shifted, with media coverage increasingly resembling commentary and analysis rather than impartial reporting (McNair, 1999, pp. 136–138). Alastair Campbell, a leading spin-doctor for New Labour, has argued that the media often function as the true manipulators of public discourse, merging news and commentary. He contends that his role is to convey the government’s message, while the media can sometimes obstruct this communication (Campbell, 2000).

This evolving dynamic highlights inherent tensions between democratic ideals and market principles, impacting the goals of both political parties and the media. The struggle for control over public narratives carries significant implications for citizens, the public sphere, and the formation of public opinion. For citizens to genuinely consent to governance—as democratic theory stipulates—they must be well-informed about the issues being decided. Ideally, the media should not act as mere instruments of political power or passive presenters of policies; however, the market-driven nature of media often compels them to take on a more active role in shaping public discourse.

If vested interests skew the foundation upon which public opinion is built, this poses a challenge to the legitimacy of the political system and its actors, as rational-critical debate devolves into superficial soundbites and visual narratives. Consequently, public opinion increasingly diverges from the normative expectations established in Habermas’s concept of the public sphere. Political parties actively seek to dominate information dissemination to shape public opinion, ensuring it remains informed and favorable—not just during elections but also in broader contexts of legitimacy and social cohesion.

Ultimately, the interaction between media interests and political objectives results in a collaborative effort to shape narratives that impact public opinion. The function of the media has evolved; they no longer merely supply information for informed dialogue but now play a crucial role in rallying support and persuasion, emphasizing the need for attention over the delivery of substantial information.

### **The internet**

The internet, still largely free from the control of the state, government, and political parties, holds the potential to transform political communication and reshape the way public opinion is expressed and formed. Unlike traditional channels, which are often influenced by political agendas, the internet offers a platform where both the medium and the message are free from such distortions. In line with Habermasian ideals, it provides a space for uncoerced debate, where freedom of speech prevails and information can flow freely. This decentralization of information challenges the dominance of traditional media, as new technologies democratize opinion formation by increasing interactivity and reducing the ability of authorities to control information dissemination (Wheeler, 1997, p. 222).

The internet shows promise as a neutral provider of information, supporting public opinion formation. From a pluralist perspective, it enhances the democratic process by offering a more open and accountable form of communication. British government efforts to increase internet access in schools and colleges highlight this trend, suggesting a decentralization of power and greater opportunities for citizens to engage in the political process (Graham, 1999, p. 87). As noted by Coleman et al. (1999, p. 366), improved information flows between citizens and their representatives strengthen the health of liberal democracy.

Optimists view the internet not just as a communication tool, but as a revolutionary force for democracy. Its interactive nature encourages more citizen participation in public opinion expression and governance. Moreover, the internet serves as a counterbalance to the agenda-setting influence of traditional media and the efforts of political elites to maintain the status quo. Unlike traditional forms of communication, which are often hierarchical, the internet facilitates a dynamic, two-way process that can be both top-down and bottom-up, as well as horizontal and vertical. This remains a medium that has yet to be fully controlled or influenced by



competing interests, making it a space where the ideals of free speech and information, as envisioned by Habermas, can thrive.

However, this environment of free speech and unrestricted information flow does not necessarily lead to greater knowledge. Paradoxically, the absence of the traditional media's "filtering" mechanisms may reduce the internet's effectiveness as a reliable information source. Without the editorial oversight found in television and print media, public debate might be based on misinformation rather than authoritative facts. While deliberation ideally involves the testing of opinions through scrutiny and validation, the internet often fosters echo chambers where like-minded individuals engage without encountering dissent. Research suggests that online communication tends to occur among those who would interact anyway, neither expanding nor deepening the level of discussion. Wayne Rash has pointed out that much online political debate is "ill-informed, ill-reasoned, and ill-behaved" (1997, p. 7). In the absence of rational argument or consensus, elites may benefit by maintaining the status quo without feeling pressure to respond or enact changes.

Political parties and governments, particularly in Britain, have adapted to this new medium by offering limited information and selective opportunities for feedback through their websites, thereby controlling the scope of public engagement. Although the New Labour government passed the Freedom of Information Act in 2000, it has yet to fully implement it, keeping certain information out of the public's reach despite the internet's potential to bypass traditional barriers.

Traditional media and political actors still attempt to shape reality based on established norms and values, providing frameworks for the public to interpret events. However, rather than fostering consensus and resolving conflicts within a shared value system, the internet has become a space where virtual individualism thrives, unconstrained by geographic or political boundaries. These virtual platforms allow opinions to form and coalesce without reference to traditional actors like the media or political parties, potentially shifting the landscape of public opinion formation.

### **Conclusion**

Public opinion, as normatively theorized, is developed within a framework of free speech, universal access, and shared norms and values. Traditionally, the media have taken on the role of intermediaries between the state and citizens—a function that was previously held by political parties. The medium through which communication occurs can significantly influence the nature of the message being disseminated. Media, rooted in democratic ideals of independence from the state, play a crucial role in holding elites accountable while also providing authoritative information, interpreting events, and structuring social and political realities. Political actors recognize this and strive to control media narratives and public debate, shaping public opinion to align with their interests.

The tension between the media's objectives and political parties' agendas has led to distortions in how information is communicated, even as the media enable citizens to become more informed. Yet, simply having access to information does not necessarily foster greater civic engagement or participation. Political parties have attempted to shape and control media outputs and public discourse, but the emergence of the internet has introduced a new dynamic that challenges this traditional power structure. By enabling broader access to information and reducing elite control over public discourse, the internet offers a platform for opinion formation, debate, and expression that is less reliant on the gatekeeping functions of traditional media and political elites.

However, the internet's potential for democratizing public communication is not without limitations. While it offers individuals greater access and the possibility of empowerment, this access does not inherently translate into meaningful participation. Collective action problems persist, and the digital divide means that not all citizens are equally able to engage in this new form of political discourse. Furthermore, while the internet may provide vast quantities of information, its quality can often be lacking, and authoritative sources still predominantly reside within traditional media and institutional channels.

Thus, while the internet creates the illusion of a "public sphere," where open debate and free speech prevail, elites continue to control the boundaries of public information and opinion formation. Access to authoritative, reliable information remains largely within the purview of government, political parties, and the traditional media, making the internet's transformative potential for public opinion and political participation incomplete at best.

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## **Medical sciences**

### **STUDY OF PHYSICAL WORK CAPACITY IN ATHLETES BASED ON THE COOPER TEST**

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### **ИССЛЕДОВАНИЕ ФИЗИЧЕСКОЙ РАБОТОСПОСОБНОСТИ СПОРТСМЕНОВ НА ОСНОВЕ ТЕСТА КУПЕРА**

**Рафига Багирова**

#### **Abstract**

Kuper testinin köməyi ilə Azərbaycan İdman Akademiyasının tələbələrində ürək-damar sisteminin funksional vəziyyəti qiymətləndirilib. Test nəticələri aerob fiziki iş qabiliyyətinin yüksək qiymətləndirməyə imkan verdi. Qan dövrəni sisteminin bərpa qabiliyyəti yaxşı səviyyədə olmuşdur.

Test nəticələri tələbələrin fiziki hazırlığını olduqca dəqiq xarakterizə edir və bütün təhsil müddəti ərzində dözümlülüyn inkişafına diqqət yetirməyin zəruriliyini göstərir. Tədqiqat fiziki hazırlıq səviyyəsində müsbət dinamikanı ortaya qoydu ki, bu da hazırlıq səviyyəsinin artması ilə əlaqələndirilir.

#### **Аннотация**

С помощью теста Купера оценивалось функциональное состояние сердечно-сосудистой системы у студентов Азербайджанской спортивной академии. Результаты испытаний позволили дать высокую оценку аэробной физической работоспособности. Восстановительные возможности системы кровообращения находились на хорошем уровне. Результаты тестирования достаточно точно характеризуют физическую подготовленность студентов и показывают необходимость уделять внимание развитию выносливости на протяжении всего периода обучения. В ходе исследования выявлена положительная динамика уровня физической подготовленности, что связано с повышением уровня тренированности.

**Keywords:** Cooper test, physical work ability, fitness, endurance.

**Ключевые слова:** тест Купера, физическая работоспособность, подготовленность, выносливость.

#### **I. INTRODUCTION**

It is known that physical training has a significant impact on the human cardiorespiratory system and the body as a whole. Most researchers argue that such exercises increase the level of functional state and non-specific resistance of the body. This should be considered as a condition for the fact that high physical performance and potential capabilities of the body should be effectively adapted to environmental conditions, especially to the imposed competitive and training loads. However, according to the literature, high physical loads have a negative impact on the human body. Therefore, the lack of information on the development of functional resources of athletes and the patterns of their formation necessitates complex studies, which, in turn, helps to promptly correct the current state, structural and functional changes in the activity of vital systems in the process of adaptation. to high physical loads, prevent diseases and allow them to be correctly assessed and controlled.

In sports, physical activity plays an important role in the formation of the functional resources of the body [1, 5]. At the same time, training and competitive activities in parallel with educational loads make increasing demands on the functional capabilities of the body, which is especially characteristic of sports games, martial arts and track and field. Any discrepancy between the volume and intensity of physical activity and the adaptive capabilities of the body can cause a number of changes in the functional systems of the homeostatic level, change the regulatory and adaptive state of the body, predetermine the current and future step. adaptation [3, 12]. As a rule, the effect of physical activity on the functional state and adaptive capabilities of the body in sports is considered without taking into account the state of regulatory mechanisms. Analysis of the identified changes in physiological indicators, even in comparison with the strength of the work done, if another important indicator of its functional state is not determined - the quality of resource management, does not allow obtaining a comprehensive picture of the adaptive capabilities of the body. Therefore, the heart rate, which is controlled by two main mechanisms of the leading system - the central and vegetative, is considered a fairly

objective indicator of the regulation of the quality of the reserve capabilities of the whole organism [2, 4]. The transition from the phase of immediate adaptation to sustainable long-term adaptation under the influence of physical activity in sports is based, first of all, on the formation of functional changes in the cardiovascular system and the mechanisms of its regulation [10, 11]. Based on the above, it seems relevant to study the influence of physical activity on the quality of regulation and adaptive capabilities of the cardiovascular system in various sports. The fundamental problem of adaptive physiology requires a systematic approach. After all, the functional-adaptive system that ensures sports results, in addition to the cardiovascular and respiratory systems, includes the adaptive-resource component of the body, which plays an important role in maintaining homeostasis [6, 7]. In this context, indicators of the functional and reserve capabilities of the respiratory system can serve as a tool for a more comprehensive analysis of the development of long-term adaptive mechanisms of the body under the influence of physical activity during regular sports [8, 9].

Despite the large number of studies devoted to the problems of adaptation of the cardio-respiratory system to physical activity in sports, there is insufficient information about the nature of autonomous regulation of the heart rate, the formation of functional reserves of the cardiorespiratory system, the patterns of restructuring the regulatory and adaptive status of the students' body in various forms of organizing sports activities. Therefore, among students who do not have a sports education, functional and adaptive reconstruction within the framework of sports sections is practically unknown, which is relevant for effectively solving issues of optimizing motor activity for health protection and restoration of working capacity, preventing psycho-emotional overload in the educational process and allows for the adoption of preventive and corrective measures.

## **II. Method.**

The research was conducted on 2nd and 3rd year students. A total of 50 students of the Azerbaijan Sports Academy took part in the research. 27 students were 1st category athletes in various sports, 5 were masters of sports and 7 were candidates for master of sports, 11 students did not play sports or played irregularly. At the time of the research, the average age of the students was 19.5 years, the average height was  $177 \pm 1.9$  cm, the average weight was  $72.4 \pm 3.1$  kg. The 12-minute Cooper test is used to assess the state of physical performance of the body. It is assumed that the person runs during the entire test. If the test subject does not meet this requirement, then he can walk. The longer a person spends walking rather than running during the test, the worse the test result. After 12 minutes of movement, the distance traveled is measured in meters and the student's physical performance is assessed according to the table.

*Table 1.*

*Assessment of physical work capacity using the Cooper 12-minute test*

Physical work capacity	Distance in meters					
	Girls 13-19 years old	Girls 20-29 years old	Girls 30-39 years old	Boys 13-19 years old	Boys 20-29 years old	Boys 30-39 years old
Very bad	< 1600	< 1550	< 1500	< 2100	< 1950	< 1900
Bad	1600-1900	1550-1800	1500-1700	2100-2200	1950-2100	1900-2100
Satisfactory	1900-2100	1800-1900	1700-1900	2200-2500	2100-2400	2100-2300
Good	2100-2300	1900-2100	1900-2000	2500-2750	2400-2600	2300-2500
Very good	2300-2400	2100-2300	2100-2200	2750-3000	2600-2800	2500-2700
Excellent	> 2400	> 2300	> 2200	> 3000	> 2800	> 2700

## **III. Results and discussion**

The analysis of the conducted study showed that according to the results of Cooper's test, 14.2% of students (4 people) were "very bad"; 10.8% "unsatisfactory" (7 people); 40.5% placed on the rating scale "satisfactorily" (25 people). At the "good" level, 25% (9 people) and 9.46% (5 people) were determined. It should be noted that when viewing the results of Cooper's test, it is clear that 25 students who entered the "acceptable" zone showed high indicators of endurance. (2300-2465 m). This is 50% of test participants. The results shown were 8% (4 students) of students who fell into the "very bad" zone (1865-1954). Based on the results obtained on the Cooper test, it was shown that only 25 students demonstrated high endurance, which was 50% in the "satisfactory" zone (2300-2465 m). 8% of the examined (4 students) showed results according to the level of endurance in the "very poor" zone (1865-1954 m). The number of students with an "unsatisfactory" level of endurance (2100-2150 m) was 7 people, which is 14% of the number of students. "Good" endurance (2530-2690 m) was noted in 9 students (18%), the level of endurance was estimated at the level of "excellent" (2770-2940 m) in 5 surveyed (10%) (table 2).



Table 2.

*Assessment of physical fitness based on Cooper's 12-minute test*

Level of preparation	Distance, m	
	Men	Women
Very bad	< 450»	< 350
Bad	450	350
Satisfactory	550	450
Very good	650	550
Excellent	> 650	> 550

The results of the study of the functional capabilities of the cardiovascular system of student-athletes of the National Academy of Sciences made it possible to determine the average values of a number of functional indicators (Table 3). Thus, the pulse of the examined students averaged  $70.48 \pm 0.26$  bpm. The level of endurance according to the Cooper test - as an integrated indicator of physical performance in 50 examined athletes involved in sports games. Thus, the pulse index of the examined students, an integral indicator of the endurance level, was only in the "satisfactory" zone (2300-2465 m) among 50 people involved in sports. Analysis of individual indicators showed that broad functional capabilities of students are determined (Table 3). Based on this, the subjects of the study can be divided into 5 groups. Analysis of individual values revealed a wide range of functional abilities of students (Table 3). Based on these data, all those studied can be divided into 5 groups.

Table 3.

*Average limit of functional parameters of the cardiovascular system (n=50)*

Resting heart rate (beats per minute)	Systolic blood pressure	Diastolic blood pressure	Pulse pressure
$70,48 \pm 0,26$	$103,55 \pm 0,74$	$70,8 \pm 0,8$	$29,7 \pm 0,11$

Table 4.

Assessment of the level of endurance of students involved in martial arts, according to the Cooper test (M $\pm$ m)

Evaluation of the level of performance using the Cooper test	Cooper test scores (c.u.)	Heart rate recovery (beats/30sec)		
		2nd minute	3rd minute	4th minute
Excellent	2770-2940 m (n=5)	$64,09 \pm 0,14$	$50,1 \pm 0,27$	$42,0 \pm 0,16$
Very good	2530-2690 m (n=9)	$68,8 \pm 0,53$	$46,2 \pm 0,3$	$42,7 \pm 0,25$
Satisfactory	2300-2465 m (n=25)	$72,12 \pm 0,24$	$68,3 \pm 0,2$	$60,1 \pm 0,28$
Not satisfactory	2100-2150 m (n=7)	$80,0 \pm 0,56$	$74,3 \pm 0,41$	$68,2 \pm 0,27$
Very bad	1865-1954 m (n=4)	$82,14 \pm 0,41$	$76,4 \pm 0,37$	$70,0 \pm 0,18$

The first group included 5 athletes with excellent endurance (2770-2940 m), which made up 10% of the total number of subjects. Their heart rate at rest was 33.5 beats/30 seconds. After physical work, the heart rate increased by 60%, 36% and 17%, respectively. This group included 3 Master of Sports and 2 Candidate for Master of Sports. This group demonstrated a normotonic type of response to the proposed load. The blood pressure (BP) at rest in this group of subjects was 115/80 mm Hg (systolic  $108.3 \pm 0.2$ ; diastolic  $78.2 \pm 0.08$ ; pulse  $27.3 \pm 0.12$ ). It took 5 minutes for the readings to return to the background level.

The second group consisted of 9 people whose endurance level corresponded to the "good" zone (2530-2690 m). This group comprised 18% of the experiment participants. Their heart rate was 34 accents/30 sec in a calm state. The increase in this indicator increased by 72.2%, 48% and 14.8% during rest after 2, 3, 4 minutes, respectively. This group consisted of 5 people (10%), including 2 Master of Sports and 3 Candidate for Master of Sports. The recovery time was 5 minutes. This group demonstrated a normotonic reaction to the proposed load.

The third group consisted of 25 people with a "satisfactory" level of endurance, which was 50% of the total number of athletes examined. This group included the majority of students who took part in the experiment. At rest, before physical work, they had 120/75 mm Hg (systolic  $110.2 \pm 0.18$ , diastolic  $76.7 \pm 0.21$ , pulse  $33.5 \pm 0.9$ ). In this group, a normotonic type of reaction to the proposed load was observed, the arterial pressure at rest was 90/60 mm Hg (systolic  $90.4 \pm 0.23$ , diastolic  $60.8 \pm 0.2$ , pulse  $30.08 \pm 0.14$ ). Recording of arterial

pressure showed that systolic pressure in the first minutes of the load was 140 mm Hg. rose to -115 mmHg at the 3rd minute. Some decrease is observed. Compared with intact values after the Cooper test, the tendency of arterial pressure to increase at the first and third minutes was 16.7% and 5.8%, respectively. At the fifth minute, the studied indicators were completely restored to the background level. As a result of monitoring the change in diastolic pressure after work, it was found that its level was 40 mmHg. systolic pressure decreased to (60 mmHg at rest) and is 33.4%. At the third minute, diastolic pressure indicators were at a normal level. It follows that the type of reaction to physical activity is hypotonic (systolic pressure increases slightly, diastolic pressure decreases to 20 mmHg). UVS is restored to the background level 5-7 minutes after physical activity. The above indicates that the cardiovascular system of athletes is in good physiological condition and they have extensive training experience.

The fourth group included 7 people whose endurance level according to the Cooper test was in the "unsatisfactory" zone (1865-1954 m). This group made up 14% of the total number of subjects. During the rest period, the SVR was 39 accents/30 seconds. The increase in pulse was 152%, 124%, 102% for 2, 3 and 4 minutes, respectively. The recovery time was increased to 15 minutes. This group includes students who either regularly play sports or play sports with long breaks. This group of subjects showed a hypertensive type of reaction to the presented physical load. At rest, the AT indicators were within the normal range - 105/75 mm.s. (systolic  $98.4 \pm 0.3$ ; diastolic  $67.5 \pm 0.3$ ; pulse pressure -  $30 \pm 0.9$ ). During AT registration, the systolic pressure was 165 mm Hg, which is 57% higher than the background level. The recovery period begins on the third, fifth and eighth minutes and drops significantly — 145, 130 and 110 mm Hg, respectively. The increase in systolic pressure was 38, 23 and 14%. During the study of diastolic pressure, its growth was noted at 80 mm Hg (the increase was 6%). The increase in diastolic pressure continued until the 3rd minute and was completely restored to the background level on the 5th minute. This type of reaction is observed in chronic overstrain of the central nervous system. Such a reaction also occurs in chronic stress of the cardiovascular system, in prehypertensive and hypertensive individuals. However, since the subjects had normal blood pressure, this type of reaction indicates poor tolerance of this load and poor physical performance. Since the subjects had normal blood pressure, this type of response indicates an adverse effect of this load and poor physical performance. This can be explained by the fact that the subjects exercise intermittently.

The fifth group included 4 students (8%), related to the "very poor" zone according to the endurance results. The increase in the UVS was 160%, 136%, 118% at 2, 3 and 4 minutes at rest. The recovery period of the cardiovascular system took 20-25 minutes. This group of students had never done sports. In this group, the reaction of the cardiovascular system to physical activity is considered a dystonic type. With this type, systolic pressure increases significantly - 180 mm. s.s., and diastolic pressure after the cessation of the load sharply drops, sometimes to "0" - at this time, the phenomenon of endless tone of the UVS increases. Such a reaction to physical activity is considered unfavorable. The recovery period is extended to 15-20 minutes. In our study, this type of reaction was observed in 4 students. This group of students who participated in the testing did not do sports.

A comparative analysis of the degree of heart rate and respiratory indices showed that in the group of athletes-athletes the relationships were less rigid than in the group of athletes-judoists. In the judo group, a positive correlation was also found between the vital capacity of the lungs (VC) and the number of heart contractions (HR). Athletes of the group of track and field athletes and judoists have a more pronounced connection between HR and breathing compared to track and field athletes and judoists. A comparative analysis showed that the respiratory system of judoists does not acquire an economical function, as in track and field athletes. This may be due to the fact that the training process of those involved in martial arts has its own characteristics. This feature is that judoists perform sports movements against a tense background and often stop breathing when fixing the chest in a certain position, which contributes to the growth of vital capacity of the lungs. The viability of the lungs is higher in athletes with a relatively stable, cyclic technique. According to the works of R. M. Baevsky [1, p. 352], systems in which the elements do not depend on autonomy relations are characterized by high plasticity, which makes it easier to adapt to changing environmental conditions, including physical sports loads. In such systems, adaptation processes occur with high efficiency. This means that the cardiorespiratory system of track and field athletes is characterized by a better regulation mechanism - an increase in physiological reserves and their readiness for mobilization. At the same time, the endurance of the athletes' body to long-term and intense physical activity increases, but additional accompanying mechanisms are necessary to maintain neurohumoral regulation of the cardioreceptor activity of student judoists. This also agrees well with the principle of economy of functions and the theory of the system of functions of P.K. Anokhin. According to this theory, a decrease in the connections between individual elements of a functional system increases the "degree of freedom" of these elements. This also contributes to the achievement of optimal functional states when performing certain tasks.

Thus, the study of these relationships allows us to more broadly reveal the intrasystemic and intersystemic processes of the formation of the respiratory system, the control of the respiratory system during systematic physical activity of athletes, and the regulatory and adaptive state of the athletes' body.

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## **Pedagogical sciences**

### **LINGUODIDACTIC POSSIBILITIES OF THE ELECTRONIC APPLICATION QUIZLET IN TEACHING FOREIGN LANGUAGE VOCABULARY**

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#### **Abstract**

The article deals with the linguodidactic possibilities of using the electronic application Quizlet in teaching foreign language vocabulary. The application offers a variety of exercise formats, including cards, tests and games, which contributes to effective memorisation and repetition of lexical units. The features of its functionality, such as automation of the memorisation process, support for different types of speech activities, interactivity and gamification are highlighted. The advantages of individualisation of learning and social interaction in the language learning process are also highlighted. Both the advantages of Quizlet and its limitations for deep language learning are analysed. It is concluded that this tool is significant for the development of lexical skills at the elementary and intermediate level of language proficiency.

**Keywords:** Quizlet, vocabulary learning, digital technologies, linguodidactics, foreign languages, gamification, interval repetition, interactive learning.

#### **Introduction**

The digitalisation of modern society has justifiably led to the modernisation of the Kazakh and foreign education system, in which more and more attention is being paid to so-called 'digital education'. School teachers and university professors are called upon to master new digital technologies, use online services, digital tools and new e-learning systems in the teaching process. In the second decade of the 21st century, a scientific trend called 'digital didactics' ('digital pedagogy') has emerged in pedagogy, which investigates the learning process in the conditions of digital transformation of the educational process [1, 2, 3, 4, ]. The basic concepts of digital didactics include 'digital pedagogical technologies' and 'digital educational resources'. The study, convergence and integration of pedagogical and digital technologies in the educational process is the main task of digital didactics. The urgent transfer of Russian educational institutions due to the coronavirus infection pandemic to the distance learning format in spring 2020, as well as the need to periodically introduce blended/hybrid or distance learning in the following years forced educators to actively improve their IT competence.

Foreign language teachers face a particularly acute task of finding ways to realise the main goal of foreign language education - the formation of students' communicative competence in a foreign language under new conditions. This task is complicated by the fact that, despite the fact that the concept of linguistic competence is well enough studied in scientific literature, its definition, content and composition are still being discussed [5]. In particular, lexical competence as a vivid component of linguistic competence is still under discussion [5]. part of linguistic competence is still a subject of scientific discussions in domestic and foreign scientific literature discussions in domestic and foreign didactic and methodological literature. In addition, due to the active introduction of digital technologies into the educational process, there is a need to clarify and expand the composition of its components [6,7].

A.N. Shamov distinguishes several components of it: 1) motivational; 2) cognitive; 3) practical; 4) behavioural. The motivational component is responsible for goal-setting in the process of working with new lexical units, as well as for maintaining constant motivation to learn a foreign language. The cognitive component is connected with activation of students' background knowledge to ensure continuity of previously learnt lexical units with the new lexical material. The practical component is an opportunity to use the learnt lexical material in practice to build their own communication in written and oral form. The behavioural component is the formation of students' autonomy of independent work on lexical material [8].

Scott Turnberry, Jim Scrivener, Jeremy Harmer, as well as many Russian teachers offer basically the same algorithm of formation and development of the lexical skill: 1) introduction of new lexical units in a



context meaningful for students; 2) familiarisation with the meaning of the lexical unit and its form. 3) initial consolidation of new lexical material in a limited context under the guidance of the teacher; 4) free use of new lexical units in oral and written communication; 5) further work on automatising of the lexical skill, as well as ensuring further recirculation of lexical material. It should be noted that this algorithm can be effectively implemented in the context of classroom work. However, in the context of distance learning, a greater role is given to the autonomous work of learners. In this case, we suggest using online tools for effective work with lexical material [9, 10].

As S.S. Kunanbaeva notes in the 'Concept of foreign language education of the Republic of Kazakhstan', one of the main directions of improving the training of pedagogical staff in foreign language is 'mastering modern methods and technologies, including information and computer-based, of foreign language teaching' [11].

A E. Niyazova in the article 'Using the online application Quizlet for mastering lexical material in teaching foreign languages' the author analyses the advantages and disadvantages of Quizlet in teaching vocabulary. The study is based on examples of using Quizlet in universities of Kazakhstan. [12].

The electronic application Quizlet has a significant linguodidactic potential in teaching foreign language vocabulary. Its main features include:

1. Variety of exercise formats. Quizlet offers several formats for working with vocabulary: cards, tests, games, as well as the possibility of creating custom word sets. This allows learners to choose the ways of memorising and repeating words that are most convenient for them.

2- Automate the memorisation process. Quizlet's repetition system, based on the principles of interval repetition, helps users memorise foreign language words more effectively. The user programme remembers which words are learned the worst and suggests them for more frequent repetition.

3. Support for different activities. The application supports reading, listening, writing and speaking through a variety of exercises, which helps to develop all types of speech activities. For example, in pronunciation tasks, the user can listen to the correct sound of a word and practise its pronunciation.

4. interactivity and gamification. Through game elements such as speed tests and competitions with other users, the learning process becomes more fun and motivating, which helps to increase interest in learning a foreign language.

5. Accessibility and flexibility. The app is available on different devices and platforms, allowing users to study anywhere and anytime they want. This makes learning more flexible and personalised.

6. Social aspect. Quizlet allows users to share their sets of cards and find cards created by other users. This fosters a learning community where students can share materials and experiences.

Advantages of using Quizlet in vocabulary teaching:

- Motivation through play: a game-based learning format helps to keep students' attention and motivates them.

- Visualisation and auditory reinforcement: visual cards with pictures and sounding out words make it easier to associate a word with its meaning.

- Individualisation of learning: learners can choose the pace and difficulty, which makes learning adapted to their level of proficiency. [13].

Disadvantages:

- Limited functionality for deep learning. Quizlet is primarily oriented to memorising individual words, but its capabilities may not be sufficient for learning complex grammatical constructions or contextual language learning.

- Passive learning. The main focus is on memorisation, but active use of words in speech requires additional exercises and interaction with a teacher or native speaker.

In general, Quizlet is a powerful tool for memorising and practising foreign language vocabulary, especially at the primary and intermediate stages of learning.

Experiment: Linguodidactic possibilities of Quizlet in teaching foreign language vocabulary

Purpose of the experiment:

To determine the effectiveness of using Quizlet application for learning foreign vocabulary among students at elementary and intermediate levels of language proficiency.

Objectives:

1. To evaluate whether the use of Quizlet improves memorisation and active use of lexical items.
2. To determine the degree of students' satisfaction with the use of Quizlet in the learning process.
3. To compare the results of students who use traditional methods of vocabulary memorisation and those who use Quizlet.

Participants:

The experiment was conducted among two groups of students (25 students in each) of a language faculty studying English as a foreign language. Both groups had approximately the same level of language proficiency (A2 on the CEFR scale).

Stages of the experiment:

1. Preparatory phase:

- A set of 50 new words in English was selected, which included both basic and specialised vocabulary.
- Students of the first group (control group) learnt vocabulary by traditional methods (reading, writing, oral repetition).
- Students of the second group (experimental group) learnt vocabulary through Quizlet. They were provided with sets of cards with voice-over function, interactive tests and games.

2- Learning Phase (2 weeks):

- Both groups practised for 30 minutes daily for a fortnight. The experimental group used Quizlet and the control group followed traditional methods.
- Each student kept a diary where they recorded the amount of time spent on vocabulary learning and their feelings about the learning process.

3- Testing Phase:

- After the study period, both groups were tested. The test consisted of two parts:

1. Passive vocabulary knowledge (simple translation and definition of words).
2. Active use of vocabulary (making sentences and oral task).

4. Questionnaire:

- Students in both groups were asked to complete a questionnaire to assess their satisfaction with the learning process and motivation.

Results:

1. Passive vocabulary knowledge:

- Control group: The mean score was 75%.
- Experimental group (Quizlet): Average score - 88%.

2- Active use of vocabulary:

- Control group: Average score - 68%.
- Experimental group (Quizlet): Average score - 82%.

3- Questionnaire survey:

- 80% of the students in the experimental group said that using Quizlet made learning more interesting and engaging.
- 70% of respondents in the control group indicated that they found traditional methods less interactive and less engaging.
- 90% of the students in the experimental group expressed a desire to continue using Quizlet for vocabulary learning.

Conclusions:

1. Students who used Quizlet showed higher scores in both tests, indicating that this method is more effective for learning foreign language vocabulary.
2. the interactive format of Quizlet increases students' motivation and interest in the learning process, which is confirmed by questionnaires.
3. The application effectively supports both passive and active vocabulary acquisition, making it a valuable tool at all stages of learning.

Recommendations:

It is recommended to integrate Quizlet into foreign language education programmes, especially for vocabulary work, in order to improve the quality and motivation of the learning process.

Table 1 exhibits the general results of the trends of studies on the use of Quizlet in foreign language vocabulary learning. Regarding the country of research, Indonesia occurred the most, followed by Southeast Asia countries other than Indonesia (Vietnam, Malaysia, and

Thailand), Asia countries other than the mentioned ones before (Japan, South Korea, China, and Turkey), and Europe (Austria). The next point was associated with the language focus of the research. English was the most frequently researched regarding the use of Quizlet in

vocabulary learning, followed by Japan, Chinese or Mandarin, Arabic, and German. However, three studies did not specifically mention the language focus. Furthermore, most studies involved secondary or tertiary students. Only one study (Romdani & Andriyani, 2021) involved primary school students, particularly in the Indonesian context. Since Quizlet is an electronic tool mainly to learn vocabulary, the research methods

were mostly involving a quantitative approach. The studies were oriented to examine its effectiveness in enhancing

the students' vocabulary mastery. The preferences for involving a quantitative approach in the studies influenced the tendency to conduct experimental research or dig into perceptions. Delving into the experiences or process of implementing action research became another objective. [14].

Table 1. A Summary of trends of relevant studies

Category

Sub-category

Number of

studies (n)

Table 1.

A Summary of trends of relevant studies

Category	Sub-category	Number of studies (n)
Country of research	Indonesia	8
	Southeast Asia (other than Indonesia)	5
	Asia (other than Southeast Asia)	6
	Europe	1
Language focus	English	11
	Other than English	6
	Not mentioned	3
Students' education level	Primary	1
	Secondary	9
	Tertiary (Higher education)	9
Research methods	Qualitative	1
	Quantitative	7
	Qualitative + Quantitative	9
Research methods	Literature review	3
	Experimental	5
	Perception and experiences	8
	Classroom-based action research	3

#### Conclusion:

The Quizlet application has significant linguodidactic potential for teaching foreign language vocabulary. It provides the opportunity to work with the material in a variety of ways through cards, tests and games, which makes the process of memorising and repeating words more interesting and effective. The use of gamification, repetition automation and interactivity increases student motivation and promotes faster learning.

Despite the obvious advantages such as accessibility, convenience and personalisation of learning, there are some limitations. The application is mainly focused on memorising individual words, and additional techniques and tools are required to master grammatical constructions and contextual use of the language in greater depth. Nevertheless, at the initial and intermediate stages of foreign language learning, Quizlet is a powerful tool that can increase students' interest and improve their vocabulary skills.

Thus, Quizlet can be useful in educational practice, especially in the conditions of modernisation and digitalisation of educational processes characteristic of the modern educational space, including Kazakhstan.

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## **Philological sciences**

### **THE THEME OF CHILDHOOD IN THE WORKS OF AGATHA CHRISTIE: PSYCHOLOGICAL ASPECT AND DETECTIVE FUNCTION**

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### **ТЕМА ДЕТСТВА В ТВОРЧЕСТВЕ АГАТЫ КРИСТИ: ПСИХОЛОГИЧЕСКИЙ АСПЕКТ И ДЕТЕКТИВНАЯ ФУНКЦИЯ**

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#### **Abstract**

This article explores the use of childhood themes in the works of Agatha Christie. It examines the psychological aspects related to childhood traumas and memories, as well as their influence on character motivation and plot development. Special attention is given to the phenomenon of repressed memories, the role of childlike innocence and honesty, the contrast between the worlds of children and adults, and the impact of family relationships on character behavior. The analysis demonstrates how childhood experiences become a crucial element in building detective intrigue and solving crimes.

#### **Аннотация**

В данной статье исследуется использование темы детства в произведениях Агаты Кристи. Рассматриваются психологические аспекты, связанные с детскими травмами и воспоминаниями, а также их влияние на мотивацию персонажей и развитие сюжета. Внимание уделяется феномену вытесненных воспоминаний, роли детских образов как символов невинности и честности, контрасту между миром детей и взрослых, а также влиянию семейных отношений на поведение героев. Анализ показывает, как детские переживания становятся важным элементом в построении детективной интриги и раскрытии преступлений.

**Keywords:** childhood, trauma, memory, Agatha Christie, detective fiction, family relationships, psychological motivation, crime.

**Ключевые слова:** детство, травма, память, Агата Кристи, детективная литература, семейные отношения, психологическая мотивация, преступление.

Агата Кристи, одна из самых известных писателей в жанре детектива, создала множество произведений, которые изучают человеческую психологию и взаимоотношения между людьми через призму преступлений. Одним из ключевых элементов, которые делают её творчество многослойным и интересным для глубокого анализа, является тема детства. Детство у Кристи — это не просто фоновая часть биографии персонажей; оно играет центральную роль в объяснении мотивации героев и развитии сюжета. В данной статье будет исследована роль детства в произведениях Агаты Кристи, его психологические и сюжетные функции, а также способы, с помощью которых автор использует детские воспоминания и травмы для построения своих детективных историй.

В психоаналитической литературе широко рассматривается роль детских травм в формировании личности и их долгосрочные последствия на поведение человека. Кристи нередко обращается к этой теме, используя её для объяснения поступков своих героев. В некоторых её романах детские травмы становятся ключевым мотивом преступлений.

Одним из ярких примеров является роман «Убийство в «Восточном экспрессе» (1934), где мотивом преступления становится месть за похищение и убийство маленькой девочки Дейзи Армстронг. Преступление, произошедшее в далёком прошлом, оставило глубокий след в жизни многих людей, которые впоследствии решили совершить коллективное убийство в возмездие за это страшное событие. Здесь Кристи показывает, как трагедия, случившаяся в детстве, становится решающим фактором для совершения серьёзного преступления во взрослом возрасте.

В другом романе, «Десять негрятят» (1939), один из персонажей — генерал МакАртур — испытывает угрызения совести за смерть своего подчинённого в юности. Несмотря на то, что этот поступок был совершён не в детстве, его корни уходят в более ранний период, когда чувство ревности и ярости, порождённые детскими травмами и неуверенностью, привели к трагедии.

Таким образом, Кристи часто использует детские травмы и воспоминания как объяснение внутренних конфликтов и поведения своих героев, создавая многослойные, психологически сложные образы.

Другим важным аспектом использования темы детства у Агаты Кристи является феномен забытых или вытесненных воспоминаний. Часто в её произведениях ключ к разгадке преступления лежит в прошлом, в событиях, которые герои либо забыли, либо сознательно вытеснили из своего сознания.

Примером такого подхода является роман «Пять поросят» (1942), где Пуаро расследует преступление, произошедшее 16 лет назад. Главная героиня, Карла Лемаршан, пытается узнать правду о прошлом своей матери, которая была осуждена за убийство. В ходе расследования выясняется, что именно воспоминания детства героини играют ключевую роль в понимании того, что действительно произошло. Кристи мастерски использует идею вытесненных воспоминаний, чтобы показать, как прошлое может быть переосмыслено с течением времени и как детские впечатления могут сохранять подсознательные отпечатки, влияющие на настоящее.

Другой пример — «И, треснув, зеркало звенит...» (1962), где сюжет строится вокруг прошлой трагедии. Одна из героинь, Марина Грегг, переживает эмоциональный срыв, связанный с воспоминаниями о её потерянной ребёнке. Эти воспоминания, будучи подавлены на протяжении многих лет, всплывают в критический момент и приводят к совершению преступления. Кристи показывает, как подавленные детские травмы могут неожиданно возвращаться и проявляться в разрушительной форме.

Дети в произведениях Кристи часто предстают как символы невинности, наивности и честности. Их непосредственные суждения и простодушные поступки могут быть ключом к разгадке сложных преступлений, поскольку они, в отличие от взрослых, не утрачивают способность видеть мир без предвзятости и хитросплетений социальных норм.

В романе «Безмолвный свидетель» (1937) собака по кличке Боб, которая, по сути, заменяет ребёнка, оказывается важным персонажем, который в конечном итоге помогает Пуаро распутать дело. Здесь Кристи обращается к архетипу невинного наблюдателя, который, будучи лишённым хитрости и интриг, видит правду, скрытую от взрослых.

В «Карман, полный ржи» (1953) ребёнок играет важную роль в раскрытии семейной тайны, ставшей причиной убийства. Кристи искусно использует детей и их восприятие мира для того, чтобы показать, как невинные на первый взгляд события могут оказаться ключевыми в детективной головоломке.

Мотив детства у Кристи тесно связан с темой семейных отношений, особенно с конфликтами между поколениями. Взаимоотношения родителей и детей, их взаимные обиды и неразрешённые конфликты часто становятся катализатором для преступлений в её романах.

Например, в романе «Убийства по алфавиту» (1936) мотивом убийства оказывается наследственное безумие, передающееся от отца к сыну. Это демонстрирует, как генетическое наследие и семейные проблемы могут стать причиной трагедий.

Одним из ключевых аспектов темы детства в произведениях Агаты Кристи является исследование динамики семейных травм и того, как они влияют на поведение персонажей. Семейные конфликты и напряжённые отношения между поколениями могут приводить к развитию психологических проблем, которые становятся основой для совершения преступлений. В произведениях Кристи часто встречаются персонажи, чьё детство было омрачено насилием,

пренебрежением или чрезмерным контролем со стороны родителей. Эти события оказывают длительное влияние на их взрослую жизнь, провоцируя их на разрушительные действия.

Например, в романе «Смерть в облаках» (1935) основной конфликт вырастает из сложных отношений между матерью и дочерью. Пуаро обнаруживает, что убийство связано с травмами, связанными с семейной историей, и что именно проблемы, связанные с прошлым, служат основной причиной для преступления. Семейные узы оказываются не просто фоном для сюжета, но основополагающим элементом в построении мотивации убийцы.

Ещё один пример можно найти в романе «Карман, полный ржи» (1953), где наследственные конфликты между родственниками, включая родителей и детей, приводят к множеству убийств. В этом романе Кристи исследует влияние алчности и семейных амбиций на поведение людей, демонстрируя, как детские воспоминания и наследственные отношения могут породить серьёзные преступления.

Одной из характерных черт произведений Кристи является умение показать, как детское восприятие мира может исказить реальность. Дети видят мир по-другому, и их восприятие событий часто оказывается ключом к разгадке преступления. Их наивность и честность могут как помогать в расследовании, так и вводить следствие в заблуждение.

Кристи часто использует детей или людей, находящихся в «детском» состоянии (например, людей с психическими отклонениями или стариков), чтобы продемонстрировать, как субъективное восприятие может стать основой для загадки. В романе «Зло под солнцем» (1941) ребёнок случайно наблюдает ключевую сцену, но её интерпретация событий настолько невинна, что никто не придаёт ей значения. Только позже Пуаро понимает, что именно слова ребёнка были ключом к разгадке.

В романе «Убийство Роджера Экройда» (1926) восприятие повествователя играет важную роль в структуре сюжета. Хотя рассказчик — взрослый человек, его субъективное восприятие искажается, и в какой-то мере он также «видит» происходящее глазами ребёнка, что скрывает от читателя правду до последнего момента. Таким образом, Кристи показывает, как люди, подобно детям, могут быть склонны к ошибочным суждениям и самообману.

Важным элементом детских образов в произведениях Агаты Кристи является контраст между миром детей и миром взрослых. Мир взрослых в её детективах полон лжи, интриг, скрытых мотивов и сложных социальных норм, тогда как дети в её книгах представлены как существа, которые ещё не утратили своей невинности и искренности. Этот контраст часто становится основой для развития сюжета, когда именно детская честность и неподдельность выводят на поверхность скрытую правду.

В романе «Немезида» (1971) мисс Марпл раскрывает преступление, происходящее в окружении интригующих взрослых персонажей. Хотя детей в романе нет, сама Марпл, как персонаж, символизирует ту невинность и детское видение мира, которое позволяет ей разгадывать преступления, в то время как остальные персонажи запутаны в своих ложных предположениях и домыслах. Марпл, как и дети в других романах Кристи, обладает простым и ясным видением истины, что позволяет ей видеть суть преступления.

Кристи часто изображает детство как период жизни, связанный с тайнами, которые со временем могут привести к преступлениям. Эти тайны могут быть как сознательно скрытыми, так и забытыми, но они всегда играют значимую роль в формировании последующих событий. Прошлое и настоящее у Кристи тесно связаны: преступления, совершённые в настоящем, нередко обусловлены событиями, произошедшими в детстве.

В романе «Печальный кипарис» (1940) главная героиня Элинор Карлайл вспоминает моменты своего детства, которые формируют её отношения с окружающими, в том числе с жертвой. Эти воспоминания играют ключевую роль в её мотивации и в ходе раскрытия преступления. Таким образом, Кристи показывает, как прошлое влияет на настоящее и как детство может быть источником как личных травм, так и мотивов для преступления.

Тема детства в произведениях Агаты Кристи играет многоуровневую роль, затрагивая психологические, моральные и сюжетные аспекты её творчества. Детские травмы, воспоминания, а также взаимоотношения с родителями и окружением становятся важными элементами, определяющими поведение персонажей и мотивы для совершения преступлений. Кристи использует детство как источник загадок и эмоциональных конфликтов, что придаёт её детективным историям глубину и психологическую сложность. Через тему детства она исследует, как ранние события и семейные отношения могут формировать внутренний мир человека, влияя на его поступки в будущем.

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**A HEART BEATING FOR THE MOTHERLAND - MAHIRA NAGYGIZI**

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**Abstract**

A woman's name, a mother's name, which is a symbol of nobility, elegance and beauty has always been held in high regard in our country. The Azerbaijani woman has rendered exceptional services in the preservation and survival of our national and moral values with her talent, intelligence, will and determination. Many glorious and bright pages of our history and culture are connected with the name of a woman. The Azerbaijani woman has given the world literary personalities, prominent scientists and well-known political figures who created the pearls of the cultural treasure of humanity. In the thinking of our people, the concept of mother is the embodiment of the homeland, the Motherland. Today the Azerbaijani woman is an active participant in our country's socio-political, economic and cultural life. Achievements in science, education, culture, healthcare and other fields have repeatedly confirmed that Azerbaijani women have great potential.

The author will focus on the activity of poetess Mahira Naghigizi Huseynova, doctor of philology, professor and honoured teacher.

**Keywords:** Azerbaijani women, poetess, poems, patriotic scientist, great leader, **spiritual culture**, national spirituality, social morality

**Introduction**

Looking through our history, we see that Azerbaijani women have always played an active role in the progress of the nation. Besides raising brave sons and daughters with their beauty, noble deeds, intelligence, they also contributed to the formation of national spirituality, social morality and sound, far-sighted management. (2)

The great leader Heydar Aliyev has bright examples of a careful and caring attitude towards women in his personal life, state activities, and speeches. Our national leader said in one of his speeches: "What do women want when they are suffering? Just attention, care and respect for them! These concepts are very broad. Attention and care can be in different forms. But men should always look up to women, and women should have special respect. Let them treat women carefully".

Haraya getsəm də, Vətən, ay Vətən,	Köksündə dondurmaz ayazı qışın
Könlümdə ruhunun var, havası var.	İstisi bəsimdi bircə qarışın.
Ayrılıqdı bilməm, xiffətdi - bilməm,	Qürbətdə küləyin, yağın yağışın,
Sənsiz hər tərəfdə qar havası var.	Səsində bir ahu-zar havası var.

Of course, there is a reason why I started my writing with these beautiful verses as the Motherland is one of the most loved and highly valued topics of Mrs Mahira. There is nothing strange here. First, all the poets wrote poems glorifying the Motherland, which we call Mother. We all love the Motherland, our native land. We all interpret it differently. One of us with poems, another with prose work, another with architectural work, some by jumping to its defence, others by promoting Azerbaijan on a world scale. (1)

Doctor of philology, professor, honoured teacher and poetess Mahira Naghigizi Huseynova

is a woman with dedicated work, an active social position and a special place in Azerbaijani philology.

Mahira Huseynova is one of the highest figures of our modern poetry and science, a wonderful teacher, a talented poetess, a patriotic intellectual and a hard-working scientist. Mrs Mahira is one of the personalities who created the perfect unity of science and art through her personal qualities and practical activities.

Mahira Khanim was born in the Sust village of Babek district in Nakhchivan, the home of Azerbaijan intellectuals, where the mountains create dignity and pride in a person. Mrs. Mahira is a scientist and the author of numerous monographs, books and articles.



Mahira Huseynova is one of the most distinguished and valuable scientists who serves the development of Azerbaijani science. Her research work and published works in the field of linguistics are characterized by important innovations and contributions. (3)

The scientist skillfully combined all the spiritual culture, values and heritage of the Azerbaijani people at the level of mutual scientific research and published monographs rich in results of very serious importance. Originally from West Azerbaijan, she was condemned to live a life of deportation and displacement, which was experienced by the Armenian oppression of our people by her family's fate, this outstanding scientist realized in her creativity and researches the unity and integrity that this longing turned into a duty of citizenship, folklore, love environment of our West Azerbaijan, artisans of our West. based on his creativity, she managed to connect many issues of our mother tongue with literary language studies on a logical level. Mahira Naghigizi is a talented poetess as well as a well-known scientist.

Scientific competence and artistic competence complemented each other, introduced her to the world of words as a master poet, and kneaded her creativity as a "word that calls to the truth" (I. Habibbayli). Poetess: "Mənim anam" ("My mother"), "Ana sevgisindən doğan nəğmələr", ("Songs born from mother's love"), "Ana kəndim Xalxalım" ("My mother village Khalkhal"), "Ömrün çıraqdır sənin" ("Your life is a lamp"), "Sözün hikməti" ("The wisdom of your word"), "Haqqa çağırən səs" ("A voice calling for the truth"), "Bayatılar" ("Bayatılar"), "Bayatılar və üç şeir" ("Bayatılar and three poems"), "Ruhuna beşiksə, tanı, Vətəndir", "Salam olsun" ("Hello") were loved by a wide readership with books of poetry. Mahira Naghigizi received the "Qızıl qələm" ("Golden Pen") award for her works created with talent as a poetess.

A word is like water, it flows gently and gurgles and fascinates a person, a word is like a stone, a rock carries weight. In the modern literary process, Mahira Naghigizi's writing, known by her pen and signature, is exactly like this: sometimes it is fluid like water, sometimes it is heavy like stone. The richness of Mahira Naghigizi's heart, the depth of her soul, the strength and eloquence of her words and the essence, content and power of her love are fully reflected in her words and artistic heritage. More than 30 songs were composed by Azerbaijani composers to the words of Mahira Khanum and 70 songs were performed by the lovers.

Let's pay attention to some songs: "Azərbaycan" ("Azerbaijan") and "Layla çal, yatım ana" ("Layla chal, yatım ana") composed by Sevinj Mansurova; "Ata Heydər, oğul İlham" ("Father Heydar, son İlham"), "Ay ana" ("Ay mother"), "Ana" ("Mother"), "Balam" ("Balam") composed by Arif Salimov; "Ata" ("Father") composed by Tahir Mahiroğlu; Tahir Akbar's composition "Qısqanıram" ("I'm jealous") and so on.

Mahira Naghigizi's poems attract attention in terms of the variety of topics, variety of topics and fullness of content. First of all, we should note that she is a patriotic poetess. The promotion of the national spirit and service to national self-awareness occupy a special place in her works. She glorifies her native country by repeatedly emphasizing her love for the motherland, its integrity, inviolability, independence and freedom. She talks about our struggle and war with endless hatred against the fascist invaders of Armenia and highlights our crushing of the Armenian army in 44 days, the sacrifice of our officers and soldiers and the great skill of our martyrs and veterans.



Let's remember the poem "Salam olsun" ("Hello"):

Rəzil oldu bizi qüvvə saymayanlar,  
Qanda batdı qan içməkdən doymayanlar.  
Bu milləti yıxılmağa qoymayanlar,  
Dünyada hər anınıza salam olsun!

The role of the President of Azerbaijan, Commander-in-Chief

İlham Aliyev in this historic victory is specially emphasized and Recep Tayyip Erdogan, who supported our country in the Patriotic War is praised with great love:

Adı qalar zaman-zaman Sər doğanın,  
İzi qalmaz hər olanın, hər doğanın.  
İlham, sənin, Rəcəb Təyyub Ərdoğanın,  
Həmişə var canınıza salam olsun!

Those who fought with weapons, selflessly and skillfully, those who died on the battlefield for the freedom, territorial integrity and independence of the Motherland are not forgotten:

Şəhidlərim, haqqınız var çiyinizdə,  
Kəfən geydik, qalacaqdır əyninizdə,  
Çıxmayacaq, yaşayacaq eyninizdə,  
Tökülən al qanınıza salam olsun!

Our Azerbaijan has lost hundreds of thousands of sons and daughters for the sake of the independence and freedom of our Motherland for hundreds of years. During the Second World War, more than 600,000 Azerbaijanis went to the front, half of them did not return and died. Many brave sons and daughters were martyred in the first and second Garabakh Wars. There are also martyrs of January 20. The leadership of the USSR planted tanks on its citizens and shot civilians with automatic bullets. Mahira Khanum's poem "Şəhidlər" ("Martyrs") reminds us of the Soviet army's grip on our people:

Doğulub düşməyə dəş atmaq üçün,  
Ürəyi qorxudan boşaltmaq üçün.  
Ölərlər vətəni yaşatmaq üçün,  
Hər qəlbə bir qala tikər şəhidlər. (4)

I would like to end my article with a poem dedicated to Azerbaijan by our beloved poetess and valuable scientist Mahira Khanum:

Azərbaycan	Azerbaijan
qayalarından uca,	above the rocks,
Yaşımdan da cavan,	Younger than my age,
Dünyadan qoca Azərbaycan.	Azerbaijan is older than the world.

Mahira Khanum's poems are read with love. I wish you success in your future endeavours, I wish you greatness! ...

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## **Psychological sciences**

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### **PERSONAL POLITICAL SOCIALIZATION AND FACTORS INFLUENCING IT**

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### **ЛИЧНОСТНАЯ ПОЛИТИЧЕСКАЯ СОЦИАЛИЗАЦИЯ И ФАКТОРЫ, ВЛИЯЮЩИЕ НА НЕЕ**

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#### **Abstract**

The formation of personality is influenced by social factors - the environment, society, a person's psychological readiness and the need for socialization. As a result of these processes, socialization occurs.

In the political life of society, such "socio-political agents" as family, school, university, social groups and media play an important role. The process of socialization depends on the purposeful activity of a person, the nature of his communication, the possibilities of conscious changes in the content and organization of education.

#### **Аннотация**

На формирование личности оказывают влияние социальные факторы – окружающая среда, общество, психологическая готовность человека и потребность в социализации. В результате этих процессов происходит социализация. В политической жизни общества важную роль играют такие «социально-политические агенты», как семья, школа, университет, социальные группы и медиа. Процесс социализации зависит от целенаправленной деятельности человека, характера его общения, возможностей осознанного изменения содержания и организации воспитания.

**Keywords:** socialization of the individual, identification, identity of the subject, regulatory function, political ethics, political reliability, opinion formation, psychological environment.

**Ключевые слова:** социализация личности, идентификация, идентичность субъекта, регулятивная функция, политическая этика, политическая надежность, формирование мнения, психологическая среда.

Сущность человека развивается и меняется вместе с обществом. Это доказывает его неразрывную связь с социальной средой и тесную взаимосвязь с процессом социализации. В ходе социализации личность усваивает основные достижения культурной системы общества, в котором живет. Объектом исследования политологии являются политические процессы и политическая реальность. Социализация означает адаптацию человека к обществу. Это процесс формирования личности как активного гражданина. В формировании личности, помимо биологических и психологических факторов, участвуют социальные воздействия, которые изучают взаимосвязь между активным гражданином и системой. Социальный фактор включает общественно-политическую активность, результатом которой становится активный гражданин. Для социализации обязательны следующие факторы:

1. Окружающая среда и общество.
2. Психологическая готовность человека.
3. Потребность в социализации.

Эти факторы играют ключевую роль в процессе социализации.

Великий Низами Гянджеви высоко оценивал влияние среды и окружающего мира на формирование личности:

Ağıllı adamlar dost olsan əgər,

Elmi, mərifəti sənə də keçər...

Vəhşiyə dost olsa insan dünyada,

Vəhşi adətincə ömr edər oda.

«С умным поведешься — наберешься знаний,



С диким поведешься — диким станешь сам».

Существует множество мнений о влиянии среды на личность и её развитие. Например, представители бихевиоризма и прагматизма считали, что задача личности заключается в адаптации к существующей социальной среде [1]. Французские материалисты утверждали, что человек — это пассивный продукт среды. Марксисты считали, что человек и среда всегда находятся во взаимодействии. Политическая социализация — это длительный процесс, в ходе которого люди участвуют в политических отношениях и проявляют политическое поведение. Высшей точкой этого процесса является участие в политике и влияние на принятие политических решений. Понимание политики, формирование мнения и выражение отношения к вопросам — это часть общей среды.

Политическая жизнь общества воплощает политические связи между людьми. В формировании этого процесса важную роль играют «социально-политические агенты», такие как семья, школа, университет, социальные группы и медиа. Интерес к политической социализации начинается в семье, затем распространяется на образовательный период, а позже укрепляется в среде единомышленников в социальных группах, что в итоге превращает гражданина в реального участника политических процессов [2].

Если вспомнить идеи некоторых классиков социологии, они окажутся весьма уместны. Например, Э. Дюркгейм указывал на то, что воспитание является важнейшим инструментом общества для развития детей и молодежи. «Благодаря этому общество подготавливает своих детей к необходимым условиям их существования». Дюркгейм подчеркнул социальное воздействие общественных процессов на развитие личности и впервые смог объединить понятия «воспитание» и «социализация» в единую систему [3].

Первым важным этапом политической социализации является «политический язык», то есть общее понимание политики, интерес к ней, формирование мнения и выражение отношения к вопросам [3]. Политическую социализацию можно разделить на два этапа: первый — это интерес гражданина к общественно-политическим процессам и его близкое участие в них. Вне общества существует система, которая прямо или косвенно оказывает влияние на общество, но, по сути, эта система является частью общей среды. Каждый гражданин — полноправный член этой среды и общества. Естественно, у него есть определенные социальные и политические функции и обязательства.

Интерес к политической социализации начинается в семье, затем охватывает образовательный период, далее закрепляется в социально-политических группах, что в итоге превращает гражданина в активного участника политических процессов. Таким образом, процесс формирует политическое мнение у гражданина, а также общественно-политическое мнение в обществе [4].

Роль медиа в этом процессе очень значительна. Активные участники политической социализации — журналисты. Политическая этика и политическая надежность являются важными и влиятельными факторами в политической социализации. Политическая этика выступает лицом политической системы, формируя нормы участия граждан в политике, а политическая надежность определяет путь, по которому будет двигаться гражданин в этих процессах.

Понятие политической социализации в политологии означает усвоение личностью политических ценностей, норм поведения и их реализацию в своей деятельности. В процессе политической социализации общество решает следующие задачи:

1. формирование у индивидов навыков и качеств, необходимых для выполнения своих общественных функций;
2. интеграция индивида в систему общественно-политической самореализации;
3. выполнение индивидом соответствующих социальных ролей в системе социально-политических отношений;
4. развитие и обогащение политических отношений.

Интеграция личности в социальный организм — это реакция индивида на влияние социальной среды. Процесс социализации позволяет понять природу взаимного влияния индивида и общества.

Выбор, усвоение и внедрение политических ценностей, норм и методов поведения могут происходить как косвенно, так и прямо. Например, представления личности о государственном устройстве, информация о внешней и внутренней политике напрямую влияют на её политическую позицию.

Естественная реакция личности на систему определяется тем, является ли она активным или пассивным гражданином. Гражданин должен осознавать свои права и обязанности, ощущать себя полноправным членом общества. Он должен понимать, что является свободной, интеллектуальной личностью, не подчиненной никакой системе. Понимание прав и обязанностей обеспечивает объективность процесса требований и предложений, увеличивая ответственность и осведомленность

гражданина перед обществом и системой. Это побуждает его лучше узнавать своё общество, а система играет роль посредника.

Процесс политической социализации различается в зависимости от общества и системы. В тоталитарных и авторитарных обществах говорить о политической социализации невозможно, так как свобода личности ограничивается.

В демократическом обществе все решения принимаются в результате консенсуса между верхами и низами. В таких обществах заинтересованы в формировании личности как гражданина. Влияние микро- и макросреды на процесс велико. Ведь там, где нет плюрализма, политика все равно вмешивается в жизнь гражданина. При наличии различий ситуация меняется. Разница между социализацией и политической социализацией заключается в том, что человек сначала выбирает процесс социализации, а уже потом, на втором этапе, решает, будет ли он участвовать в политической социализации, в зависимости от того, хочет ли он быть активным гражданином.

Сегодня процесс политической социализации большинства людей начинается в подростковом и молодом возрасте, совпадая с годами учебы или периодом общественной активности. Вовлечение молодежи в социально-политические процессы означает привитие им общественно-политических ценностей или создание ими новой идеологии и системы ценностей для себя. Постепенно они заменяют старшее поколение в различных сферах жизни. Активная социально-политическая позиция молодежи свидетельствует о том, что гражданское общество через 50 лет будет другим.

Таким образом, процесс социализации зависит от целенаправленной деятельности человека, характера его общения, возможностей осознанного изменения содержания и организации воспитания.

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## **Sociological sciences**

### **MODERN RESOURCES FOR ADDRESSING BULLYING IN KAZAKH SCHOOLS: ANALYZING SOCIAL AND PSYCHOLOGICAL FACTORS**

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#### **Abstract**

Article on the topic of bullying (school violence) in Republic of Kazakhstan. It provides statistical information about social and psychological factors that contribute to violence in educational settings. In addition, it studies the behavior patterns of adolescents across age groups and rationalizes selecting test groups by considering specific features associated with a particular adolescent crisis. The author analyzes and critiques the use of sacrificial practices on children, drawing on research conducted with students in the 5th and 9th grades. This article is intended to improve the professional practices of school psychologists.

**Keywords:** Bullying, school violence, Republic of Kazakhstan, social factors, psychological factors, adolescent behavior, test groups, sacrificial practices, 5th grade, 9th grade, school psychologists.

#### **Introduction**

At the current stage of societal development, psychologists are drawing attention to the increasing number of cases of school violence among adolescents. Aggressive actions committed by children, such as bullying, fights, and school harassment, often provoke strong public reactions. Bullying, as a social and psychological problem, has also affected schools in the Republic of Kazakhstan.

Bullying (from the English word “bully”—meaning hooligan, fighter, troublemaker, or thug) is defined as oppression, discrimination, or harassment. One of the first researchers to study this phenomenon was the Scandinavian scholar David Olweus, who conducted research on bullying among boys in the 1970s. Olweus described bullying as a specific type of violence where one person (or group) physically attacks or threatens another person (or group), who is weaker and unable to defend themselves either physically or mentally.

Bullying is a social phenomenon mainly characteristic of organized children’s groups, particularly schools. Numerous researchers explain this by noting that schools serve as a universal arena, a place where children release the negative impulses they accumulate at home.

In Russian psychological science, this topic has been addressed in the works of

V. V. Denisov, G. N. Kireev, A. B. Kiryukhina, V. A. Sitarov, and others. Researchers such as S. Alekseeva, I. A. Baeva, E. V. Burmistrova, E. F. Bykovskaya, E. N. Volkova, T. G. Volkova, E. V. Grebenkin, N. O. Zinovieva, N. F. Mikhailova, D. Pstrog, and others have studied aspects of violence in the educational environment. In Kazakhstan, the problem of violence in the context of deviance and its consequences in the lives of troubled adolescents and orphans has been analyzed by psychological scholars such as A. Akazhanova, G. Dusmanbetov, S. Shalgimbaev, and others.

Bullying is a socio-psychological phenomenon typically understood as a direct confrontation between a bully and a victim. In schools, specific role relationships emerge among children, ranging from “leader” to “outcast.” Another factor that contributes to the persistence of bullying in schools is the inability or, in some cases, unwillingness of teachers to find a solution to this issue. Almost every class has students who differ from the others, making them victims who endure harassment from their peers. Recently, mobile phones, computers, and other gadgets have increasingly been used for these purposes.

What are the causes of school bullying? This is a highly complex issue, but some factors can be identified: academic performance, appearance, dress style, dialect, physical strength, self-esteem, fear and anxiety, depression, and physical disabilities .

Bullying manifests through various forms of physical and/or psychological abuse experienced by a child at the hands of other children. These may include systematic mockery based on some characteristic of the victim’s appearance or personality. In other cases, it could involve damage to personal belongings, pushing under desks, extortion, or outright humiliation, such as forcing the victim to publicly apologize while kneeling before the tormentor.

In Kazakhstan, as reported by the head of the National Center for Human Rights, V. Kalyuzhny, in July 2015, bullying in the educational system shows that 66.3% of children encounter violence in schools, whether

as witnesses, victims, or aggressors. Of the surveyed students, 23% had experienced physical violence, 20% were victims of extortion by peers, and 27% had been subjected to corporal punishment by teachers. Kalyuzhny noted that these issues led the ombudsman to send an open letter to the Minister of Education and Science of Kazakhstan. The letter stressed the importance of all state bodies working together to implement the existing legal frameworks. This spurred the Ministry of Education to accelerate the development of an Interagency Action Plan for the prevention of violence and abuse against children for the 2015/2016 academic year. Despite this, schools and teachers in Kazakhstan often distance themselves from addressing bullying. Additionally, many educators are not fully aware of the underlying causes and manifestations of bullying among students. Teachers often lack a clear understanding of the scope of the issue and are unsure of how to effectively address this growing psychological problem.

In the study of bullying in modern Kazakhstani schools, we conducted research from 2013 to 2015, involving 200 students from Almaty and Astana. The participants included 5th graders, who formed the control group, and 9th graders, who were part of the experimental group.

The selection of these age groups was intentional: 5th grade marks the transition from elementary to middle school, a period of significant psychological stress for younger adolescents due to adaptation to new teachers and changes in the learning process. Similarly, 9th graders face numerous psychological challenges associated with adolescence. They experience anxiety, doubts about their importance to parents and friends, and increasing self-doubt. Adolescents often feel misunderstood, seek ways out of difficult situations, sometimes in dangerous ways, and strive to break free from adult dependency. Spontaneous aggressive reactions can also occur in situations where no real threat exists.

For many students, academics take a backseat as they try to assert their significance and identity. The 9th grade is also a critical time when students must decide whether to stay in school or leave.

In the initial phase, participants completed a specially designed questionnaire and participated in a survey addressing issues of school violence. Both 5th and 9th graders answered six questions (refer to Table 1).

The research reveals that the school environment isn't always conducive to children's well-being (see Table 2). According to the 5th graders, violence at school manifests in the form of extortion, racketeering, physical assaults, threats, verbal insults, restrictions, and mockery. Early findings suggest that this group includes highly isolated students who are targeted by both aggressors and passive observers. In 5th-grade bullies, psychological traits such as a feeling of impunity, lack of empathy for others' suffering, and growing cruelty were evident. Among the victims, symptoms like depression, eating disorders, low self-esteem, dissatisfaction with school, increased shyness, and a decline in trust towards others were observed.

For 9th graders, psychological violence was the most prevalent, particularly through verbal insults, humiliation, intimidation, and threats. Extortion of money and personal belongings was the most frequently reported issue.

Table 1

Indicators of the questionnaire on the problem of school violence, control group (5th grade)

<b>№</b>	<b>The content of the questionnaire question</b>	<b>The content of the student's response</b>	<b>Quantity in %</b>
1	Did high school students ask you for money at school?	Yes, they asked	59%
2	Have you been beaten by high school students?	No, they didn't. Yes, they were beaten	54,5% 45,5%
3	Are you being punished for poor grades, bad behavior at school?	The children replied that they were not punished at school for poor grades and behavior	82%
4	Are you being punished for poor grades, bad behavior at home?	Parents are punished at home for poor grades and behavior	72,7%
5	How to deal with child abuse at school? A. Conduct class hours on this issue. B. Improve the control of student behavior by teachers	A. They believe that it is necessary to spend more class hours on the problem of violence. B. They believe that it is necessary to strengthen control over the behavior of students	70 % 30%
6	Does the school need a support service for victims of violence?	They think that a service for victims of violence at school is needed	64,5%



Table 2

Indicators of the questionnaire on the problem of school violence, experimental group (9th grade)

№	The content of the questionnaire question	The content of the student's response	Quantity in %
1	Is there a problem of violence at school?	Violence at school exists	85%
2	What forms of violence at school are most common: a) physical; b) psychological; c) sexual; d) economic	Physical violence prevails. Psychological violence prevails. Children were victims of economic violence at school	24% 26% 50%
3	Have you been a victim of violence at your school?	Yes, they were	30%
4	Are you being punished for poor grades, bad behavior at home?	Yes, parents punish for bad behavior and grades	53%
5	What solutions to the problem of violence at school do you suggest: a) discussing the problem of violence in class hours; b) stricter discipline at school; c) improved control and supervision of student behavior	We need to discuss the problem of violence in class hours. It is necessary to improve the control and supervision of student behavior	75% 68%
6	Do you see the need to create a social service to help victims of violence at school?	They believe that the school needs a social service to help victims of violence	98%

At the next stage of studying bullying in modern schools, we applied the methodology for diagnosing the tendency toward victim behavior developed by O. O. Andronnikova. This method was chosen because "victimhood" in adolescents is understood as a kind of predisposition to become a victim of negative events. The adolescent may not yet be a victim, but they possess certain personality traits that make them more likely to become one under certain circumstances, more so than someone without these traits.

The methodology for studying victim behavior is a standardized test-questionnaire designed to measure adolescents' susceptibility to various forms of victim behavior. Victim behavior refers to actions that, due to their specific nature, increase the likelihood of an individual becoming a victim of a crime, unfortunate circumstance, or accident. The method focuses on social and personal attitudes.

The questionnaire consists of specialized psychodiagnostic scales aimed at assessing the tendency to engage in different forms of victim behavior (Table 3).

In the control group, 24% were classified as having an aggressive victim type, while in the experimental group, the percentage was 29%. This category includes participants prone to finding themselves in unpleasant or dangerous situations due to aggressive actions, such as provocation, insults, slander, or mockery. These individuals are characterized by a tendency to create or provoke conflict, exhibit antisocial behavior, violate social norms and ethical values, and are often dominated by negative emotions. They tend to be dominant, impatient, and quick-tempered, often with a violent and antisocial attitude.

The initiative victim type accounted for 20% in the control group and 21% in the experimental group. This category includes individuals whose positive behavior attracts criminal actions from aggressors. They are courageous, principled, and willing to intervene in conflicts, even at great personal risk, often not fully considering the consequences. They are bold, responsive, and demanding but may overestimate their own capabilities. They also tend to have high self-esteem and act based on positive motives.

The active victim type constituted 16% in the control group and 18% in the experimental group. This form of victimhood is related to active behavior, where the individual provokes a victimization scenario through their requests or appeals, including potentially encouraging violations of school discipline.

The passive victim type was represented by 18% in the control group and 10% in the experimental group. These individuals do not resist offenders for various reasons, including age, physical weakness, helplessness, cowardice, or fear of accountability for their own immoral actions. They may display a learned helplessness, frequently seeking sympathy and support from others and often finding themselves in crisis situations. They exhibit traits of dependence, conformity, and tend to justify aggression from others, easily forgiving all transgressions (see Figure 1).

The non-critical victim type includes 12% of respondents in the control group and 10% in the experimental group. These individuals demonstrate carelessness and an inability to accurately assess life situations. Their lack of critical thinking can stem from a low intellectual level, and it may be based on both negative personality traits (such as greed or self-interest) and positive ones (such as generosity, kindness, responsiveness, or courage). These children tend to idealize people, justify negative behaviors, and fail to

recognize potential dangers.

Table. 3

Indicators of the study of propensity to victim behavior (according to O. O. Andronnikova)				
№	Name of the scale	Type of victimized behavior	Control group, 5th grade, %	Experimental group, 9th grade, %
1	Aggressive behavior	Aggressive type of victim	24%	29%
2	Propensity for self-harming and self-destructive behavior	The active type of victim	16%	18%
3	Tendency to hypersocial behavior	The initiative type of the victim	20%	21%
4	Addiction to dependent and helpless behavior	Passive victim type	18%	10%
5	Tendency to uncritical behavior	An uncritical type of victim	12%	10%
6	Realized victimization		10%	12%

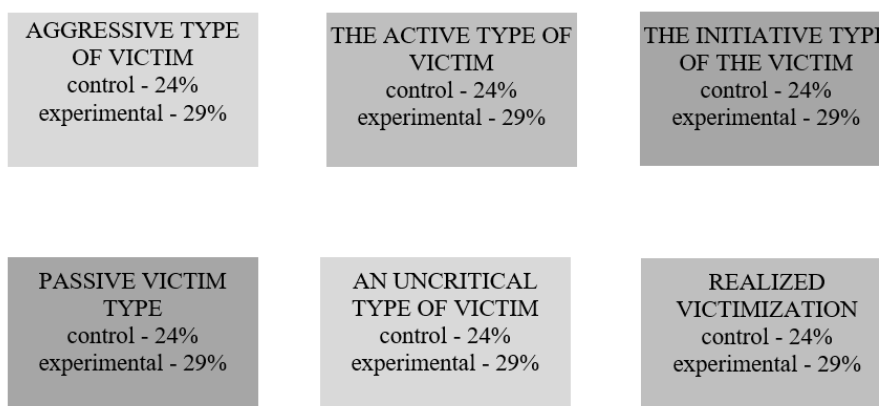


Fig. 1. Indicators of subjects in the study of propensity to victim behavior

The realized victimhood amounted to 10% in the control group and 12% in the experimental group. In the latter, children frequently found themselves in unpleasant situations. This was due to their internal predisposition and readiness to act in specific, individual ways. Typically, this involves a tendency toward spontaneous aggressive behavior.

According to 79% of 9th graders and 65% of 5th graders, the primary cause of school violence is the depiction of violent scenes in movies and on television, where such behavior is normalized.

When seeking help from school psychologists, most parents mention economic, physical, and psychological violence, as well as incidents of sexual violence among students. Many parents also point to the divide between wealthy and poor families and the influence of criminal values and relationships.

In Kazakhstan, clan and tribal affiliations hold significant importance among the indigenous population, and as a result, the aggressive behavior of adolescents is often influenced by ethnic stereotypes and prejudices. Bullying behavior is particularly prevalent in Western and Southern Kazakhstan.

It's also worth noting that incidents of school violence have increased following the devaluation of the national currency. Many social projects aimed at preventing deviant and suicidal behavior among adolescents have been cut in state-funded educational institutions in Kazakhstan due to budget constraints.

As for teacher-student conflicts, the author of this article believes that the teacher is almost always more to blame. Teachers are adults with higher education, while the student's personality is still in the process of being formed. Therefore, it's crucial to avoid harming the student's mental health. School is where children form their perceptions of adult life, and a teacher's careless actions or words can have long-lasting negative effects on a child's future. Moreover, every child is different. The parents of children involved in this study believe that tackling school violence requires a joint effort from schools, families, and the state.

If one student might simply ignore a teacher's repression, another might experience deep internal distress. This can lead to insecurity, fear of change, introversion, and silence later on. Some people who experience conflicts in school continue to seek psychological help as adults to overcome childhood fears and misconceptions.

Thus, based on our research, we can affirm that bullying in 5th and 9th grades is systemic. A key factor is the quality of interpersonal communication and psychological safety within the educational environment. Modern life does not exclude violence from the learning and upbringing processes. Many bullying victims tend to hide their problems for a long time, even in cases of obvious physical violence. It is much rarer for children and adolescents to admit or report such incidents.

The study of bullying in Kazakhstan is sporadic and episodic, often gaining attention only after a high-profile case. The objective challenges of early detection of bullying in our country limit targeted prevention efforts.

In this context, every psychologist or social worker must be prepared to encounter bullying in their professional practice, and first of all, they need to master its diagnosis. Specifically, they should be aware of the main manifestations of its most severe consequences: violent, suicidal, and dependent behaviors.

Currently, global practice identifies three leading factors that allow a child to be classified as at risk for bullying:

1. **Multiple stressors:** This refers to the fact that victims of bullying are burdened with numerous problems. Poor health, low social status, unsatisfactory relationships with peers, large families, pronounced social disadvantage, and limited coping abilities are all characteristic of bullying victims.

2. **Provocative characteristics of the victim:** The so-called provocative victims constitute a heterogeneous group of children and adolescents who, due to their personality traits, may irritate most of their otherwise tolerant peers. This group often includes accentuated adolescents and children with cognitive and behavioral disorders.

3. **Stigmatization:** This includes racial (or national) and physical characteristics of the child. The latter encompasses not only apparent physical anomalies but also hair color, unusual voice pitch, ear shape, etc. These characteristics can serve as motivating factors for bullying.

As results from numerous studies have shown, there is no psychological profile of a bullying victim that would symptomatically assist in diagnosing manifestations of this traumatic situation in affected children. Olweus's "sketch theory," which claimed that typical characteristics exist for both victims and perpetrators, has not been confirmed. There are no specific psychological signs of bullying.

Nevertheless, when observing children, the following emotional and behavioral characteristics may emerge.

**Behavioral characteristics:**

- Distancing from adults and peers;
- Negativism when discussing the topic of bullying;
- Aggressiveness towards adults and children.

**Emotional characteristics:**

- Tension and fear when encountering peers;
- Sensitivity and irritability;
- Sadness, melancholy, and unstable mood.

In cases of identified violence in schools, psychologists should engage in specific work with all parties involved: parents, students who have become victims of violence, and the educators implicated in the situation. For instance, parents should be advised to approach their son or daughter with understanding when they exhibit a clear reluctance to go to school, accompanied by fear or even horror of the educational institution. Otherwise, the child may develop feelings of helplessness, vulnerability, and rejection. It is crucial not to lose psychological contact with children. It is also important to remember the legal responsibilities of educational personnel for mistreating children.

However, before approaching representatives of the authorities, parents need to clarify the situation in discussions with the class teacher, other teachers, the student's friends, and the school administration.

Thus, the analysis of the causes and consequences of violence against children allows for the identification of the following strategic directions for overcoming it: motivational-value, aimed at enhancing the pedagogical culture of parents and strengthening the prevention of deviant behaviors within the family; social, which implies the activation of socio-economic policies to support the material well-being of families, the creation of a comprehensive social service system for families, and the development and implementation of media programs to prevent the negative consequences of harmful socialization of children's personalities; state-legal development of juvenile justice and the institution of the commissioner for children's rights.

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# **Technical sciences**

## **LOADS DURING EXPLOITATION INDUSTRIAL BOILERS AFFECTING THEIR RELIABILITY AS FACILITIES WITH INCREASED DANGER**

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### **Abstract**

The publication describes the reliable loads that occur during the operation of the boilers. The influence of individual loads affecting the reliability of boilers and the consequences that may occur during operation are considered. The spectra of the operating loads of the industrial boilers were analyzed

**Keywords:** Hot water boilers; industrial boilers; boilers for heating and hot water; reliability of boilers; operation of boilers; spectrum of operating loads; reliability of boilers

### **1. Introduction**

Boilers, as equipment working under pressure, are usually installed in places where it is necessary to provide hot water for heating or for the needs of various technological processes, including those related to the hygiene of special premises such as, for example, in meat processing plants, milk, food products and others. Defining and assessing the risks that may arise during the operation of boilers is of utmost importance and requires special attention. Making mistakes in their design, production, operation or maintenance can lead to serious accidents, such as explosion, implosion or damage to various elements of the facility or adjacent installation, as well as to elements of the room where the industrial boiler is located. Indicators of safety and durability, of reparability and storability are manifested only in the process of operation of boilers and depend on:

- the methods and conditions of operation
- established repair methods
- the ways of technical service
- operating modes
- accompanying operational factors that are typical for the particular type of boiler

A specific feature of questions about the reliability of industrial boilers in the process of their operation is the time factor. This factor determines the change in the initial parameters of the boilers and reliability indicators in this process. The change in boiler parameters during their operation is related to the impact of various processes that change the properties or condition of the materials from which they are manufactured, resulting in physical aging of the boilers.

Each boiler, when performing certain of its functions, interacts with various factors, such as the environment; with the human intervention associated with its management; with the specifics of the heating system for which they are intended, etc. In this interaction, certain interconnected states arise. The boiler cannot be isolated from the state of the environment in which it is installed; from the influence of the fuel and heat processes that take place in it during its main operation; as well as from the impact of residual influences that are a consequence of the technological processes used in its production.

All types of energy, incl. thermal, mechanical and electromagnetic affect the boiler and cause reversible and irreversible processes that lower its initial parameters and characteristics. Along with this, the actual indicators of reliability of industrial boilers are influenced by the conditions and methods of operation, the technology used for technical maintenance during their operation, the adopted technology for carrying out repairs and the qualification of personnel who are engaged in the operation and maintenance of the boiler

### **2. Main types of loads occurring during operation of industrial boilers**

In the process of operation of industrial boilers, different types of loads act. These loads are caused by the particularities of boiler operation; from external influences, from the manufacturing technology of individual assemblies and units, which are part of the boiler as an independent complex product, etc..

These loads can be classified as follows:

- **Loads arising from the weight of the boiler**

This force has a vertical static effect. In the case of industrial boilers, it has the greatest impact on the stability of the foundation on which they are installed. If the boiler is poorly leveled, this force can provoke fluctuations in its stability during operation and lead to a process of deformation and deviation from its normal operating characteristics

- **Operating loads**

These are loads that arise as a result of the pressure of the fluid used and the temperature effects during the operation of the boiler and have a primarily dynamic effect

- **Transport loads**

These loads mainly occur during transportation of the industrial boilers to the place of their installation

- **Installation loads**

These loads are manifested during the initial installation of the boilers in the place where they will be operated. To reduce the influence of these loads it is necessary to follow exactly the installation instructions provided by the manufacturer

- **Seismic loads**

These are loads that appear as a result of seismic processes and phenomena that have occurred.

The different types of loads mentioned here can be divided into the following groups:

- **Useful**

These are the loads caused by the manufacturing process

- **Own**

In addition to own loads, these loads are also called harmful. They cannot be avoided and appear during the operation of the boilers

- **Permanent**

These are the loads that do not change their value during the operation of the boilers or change this value very slowly. Typical manifestations of such loading are loading from the weight of the boiler or tension loading at the locations of bolted connections in the structure. Constant loads in an industrial boiler can cause fluctuating voltages in it.

- **Variables**

They have different effects, which is determined by the type of cause that causes them:

- Caused by the working process of the boiler's combustion plant
- Caused by irregularity of the work process
- Caused by a change in work mode or changes in working conditions
- Caused by the internal dynamics of the industrial boiler - usually these are the start-up and shutdown processes

Variable loads can be stationary. This means that they can be repeated in the same way. In addition, these loads can also be non-stationary, i.e. to change randomly.

In addition to the distribution indicated so far, the loads can be classified into three more groups:

- **Basic**

They are also called "main" and represent the operating loads from their own weight

- **Additional**

These are the atmospheric loads and those from the dynamic effects of operational loads atypical for the boiler

- **Special**

These are the installation, transport and seismic loads

In order to be able to calculate the details and assemblies of the strength boiler, it is necessary to establish typical load modes. These modes are determined by summarizing the load modes obtained under different operating conditions, characteristic of a certain type of industrial boiler. Each industrial boiler, depending on the type of purpose and the technological process it will serve, has its own typical load regime, which is characterized by certain groups of values, including:

- Mechanical load
- Electromagnetic load
- Heat load

These loads have a complex effect on the boiler and affect the performance of its individual assemblies, units and details..

To calculate the static strength, it is necessary to determine the maximum loads caused by particularly severe operating conditions.

To calculate the fatigue strength, it is necessary to determine the load mode under different characteristic operating conditions. In this case, the maximum voltages may not be taken into account if they occur episodically during operation.

For strength calculations when vibrations occur, it is necessary to determine the mode and in a situation where resonant oscillations occur.

For the calculation of the details of contact strength and wear resistance, the load mode determined for the calculation of fatigue strength is adopted.

### **3. Spectra of operational loads of industrial boilers**

The studies of the fatigue characteristics of the individual parts of the boilers under non-stationary load appear as the necessary conditions for improving the methods and specifying the results of the calculations and the experimentally obtained durability of the parts of the boiler, which work in the mode of variable cyclic load. Such studies are based on actual processes during operational loads.

The methods of modeling operational loads in fatigue testing are developing in two main directions.

In the first direction, the program mode models the time-averaged distributions of one or more parameters of the load cycles of the real process.

In the second direction, the main regularities of the processes of changes in real loads over time are modeled.

In studies based on the first direction of operational load modeling, the boiler is loaded by continuously changing one of the following quantities:

- Stresses – tangential or normal
- Efforts or strains – momentary efforts or forces

As far as the basic methodological prerequisites are the same, all load categories (efforts, deformations, stresses) are united in a common term called load " $\beta$ ", without considering external impact factors. The nature of load variation determines the methodology of conducting the experimental study of the operating load and the analysis and modeling of the process. In this regard, the probabilistic processes of the fatigue loads of the details of industrial boilers are characterized as loads in which the parameters of the composite cycles change according to a certain regularity of a non-statistical type.

The quantitative description of load modes is carried out by means of the load spectrum. The load spectrum shows what part of the time the boiler is working with what external load. The load spectrum is obtained experimentally, but can also be described by a power function (figure 1)

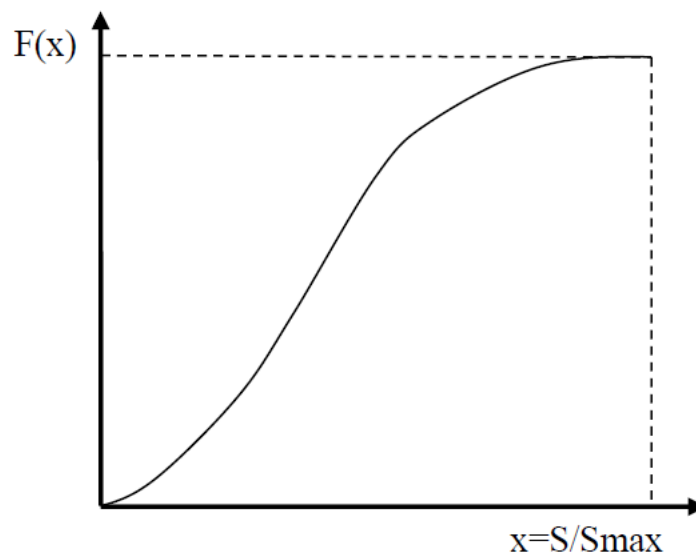


Figure 1

- $S$  - load
- $S_{\max}$  - maximum load
- $F(x)$  - distribution function

Different load spectra can be described using ralic loads. A typical determination relationship is shown in the following formula:

$$F\left(\frac{S}{S_{\max}}\right) = \left(\frac{S}{S_{\max} - S_{\min}}\right)^{\lambda}$$

- $\lambda$  - the load spectrum

For a light spectrum,  $\lambda=0.2$ , for a medium spectrum,  $\lambda=0.5$ , the mean uniform spectrum is  $\lambda=1$ , and for a heavy spectrum,  $\lambda=2$

The load spectrum shows the percentage distribution of the total number of cycles by the magnitude of the amplitudes and is characterized by the parameters:

- amplitude
- coefficient of variation
- total number of cycles

The main requirement for experimental load information is the accuracy with which it is determined. This requirement is fulfilled by choosing appropriate equipment and duration of measurement for each operating mode of the boiler. Where the load variation is of a periodic nature, the duration of the measurement shall correspond to not less than three to six full periods.

Collecting complete and accurate information from measurements is a guarantee for reaching correct conclusions and taking correct actions to increase the reliability of industrial boilers.

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**DIGITALIZATION OF LOGISTICS: IMPACT OF A MOBILE APP ON THE EFFICIENCY OF AIRPORT PROCESSES**

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**Abstract**

Modern logistics processes at international airports face many challenges, including the complexity of coordination, high speed requirements for cargo and passenger handling, and the need to accurately synchronize all participants. The introduction of innovative technologies such as mobile applications can significantly improve the management and efficiency of these processes. This article looks at how mobile platforms can help optimize airport logistics by improving interaction between different services and speeding up decision-making.

Optimization through mobile solutions is becoming a key factor in improving the overall efficiency and competitiveness of an airport.

**Keywords:** Technology, airports, logistics, airlines, mobile application, tourism, online booking, computerized business.

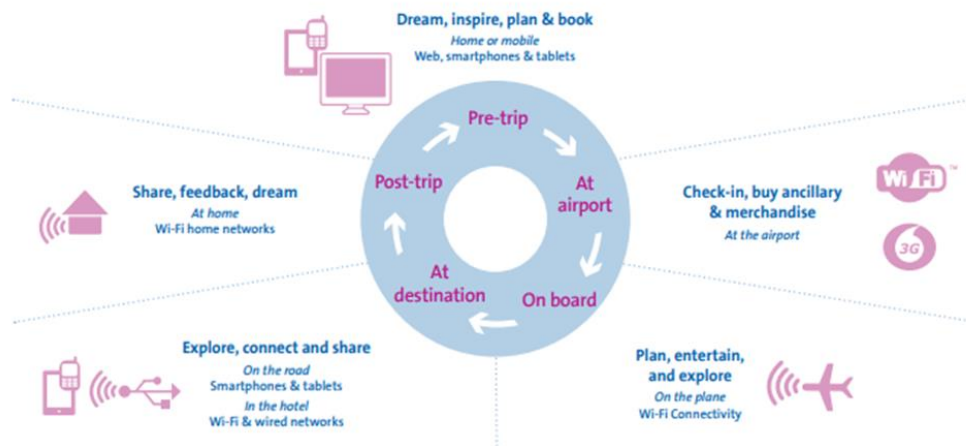
**Introduction**

Modern logistics processes at international airports face many challenges, including the complexity of coordination, high speed requirements for cargo and passenger processing, and the need to accurately synchronize all participants [2]. According to the SITA 2020 Air Transport IT Insights study, the industry's priority has been to accelerate investment in contactless passenger processing using mobile technologies, as well as remote and cloud-based IT services that allow employees to work from home while improving communication with passengers. The introduction of new technologies that process large amounts of information has brought the issue of cybersecurity to the forefront [9]. The introduction of innovative technologies such as mobile applications can significantly improve the management and efficiency of these processes. Thus, the introduction of mobile applications in the logistics processes of international airports contributes to increasing their efficiency, improving coordination between services and minimizing time and financial costs. In addition, mobile applications open new opportunities for data analysis and forecasting. They can collect and process large amounts of information, which helps to better understand customer needs and anticipate potential disruptions. This is especially important in a dynamically changing environment, where rapid adaptation to new challenges is required. The article will discuss key aspects of using mobile technologies in airport logistics, analyze their benefits and impact on operational optimization.

**Purpose of the paper.** The purpose of the article is to investigate and analyze the possibilities of using mobile applications to optimize logistics processes in international airports [3]. The article aims to identify how innovative mobile platforms can improve coordination between different airport services, increase resource management efficiency and reduce operational costs. The main objective is to show how mobile technologies can contribute to the overall efficiency of airport operations, improve passenger and shipper services, and reduce the likelihood of errors and delays. The introduction of mobile applications into airport operations not only helps to optimize logistics processes, but also opens up new sources of non-aviation revenue.

Given the high level of informatization of the population, passengers are demanding the expansion of self-service services and the provision of the possibility of individual variation of additional services through mobile applications or chatbots (Fig. 1). According to SITA surveys, 59% of respondents would like to use their cell phone instead of paper documents to pass through passport control. Involvement in the transportation process of a significant number of air transport market players (ticketing agencies, airlines, airports, border and customs services, etc.) determines the need of passengers in the development of omnichannel technologies of interaction [7]. Based on the opinion of foreign researchers that self-service and mobility will be the key characteristics of airport facilities services in the near future, we conducted a detailed analysis of the Baku

Airport mobile application and found that improving this platform will significantly minimize passenger dissatisfaction and insecurity.



**Figure 1. Impact of mobile connectivity across the traveler lifecycle on different devices.**

Despite the fact that this kind of mobile application already exists for Heydar Aliyev International Airport, by conducting a survey among tourists, we were able to find out that the software, interface and the amount of information in the application are not sufficient for comfortable movement of tourists in the airport, use of the full range of services and access to information [5]. For the research aimed at studying the use of the mobile application “Baku Airport” by passengers, a survey was conducted among passengers of the Baku-Stambul flight. The purpose of the survey was to find out how often passengers use the airport mobile application, what functions are most useful for them, as well as to identify their preferences and possible problems when using the application. The survey was conducted directly on board the aircraft during the flight to maximize coverage of the target audience.

#### Preparation for the survey

Before starting the study, a questionnaire was developed including both closed and open-ended questions. The main part of the questionnaire consisted of closed questions in order to obtain quantitative data on the frequency of use of the mobile application, its functionality and the level of user satisfaction [4]. For example, passengers were asked how often they used the app, which features they found most useful (e.g., flight information, online check-in, terminal maps), and whether they encountered any problems while using it. Open-ended questions were added to allow respondents to provide suggestions for improving the app and to share their user experience.

#### Survey process

The survey was conducted before the Baku-Stambul flight among passengers who agreed to participate in the study. Before starting the survey, passengers were informed about the purpose and importance of the survey. For this purpose, airport employees briefly explained the essence of the survey, noting that participation in the survey is voluntary and anonymous, and the data will be used solely to improve the airport service.

After that, the questionnaires were distributed to passengers and they were offered to fill them out at their convenience before boarding the aircraft. For the convenience of passengers, the questionnaire was prepared in three language versions - in Azerbaijani, Russian and English, which ensured wider coverage and participation of foreign passengers. The questionnaire also provided an opportunity to indicate if the passenger had not previously used the application, with reasons why he/she did not download or use it.

#### Data collection and processing

At the end of the survey, the questionnaires were collected by the employees and handed over to the research team for further analysis. A total of 150 passengers participated in the survey, representing 75% of the total number of passengers on the flight. After collecting the questionnaires, the data was digitized and analyzed using statistical software. The main focus was on the frequency of use of the mobile application, its evaluation by users, as well as the analysis of comments regarding problems or suggestions to improve the functionality of the application.

The results of the survey allowed us to identify the main trends in the use of the mobile application among passengers and provided valuable information for further improvement of the Baku Airport platform. The questionnaire itself will be provided below (Figure 2):

### RISE TO IMPROVEMENT: AIRPORT PASSENGER QUESTIONNAIRES FOR TRAVEL OPTIMIZATION



We constantly strive to improve the quality of our services, create the most comfortable conditions, taking into account your wishes. Please rate the following areas of service at the airport, if you have used them, by filling out the following questionnaire partially or completely:

#### Your age and gender:

☐ under 18 ☐ 18 - 24 ☐ 24 - 30 ☐ other \_\_\_\_\_  
☐ male ☐ female

#### How often do you use air transport services?

☐ frequently ☐ infrequently ☐ extremely rarely ☐ other \_\_\_\_\_

#### Do you use the "Baku Airport" mobile application?

☐ yes ☐ no ☐ never heard about this app

"If you are a user of the "Baku Airport" mobile application, please answer the following questions:

	Unsatisfactory	Neutral	Satisfactory
Information service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transportation support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Navigation services at the airport terminal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-aviation services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of mobile application performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### Additional comments and suggestions:

Thank you for choosing us!  
Have a successful takeoff and a soft landing!

### TƏKMILLƏŞDİRMƏ ARZUSU: SƏYAHƏTLƏRİ OPTİMALLAŞDIRMAQ ÜÇÜN HAVA LIMANI SƏRNIŞINLƏRİNİN SÖRGÜSÜ



Biz daim xidmətlərimizin keyfiyyətini yüksəltməyə, sizin istəklərinizi nəzərə alaraq ən rahat şərait yaratmağa çalışırıq. Aşağıdakı anketi qismən və ya tamamilə dolduraraq, aşağıdakı hava limanı xidmət sahələrini qiymətləndirin:

#### Yaşınız və cinsiniz:

☐ 18 yaşdan kiçik ☐ 18 - 24 ☐ 24 - 30 ☐ digər: \_\_\_\_\_  
☐ kişi ☐ qadın

#### Hava nəqliyyatı xidmətlərindən neçə zəmandan bir istifadə edirsiniz?

☐ tez-tez ☐ nadir ☐ çox nadir ☐ digər: \_\_\_\_\_

#### "Baku Airport" mobil proqramından istifadə edirsiniz?

☐ ha ☐ yox ☐ bu mobil tətbiq haqqında heç eşitməmişəm

\* "Baku Airport" mobil tətbiqinin istifadəçisizsinizsə, aşağıdakı suallara cavab verməyiniz xalis olur:

	Qeyri-qənaətbəxş	Neytrəl	Qənaətbəxş
Informasiya xidməti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nəqliyyat dəstəyi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hava limanı terminalında navigasiya xidmətləri	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Qeyri-aviasiya xidmətləri	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mobil tətbiqlərin keyfiyyəti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### Əlavə şərh və təkliflər:

Bizi seçdiyiniz üçün təşəkkür edirik!  
Uğurlu uçuş və yumşaq eniş arzu edirik!

### ПОДЪЕМ К СОВЕРШЕНСТВОВАНИЮ: АНКЕТИРОВАНИЕ ПДЛЯ ОПТИМИЗАЦИИ ПУТЕШЕСТВИЙ



Мы постоянно стремимся улучшить качество предоставляемых услуг, создавать максимально комфортные условия, учитывая Ваши пожелания. Оцените, пожалуйста, следующие области обслуживания в аэропорту, если Вы ими воспользовались, частично или полностью заполнив следующую анкету:

#### Ваш возраст и пол:

☐ меньше 18 ☐ 18 - 24 ☐ 24 - 30 ☐ другое \_\_\_\_\_  
☐ мужчина ☐ женщина

#### Как часто вы пользуетесь услугами авиатранспорта?

☐ Часто ☐ Редко ☐ Крайне редко ☐ Другое \_\_\_\_\_

#### Пользуетесь ли вы мобильным приложением "Baku Airport"?

☐ да ☐ нет ☐ никогда не слышал/а

"В случае, если вы являетесь пользователем мобильного приложения "Baku Airport", просим ответить на следующие вопросы:

	Неудовлетворительно	Нейтрально	Удовлетворительно
Информационный сервис	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Транспортное обеспечение	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Услуги навигации на территории аэровокзала	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Неавиационные услуги	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Качество работы мобильного приложения	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#### Дополнительные комментарии и предложения:

Спасибо за то, что выбираете нас!  
Успешного взлёта и мягкой посадки!

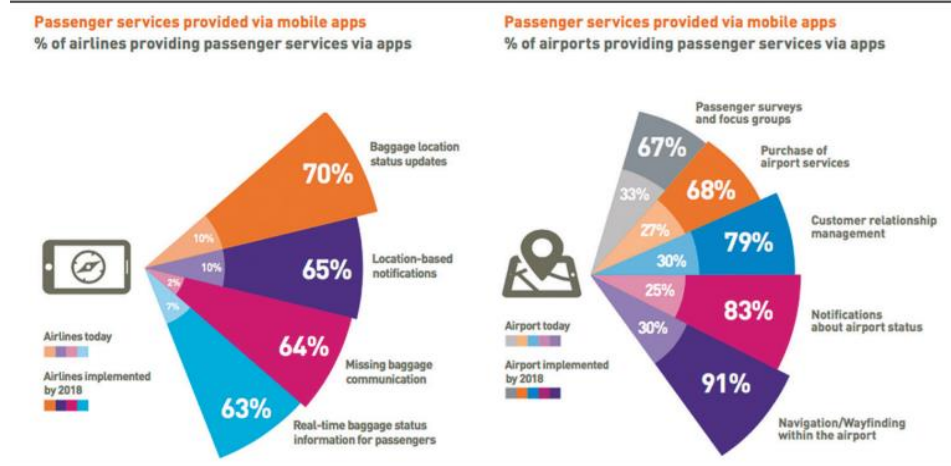
Figure 2: Questionnaire template

After conducting the survey, it became clear what exactly is the need of tourists while at the airport:

- - Availability of a map of the airport.
- - A list of restaurants and cafes within the airport and their locations.
- - Parking information.
- - A built-in translator.
- - Availability of information about hotels, inns, restaurants and vacation spots.
- - Tours of the country's attractions. (Communication with travel agencies directly through the mobile application) [11]

Analysis of existing foreign mobile applications for airports has shown that in addition to the basic functionality, additional features can be built into mobile applications [6]:

- - introduction of a scanner, with the support of which it is possible to translate any content (in particular, signs for airport navigation) from a foreign language into the native language;
- - Voice Assistant” service, which allows passengers to ask questions about airport services similar to Siri application;
- - the ability to mark your flight in the calendar with the exact time;
- - connection to in-flight radio;
- - online viewing of a feed of up-to-date photos with an airport marker; and the ability to call support for people with disabilities by specifying their location and the type of support required;
- - “Where is my car?” service, which allows leaving a photo, location, voice notification and other prompts to remember the location of the passenger's car in the parking lot [42].



Source: <https://es.sita.aero>

**Figure 3:** Services provided to passengers via mobile application abroad.

Integration with security systems is a crucial component. The mobile application can be linked to video access control and surveillance systems, which allows to promptly notify about possible dangers and quickly respond to them [1]. This significantly improves safety and allows for prompt troubleshooting.

Cargo flow management can also be improved by using a mobile application. Integration with cargo tracking and loading and unloading coordination systems allows to speed up the movement of cargo through the terminal, optimize its distribution and increase the efficiency of handling.

An equally important feature is the ability to monitor and analyze data. The mobile application allows collecting and analyzing data on various aspects of airport operations, including flight processing times, terminal congestion and other indicators[11]. This allows making informed decisions and taking measures to optimize logistics processes.

Resource and inventory management can also be greatly improved with a mobile app. It can track the utilization of resources, such as fuel and spare parts, and automatically notify the need for replenishment. This approach helps to prevent shortages and reduce costs [2].

Simplifying parking and transportation management is another area where mobile application can play an important role. It enables advance parking reservations and availability tracking, as well as managing airport traffic flow, which improves traffic management and reduces waiting times.

Improving the airport mobile app from the legacy app is an important step towards creating a more efficient and user-friendly tool for passengers and employees[8]. An updated version can significantly improve



the user experience and operational capabilities, taking into account the advances in new technologies and the current needs of the airport.

### **Conclusion**

After analyzing the use of the Baku Airport mobile application among passengers, key trends and user preferences were identified. The survey showed that the majority of passengers rated the app as a convenient tool for obtaining up-to-date flight information, tracking luggage and navigating the airport. However, problems were also identified, such as the app's lack of stability and limited features, which reduces overall user satisfaction. As a result of the analysis, it became evident that in order to improve the app's performance, it was necessary to focus on improving the user interface, enhancing functionality, and ensuring stable performance across all devices. The implementation of the proposed improvements will not only increase the level of passenger service, but will also strengthen the airport's reputation as a modern and customer-oriented transportation hub.

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