ANALYSIS OF THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE NEIGHBOURING COUNTRIES ACCORDING TO THE GOVERNMENT ARTIFICIAL INTELLIGENCE READINESS INDEX

ANI MOMTSHYAN

Public Administration Academy of the Republic of Armenia
lecturer at the Chair of Administration
amomtshyan@gaus.am

ARAM KARAPETYAN

National Academy of Sciences of the Republic of Armenia
International Scientific and Educational Center
Lecturer of the Chair of Economics and Management
PhD in Economics, associate professor
akarapetyan@mail.ru

Abstract

In today's rapidly developing world, many branches of the economy are trying to adapt to new technologies and automate as many processes as possible. Today, we are witnessing the rise of new technologies, with artificial intelligence (hereinafter referred to as AI) as the driver of software and the spearhead of the fourth industrial revolution.

In the context of the current developments in the field of AI, we emphasize the multi-faceted study of the policies conducted by the countries of the region (Armenia, Georgia, Azerbaijan, Turkey, Iran, hereinafter referred to as the CR countries) in order to reveal the degree of digitization of their economies, the directions of the main application of AI, the results obtained from political initiatives, AI risks and opportunities, obstacles and reasons for their occurrence.

Various stakeholders are interested in the process of developing a national AI strategy not to win the global AI race, but to create a powerful toolkit in this era of technological change to protect their citizens and prepare them for the expected technological changes. Countries with scarce resources but great human potential, such as Armenia, are obliged to take steps to remain an active participant in the field. The implementation of the AI strategy, which is most relevant to the Armenian reality, will help the policy makers of the sector to make effective decisions, as well as a number of developments, such as: the formation of a harmonious and effective education system, the transition from the middle level of education to the higher level and from subpar technologies to superior ones, increasing the mobility of the state administration system, as a result of which the slowness of decision-making and implementation will be pushed into the background, the acceleration of the process of various structural reforms of companies and public organizations through the introduction of state tax and preferential programs.

The main goal of the article is to assess the position of the countries of the region in the field of artificial intelligence by analyzing AI readiness index and to identify the directions of main application. The article concludes to localize the solutions currently used by leading countries for further development of AI-based systems and technologies, reveal opportunities for cooperation between stakeholders in different countries and establish flexible, competitive digital communication processes between government departments, the private sector, and society.
Keywords and phrases: Government AI Readiness Index, AI National Strategy, Cybersecurity, Chatbot.

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ԱՆԻ ՄՈՄՃՅԱՆ
Հայաստանի Հանրապետության պետական կառավարման ակադեմիայի կառավարման ամբիոնի դասախոս
amomtshyan@gaus.am

ԱՐԱՄ ԿԱՐԱՊԵՏՅԱՆ
ՀՀ Գիտությունների ազգային ակադեմիայի գիտակրթական միջազգային կենտրոնի տնտեսագիտության և կառավարման ամբիոնի դասախոս, տնտեսագիտության թեկնածու, դոցենտ
akarapetyan@mail.ru

Համառոտագիր

Ժամանակակից արագ զարգացող աշխարհում տնտեսության շատ ճյուղեր փորձում են հարմարվել նոր տեխնոլոգիաներին և ավտոմատացնել հնարավորինս շատ գործընթացներ: Այսոր մենք նոր տեխնոլոգիաների վերելքի ականատեսն ենք, որում որպես ծրագրային ապահովման շարժիչ և չորրորդ արդյունաբերական հեղափոխություն առաջ մղող հանդես է գալիս արհեստական բանականությունը (այսուհետ՝ ԱԲ):

ԱԲ ոլորտի ներկայիս զարգացումների համատեքստում կարևորում ենք տարածաշրջանի երկրների (Հայաստան, Վրաստան, Ադրբեջան, Թուրքիա, Իրան, այսուհետ՝ ՏՇ երկրներ) վարած քաղաքականության բազմակողմ ուսում-նասիրությունը՝ բացահայտելու համար նրանց տնտեսությունների թվայնացման աստիճանը, ԱԲ-ի հիմնական կիրառության ուղղությունները, քաղաքական

նախաձեռնություններից ստացված արդյունքները, ԱԲ-ի կիրառման հետ կապված ռիսկերն ու հնարավորությունները, խոչընդոտները և դրանց առաջացման պատճառները:

Տարբեր շահագրգիռ կողմեր ԱԲ ազգային ռազմավարության մշակման գործընթացով հետաքրքրված են ոչ թե այն պատճառով, որ շահեն համաշխարհային ԱԲ մրցավազքը, այլ որպեսզի տեխնոլոգիական փոփոխությունների այս ժամանակաշրջանում ստեղծեն հզոր գործիքակազմ իրենց քաղաքացիներին պաշտպանելու և նրանց պատրաստելու սպասվող տեխնոլոգիական փոփոխություններին: Սակավ ռեսուրսներ, սակայն մարդկային մեծ ներուժ ունեցող երկրները, ինչպիսին է նաև Հայաստանը, պարտավորված են քայլեր ձառնարկել գործընթացի ակտիվ մասնակից մնալու համար: Հայաստանյան իրականության առավել համապատասխանող ԱԲ ռազմավարության ներդրումը կօգնի ոլորտի քաղաքականություն մշակողներին, կնպաստի արդյունավետ որոշումների ընդունմանը, ինչպես նաև մի շարք զարգացումներին, ինչպիսիք են՝ ներդաշնակ և արդյունավետ կրթական համակարգի ձևավորմը, կրթության միջին մակարդակից անցում բարձր մակարդակի և թույլ տեխնոլոգիաներով հագեցած հասարակության վերազինումը, պետական կառավարման համակարգի շարժունակության բարձրացումը, որի շնորհիվ որոշումների կայացման և իրագործման դանդաղությունը կմղվի հետին պլան՝ արագացնելով ընկերությունների ու հասարակական կազմակերպությունների կառուցվածքային տարատեսակ բարեփոխումների գործընթացը՝ պետական հարկային և արտոնյալ ծրագրերի ներդրման միջոցով:

Հոդվածի հիմնական նպատակն է՝ գնահատել ՏԶ երկրների արհեստական բանականության ոլորտում զբաղեցրած դիրքն աշխարհի երկրների կտրվածքով՝ ԱԲ պատրաստվածության համաթվի ցուցանիշների վերլուծությամբ, և վեր հանել ԱԲ-ի հիմնական կիրառության ուղղությունները:

Հոդվածն ամփոփելով առաջարկվում է ԱԲ-ի վրա հիմնված համակարգերի և տեխնոլոգիաների հետագա զարգացման համար տեղայնացնել այն լուծումները, որոնք ներկայումս կիրառվում են այս ոլորտում առաջատար երկրների կողմից, և բացահայտել տարբեր երկրների շահագրգիռ կողմերի միջև համագործակցության հնարավորությունները և պետական գերատեսչությունների, մասնավոր հատվածի, հասարակության միջև ճկուն, մրցունակ թվային հաղորդակցության գործընթացների հաստատումը:

Բանալի բառեր և բառակապակցություններ. կառավարության ԱԲ պատրաստվածության համաթիվ, ԱԲ ազգային ռազմավարություն, կիբեռանվտանգություն:

АНАЛИЗ ПРИМЕНЕНИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В СОСЕДНИХ СТРАНАХ ПО ИНДЕКСУ ГОТОВНОСТИ ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ ПРАВИТЕЛЬСТВА

АНИ МОМЧЯН

Академия государственного управления. Республики Армения
преподаватель кафедры управления
amomtshyan@gaus.am

АРАМ КАРАПЕТЯН

Национальная академия наук Республики Армения
Международный научно-образовательного центр
преподаватель кафедры экономики и менеджмента
кандидат экономических наук, доцент
akarapetyan@mail.ru

Аннотация

В современном быстро развивающемся мире многие отрасли экономики пытаются приспособиться к новым технологиям и максимально автоматизировать процессы. Сегодня мы наблюдаем появление новых технологий с искусственным интеллектом (ИИ) в качестве драйвера программного обеспечения и движущей силы четвертой промышленной революции.

В контексте текущих событий в области ИИ подчеркнем многогранное изучение политики, проводимой странами региона (Армения, Грузия, Азербайджан, Турция, Иран, далее страны СР) с целью выявления степени цифровизации их экономик, направления основного применения ИИ, результаты, получаемые от политических инициатив, ИИ-риски и возможности, препятствия и причины их возникновения.

Различные заинтересованные стороны вовлекаются в процесс разработки национальной стратегии ИИ не для победы в глобальной гонке ИИ, а для создания мощного инструментария в эпоху технологических изменений для защиты своих граждан и подготовки их к ожидаемым технологическим изменениям. Страны со скудными ресурсами, но большим человеческим потенциалом, такие как Армения, обязаны предпринимать шаги, чтобы оставаться активными участниками системы. Реализация ИИ - стратегии, наиболее актуальной для армянских реалий, поможет политикам отрасли способствовать принятию эффективных решений, а также ряду разработок, таких как: формирование эффективной системы образования, переход от среднего уровня образования к высшему уровню и перевооружение общества, оснащенного слабыми технологиями, повышение мобильности системы государственного управления, ускорение процесса различных структурных преобразований предприятий и общественных организаций за счет введения государственных налоговых и льготных программ.

Основная цель статьи - оценить положение стран региона в области искусственного интеллекта путем анализа индекса готовности ИИ и выявить основные направления применения ИИ. В заключении статьи предлагается дальнейшее развитие систем на основе ИИ и технологии для локализации решений, используемых в настоящее время ведущими странами в этой области, а также определение возможностей для сотрудничества между заинтересованными сторонами в разных странах и создание конкурентоспособных процессов цифровой связи между государственными ведомствами, частным сектором, обществом.

Ключевые слова и словосочетания: индекс готовности ИИ правительства, национальная стратегия ИИ, кибербезопасность, чат-бот.

Introduction:

The exponential growth of computing infrastructure, coupled with the dramatic reduction in the cost of acquiring, processing, storing, and transmitting data, has revolutionized the process of computer software development and automation. AI is the fascinating tool of the century and its field of application knows no boundaries. We witnessed the application of various elements of AI when using unmanned aerial vehicles (UAV) during the Nagorno-Karabakh conflict [1], when discovering new models for rapid and effective diagnosis of the virus during the COVID-19 epidemic [2], while using deepfake programs during the campaign by the leaders of the political forces in the 2020 US presidential elections [3].

Various stakeholders – governments, corporations, the scientific community, and civil society organizations – are making efforts to take advantage of the benefits of AI use and are preparing to face the resulting risks. To this end, governments are embarking on the process of formulating and/or implementing a national AI strategy. In this regard, they face dual challenges: on the one hand, governments must pursue the creation of a favorable ecosystem for AI, attract investors, promote the development of AI technologies, increase the use of AI in industry, and on the other hand, AI poses unprecedented challenges to governments in terms of algorithmic accountability, data protection, cyber security, machine learning models and potential job shifts in decision-making [4].

AI is a multilevel, multifactorial concept and it is difficult to find a single common definition in relevant literature. The first definition of AI, proposed almost 65 years ago by John McCarthy, was used by the European Commission in its communication defining AI as systems that exhibit intelligent behavior and some degree of autonomy when analyzing their environment, carry out adequate response actions to achieve the set goals [5].

By studying and summarizing the many examples of practical use of AI in the professional literature, the following forms of AI use were distinguished:
- collecting, processing and analyzing information from large-scale digital images or videos [6],
- communication with service users/customers or citizens in a semi-automated manner through chatbots and virtual assistants,

- conducting simple analyses based on the study of textual data using natural language processing (NLP) algorithms to understand audio and text [7],
- analysis of large volumes of data to make more comprehensive and accurate predictions and/or support human decision-making, including crime prevention [8],
- development of guidelines based on past experience, as well as assistance in automating processes and tasks.

The preparedness of the countries for AI is evaluated by the methodology and rating developed by the World Economic Forum (WEF), the World Bank, the Organization for Economic Cooperation and Development (OECD), the International Institute for Management Development, and the International Telecommunication Union (ITU).

According to OECD data, in the last decade more than 300 AI policy initiatives were implemented in more than 60 countries, 130 of which were initiated by governments [9], noteworthy among which are the creation of AI expert groups, the development and approval of the national AI strategy, developing grant programs for research and development (R&D), and organizing awareness campaigns for the public.

The Government's AI Readiness Index is an annual report that ranks countries on 42 indicators, divided into three main groups: government, technology, and data and infrastructure. A number of indexes such as the National Cyber Security Index, the Network Readiness Index, the E-Government Development Index, the Global Competitiveness Index 4.0, the Inclusive Internet Index, and the GovTech Maturity Index have been used as a source for the indicators.

According to the 2021 report, almost 40% of 160 developed and developing countries have published or are still developing national AI strategies, indicating that AI is fast becoming a top concern for world leaders. 30% of the ranked countries have already published a national AI strategy, while 9% are still developing it.

Analysis: It is clear from the comparison of indicators of CR countries that in general there is a certain comparability between these indicators (see Table 1).

Table 1. 2021 government's AI Readiness Index of the CR countries according to three groups

Countries	Government (maximum 100)	Technology sector (maximum 100)	Data and infrastructure (maximum 100)	Index unit (maximum 100)	Occupied position (160 countries)
Armenia	43.10	31.14	63.53	**45.93**	**76**
Georgia	44.20	29.22	62.83	**45.41**	**79**
Iran	36.42	35.20	67.06	**46.23**	**72**
Azerbaijan	50.60	33.86	60.34	**48.2**	**57**
Turkey	71.41	39.05	55.99	**55.4**	**53**

It can be seen that a high result was recorded in the CR countries due to the sub-indicators of the "Data and infrastructure" group, although Turkey took the leading position in the region, and the 53rd place among the 160 countries of the world due to the sub-indicators of the "Government" group – 71.41 points. The sub-indicators of the "Government" group specify that the state should have a strategic vision for the development and management of the AI, the achievement of which should be facilitated by the relevant legal framework and regulations in the country, paying attention to ethical issues. Moreover, the state must have the capabilities to digitize internal systems, including skills and experience that will support the state to adapt to new technologies in a faster and more efficient way.

CR countries scored very close to each other and at the same time scored low on the sub-indicators of the "Technology sector" group, which defines whether the state uses high-quality AI tools created by the country's technology industry, and whether that industry is competitive in the global market and dynamically developing. The sector should have high innovation capacity based on a business environment that supports entrepreneurship and spends heavily on research and development. The skills and education of the people working in this field are also important.

The highest score was recorded from the sub-indicators of the "Data and infrastructure" group, which assesses the availability of high-quality data on which AI tools are based, and the potential of this data cannot be realized without the availability of appropriate infrastructure. It is noteworthy that the quality of the data characterizes the citizens of the given country.

During 2021, Turkey has been very active in the process of implementing AI and already in late 2021 published its national AI strategy, confirming its AI vision (see Figure 1).

The national strategy defines 6 priorities:
1. Training of AI experts and increasing employment in this field,
2. support for research, entrepreneurship and innovation,
3. facilitating access to quality data and technical infrastructure,
4. increasing the ability of adaption to socio-economic changes,
5. strengthening of international cooperation,
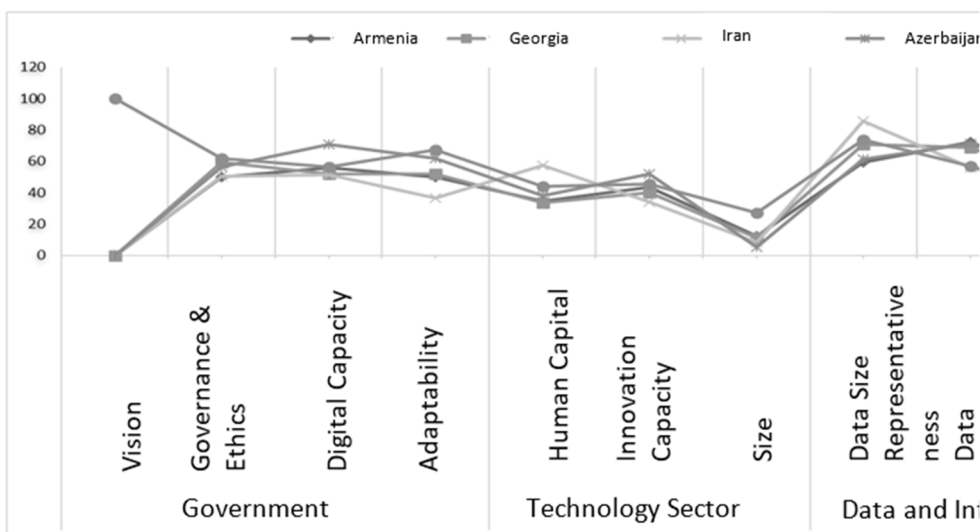6. accelerating structural reforms and labor market transformation.

Figure 1. The 2021 government AI readiness index of the CR countries by sub-indicators

Turkey hopes to achieve 5% GDP growth from 2021 to 2025 as a result of the implementation of AI and to increase employment in the AI sector to 50,000 people, including an increase of 1,000 people working in the AI sector of central and local governments.

Turkey has defined national cyber security strategy for 2020-2023 **[10]**.

Turkey has established more than 31 state initiatives, the budget of which exceeds 1 billion euros.

In contrast to Turkey, the Georgian government takes a two-pronged approach to the adoption of AI:

• AI can be widely used by the government in providing public services, increasing work efficiency, speed, workload of administrative apparatus, in some cases also contributing to cost reduction and improving the quality of services provided.

• Progressive government policies can help create an environment conducive to entrepreneurship, which can attract investors and entrepreneurship talents that can increase the economic and social well-being of society **[11]**.

In this context, Georgia is trying to build its strategy.

The other countries considered are more passive in setting a strategy. There is no established government body that will be responsible for the definition, development, and control of the AI policy. A universal strategic document can be extremely beneficial in developing the national legislative and/or policy framework. Favorable regulations and laws established for AI development can attract AI investors and increase opportunities for AI implementation in countries.

The above-mentioned countries are trying to implement reforms in the legislative field in order to create a reliable and legal basis for the adoption of AI. In addition to ensure the legal framework, the country's cyber security sector must also be considered, as before large databases can be created, it is also necessary to ensure their protection and systems security.

Georgia launched a cyber research project in 2018, creating an online cyber exercise portal. CyberLab is a new online resource created by the joint efforts of the Computer Emergency Response Team (CERT.GOV.GE) and the Georgian Research and Educational Networks Association (GRENA) with EU funding. The portal helps IT students at educational institutions interested in cyber security sharpen their practical skills so they can better identify and then respond to cyber incidents. The portal will also help IT personnel from both the public and private sectors improve their cyber resilience skills **[12]**.

Azerbaijan has taken the first steps in the field of cyber security by adding Chapter 30 in the Criminal Code, "Crimes in the field of computer information" **[13]**, and in 2018 one of the priority directions setted by the Cabinet of Ministers was the development of the "Cyber Security Strategy of the Republic of Azerbaijan" **[14]**.

Unlike the above-mentioned countries, Armenia and Iran do not have a developed national cyber security strategy.

In Chapter 4 of its 2021-2025 digitization strategy program, Armenia has considered cyber security as a fundamental condition for digitization. In order to overcome the challenges in the field of cyber security, the Ministry of High-Tech Industry plans to develop a comprehensive cyber security policy and action plan, which will include the establishment of a cyber security center, risk management and rapid response mechanisms during natural disasters, emergencies and wartime **[15]**.

As Iran's cyberspace infrastructure, the National Information Network (NIN) ensures the security of Iran culture and users' personal data from various external attacks and threats. In a national information network, the protection of certain data that is transferred between different government agencies, such as identity cards, must be done offline, and this offline presence helps ensure the highest quality of service to citizens. Because through this network, the risk of violating the privacy of citizens' personal data is eliminated, and the transfer of this data is always impossible **[16]**.

From the point of view of digitization index, Azerbaijan is the leader, registering 70.88 points, while Turkey caps at 56.59 points. Armenia is inferior in this respect to the above-mentioned two countries, occupying the 3rd place with 56.21 points. The purpose of the Digitization Capabilities indicator is to evaluate the quality of digital services provided by the state and the government's support for new technologies, performing the functions of initiator and promoter.

Azerbaijan taking the leading position in terms of Digitization Opportunities Index and Innovation Capability Index (51.81 points) is due to the initiative of state institutions in providing high-quality electronic services to the public. In addition, the majority of electronic and cyber-detectives work in government agencies, while the opposite argument is more widespread in the world, the private sector is the leader.

The Ministry of Transport, Communications and High Technologies of Azerbaijan established the Innovation Agency in 2018 with the aim of promoting the production of innovative and high-tech products and the provision of services under the "Made in Azerbaijan" brand, as well as creating conditions for existing local brands to enter the international arena, digitally identify new products and services for transformation, support robotics and cloud technologies, big data processing and AI solutions [17].

From the analysis of the data size representation index, it is clear that Iran is the leader (85.86 points), while Armenia scored 59.27 points, the lowest among the CR countries, and from the analysis of the Data Availability index, Armenia scored the highest 72.27 points. This is due to the fact that Armenia is a leader in the provision of Internet connection, 4G mobile communication coverage, as well as the number of mobile phone users. For Armenia, the mobile broadband basket is 1.1 percent of GDP, and the fixed basket is 3.5 percent of GDP, for Iran, mobile and fixed broadband baskets are 0.9 percent of GDP [18].

In recent years, 247 innovation centers, 1400 innovation companies, 144 accelerators, more than 50 scientific and technological structures, 6000 startups and 5700 information-based companies have been established in Iran, but the control by the state is very high and even in this technological age, the state shuts down the country's Internet network from time to time and strictly controls social networks, which is a rather negative circumstance for the development of the ICT sector.

The areas of application of AI in CR countries are diverse and not homogeneous, therefore, we divided the objectives of the use of AI in public government into five groups and highlighted examples of the use of AI by each country:

1. Enforcement: these cases of implementation of the AI refer to the implementation of the regulations already defined by the state through support, that is, to support the state administration bodies to carry out their activities more efficiently and at the same time to highlight the areas that primarily require the attention of the relevant bodies. For example, the State Revenue Committee of Armenia has created a big data analysis system, which, using elements of artificial intelligence and machine learning, tries to evaluate and obtain information about risky taxpayers, which cannot be obtained with ordinary eyes and usage of ordinary formulas [19]. It is interesting that the risks assessed using artificial intelligence and the selection of target groups of risky taxpayers sometimes differ from the assessment carried out by the regulation adopted by the SRC. In this regard, the system still needs development.

   The Georgia Prosecutor's Office uses IBM I2 software to facilitate complex investigations, coordination of cross-departmental functions, and management of criminal investigations. The AI program helps the user to import information from various sources, quickly analyze the data, get visible results that will help identify artificial behavior and threats [20].

2. Research, analysis and monitoring: this group refers to the use cases of AI that support policy-making processes, such as data collection, monitoring and analysis, to enhance the decision-making capacity of policy-makers and make them

evidence-based. Examples of the application of this group have not yet been implemented in the CR countries, but the big data collected in the examples mentioned in point 1 and the resulting scenarios can be utilized in the future to make more effective changes in the legislative field regulating these areas.

3. Adjudication: This group refers to the AI systems that are used to support the provision of benefits or entitlements to citizens. When looking at the experience of international and CR countries, it becomes clear that the use of this group of tools by state bodies is generally not carried out, because the use of these systems has not been extensive enough, nor the results visible, so governments do not want to completely entrust the decision-making process to the system, without being sure of its true and real potential.

4. Public services and engagement: this group includes AI solutions that support public administration bodies in providing high-quality and timely public services to citizens and entrepreneurs or to facilitate communication with the general public. For example, chatbots are the most widely used AI technology in public services in Georgia. Government agencies are using chatbots as a quick and convenient way to communicate with citizens to answer the most pressing questions. Thanks to the cooperation of Rustavi Municipality and Rustavi Innovation Hub, the "Ci - Bot" chatbot was launched on Facebook [21].

   Azerbaijan has launched the "ASAN-bot" chat-bot, the main purpose of which is to inform citizens about the public services provided by the Service and Assessment Network Agency of Azerbaijan 24/7. "ASAN-bot" enables the citizens of the country, regardless of their location, to receive up-to-date information on the services offered, it is able to understand text messages and respond to them. If there are difficulties in understanding the questions asked by citizens, they will be offered a special menu to get more detailed information and start the appeal process [22].

   The Ministry of Foreign Affairs of Turkey has launched an online service based on AI tools called "HIZIR", which answers citizens' questions around the clock.

5. Internal management. These AI use cases are used to support the organization's internal management system, such as human resources, procurement process, IT systems implementation and control, etc.

Summary:

Rapidly developing AI technologies provide a great opportunity to transform the economic and social sphere of the state. Despite the initiatives carried out by the governments of the CR countries, trying to increase the quality of public services, to meet the expectations of citizens, to create effective relations between the public and private sectors, these countries have not yet fully understood the opportunities created by the AI.

Bold steps are needed to promote the development of the national ecosystem of AI, generating major social and economic benefits.

 Recommended

 • to approve the national AI strategy and select the body that will be responsible for directing and coordinating the national AI policy;

• creation of expert groups involving policymakers, businessmen, engineers, academics and ethical researchers related to AI;

• the correct distribution of the state budget, increasing the volumes of state funding of the field of AI, while not shirking the financial support of international partners,

• creation of safe and reliable two-way data transmission structures,

• involvement of leading technology companies and advertising of companies from the CR countries abroad;

• close cooperation between the public and private sectors.

Strengthening of international cooperation, especially between the countries of the CR, is essential for the sustainable and progressive development of the AI sector in the region, be it in the form of financial investments, technical support or human capital.

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