STRATEGY

FOR THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE OF THE REPUBLIC OF UZBEKISTAN

2030

STRATEGY

FOR THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE OF THE REPUBLIC OF UZBEKISTAN – 2030

"THE SUSTAINABILITY OF OUR ECONOMY, THE QUALITY AND EFFECTIVE ACTIVITIES OF ALL SECTORS, THE CONVENIENCE OF LIFE FOR THE POPULATION DEPEND ON INFORMATION TECHNOLOGY."

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01 CHAPTER
Introduction

1. Introduction

How can an ordinary computer become smarter than a human and perform complex tasks such as playing chess or understanding speech? The answer lies in artificial intelligence. This technology, which once seemed like science fiction, is now actively used in various areas of our lives.

1.1 What is Artificial Intelligence?

Artificial Intelligence (AI) is a technology that enables computers to perform tasks that typically require human intelligence. In simple terms, artificial intelligence is the presence of computerized capabilities for reasoning, analysis, decision-making, and creativity.

Artificial intelligence encompasses several key areas:

Computer Vision: Enables machines to recognize and interpret visual information, such as photos and videos. It is used in security systems, medical diagnostics, and autonomous vehicles.

Natural Language Processing (NLP): The ability of machines to understand and process human speech and text. Examples include voice assistants like Siri, Alexa, Alisa, ChatGPT, as well as automated text translation systems.

Machine Learning and Deep Learning: The ability of AI systems to learn from data and make predictions or decisions without explicit programming. These methods are applied in financial analysis, demand and supply forecasting, and personalized recommendations in online services.

Robotics and Automation: The integration of AI technologies into physical devices, such as robots, which can perform tasks requiring precision and repeatability. Examples include industrial robots used on production lines and robotic surgical systems.

Reference: *Boston Dynamics - is an American engineering and robotics company known for its advanced robotics developments. Founded in 1992 by Marc Raibert, it evolved from the Massachusetts Institute of Technology (MIT). The company gained public attention through its impressive robots, which demonstrate high mobility, agility, and the ability to perform complex movements.*

Today, artificial intelligence has the potential to become the greatest technological revolution of our time, capable of radically transforming all aspects of human life. Andrew Ng, co-founder of Coursera and former head of Baidu AI Group/Google Brain in Silicon Valley (San Francisco, California, USA), compares the transformative impact of AI to that of electricity 100 years ago.

Artificial intelligence is not a new phenomenon: the theoretical and technological foundations were laid more than 70 years ago by scientists such as Alan Turing, Marvin Minsky, and John McCarthy. Today, AI technologies are actively used in many industries and government organizations. With virtually unlimited computing power and decreasing data storage costs, we are on the brink of an era of exponential growth in the use of these technologies, as organizations learn to unlock the value embedded in vast amounts of data.

1.2 Dispelling Myths About Artificial Intelligence

Myth: AI will replace humans in the workplace?

AI is more likely to replace tasks within a job, not the entire job itself. Almost all present-day AI systems perform specific tasks rather than entire jobs. The purpose of AI and automation is to make low-value tasks faster and easier, thus freeing up people to focus on high-value work that requires human creativity and critical thinking.

Historically, automation has created more jobs than it replaces. AI will mostly replace tasks, not jobs. It is more appropriate to think in terms of human-machine teams where each does the tasks for which it is best-suited. Many forecasts predict that new jobs will be created, i.e. people are and will continue to be needed for certain tasks and jobs.

Myth: AI can think like a human and learn on its own?

AI uses mathematical models and finite computing power to process information. Though some AI techniques might use ”neural nets”, these algorithms only remotely resemble human biology. Their outputs are still entirely based on data and rules prepared by humans.

Myth: AI is always more objective than humans?

AI applications are a product of data and algorithms combined into models. Data is collected, prepared, and managed by humans. Combining it with algorithms may still produce unfair and biased results. Machines and humans have different strengths and limitations. Humans are good at general tasks and big-picture thinking. Machines are good at doing specific tasks precisely. Human plus machine combinations are almost always superior in performance to a human alone or a machine alone.

Artificial intelligence has a long and volatile history, including periods of optimism, disappointment, and stagnation, known as "AI winters." Each previous breakthrough achievement only partially met expectations, and none managed to make the technology mainstream. However, we are currently experiencing an unprecedented period of technological innovations in various fields, giving reason to believe that the "AI spring" has arrived and is here to stay.

Artificial intelligence offers tremendous opportunities to improve quality of life and increase efficiency across various industries. However, with the development of AI, new challenges also arise, such as ethical issues, safety, and governance. The AI development strategy in Uzbekistan takes these aspects into account to maximize the benefits of new technologies while minimizing risks to society.

1.3 Implementation of Artificial Intelligence: From Early Technologies to the Present Day

The implementation of artificial intelligence in various areas of life has come a long way from its early steps to the present day. To understand how AI has become an integral part of modern life, it is essential to trace its development over the decades.

Early Stages: Foundations and Initial Successes:

The ideas and concepts underlying artificial intelligence have their roots in the deep history of science and mathematics. One of the prominent scholars whose work significantly contributed to the development of science and logic is the mathematician and astronomer Muhammad ibn Musa al-Khwarizmi. His book "Kitab al-Jabr wal-Muqabala" became one of the first systematic studies in solving equations and gave rise to algebraic methods. The name al-Khwarizmi became synonymous with the algorithm, a fundamental concept underlying programming and AI development.

The idea of AI emerged in the mid-20th century. In 1950, Alan Turing, a British mathematician and logician, proposed the Turing Test—an experiment that determines a machine's ability to exhibit intelligent behavior indistinguishable from that of a human. This marked the first step in developing AI as a scientific discipline.

In 1956, at the Dartmouth Conference, the term "artificial intelligence" was officially introduced. Scientists like John McCarthy and Marvin Minsky began developing the first algorithms that allowed machines to solve simple logical problems. However, due to limited computing power and lack of data, progress was slow.

1970s-1980s: Expert Systems and Early Applications:

In the 1970s and 1980s, expert systems emerged as the first real applications of AI. These systems were designed to mimic the decision-making process of experts in specific fields, such as medicine or engineering. They used knowledge bases and rules to analyze information and provide recommendations.

One well-known example was the MYCIN project, developed for diagnosing bacterial infections and selecting antibiotics. Despite their success, expert systems had limitations: they relied on manual knowledge input and could not adapt to new data without human intervention.

1990s-2000s: Development of Machine Learning:

In the 1990s and 2000s, significant progress was made in AI development thanks to advances in machine learning. Instead of relying on predefined rules, machines began to learn from data. This allowed for the creation of more flexible and accurate models.

A particularly important achievement was the emergence of reinforcement learning and neural network algorithms. For example, in 1997, IBM's Deep Blue computer program defeated world chess champion Garry Kasparov, demonstrating AI's capabilities in complex strategic games.

2010s: The Era of Big Data and Deep Learning:

In the early 2010s, AI entered the era of big data and deep learning. This was made possible by significant increases in computing power and the availability of vast amounts of data. Deep learning, which uses multilayer neural networks, enabled outstanding results in areas such as computer vision, natural language processing, and speech recognition.

Examples of successful deep learning applications include facial recognition systems, voice assistants, and self-driving cars. These technologies began to be actively integrated into everyday life, improving the quality and accessibility of services.

Today and Tomorrow: AI in Every Sphere of Life:

Today, AI is used in a wide range of fields: from medicine and education to transportation and finance. In medicine, AI helps diagnose diseases at early stages by analyzing medical images and patient data. In education, AI personalizes the learning process, adapting to the individual needs of each student. In transportation, AI is used to develop autonomous vehicles that can move safely without human intervention. In finance, AI analyzes vast

amounts of data to detect fraudulent activities and predict market trends.

The future of AI promises even more innovations. With the development of quantum computing and new algorithms, AI will become an even more powerful and versatile tool. However, only with a responsible approach to the development and implementation of AI can we maximize its potential for the benefit of society.

Trends in Global Legislation: How Countries Are Adapting Their Laws to AI

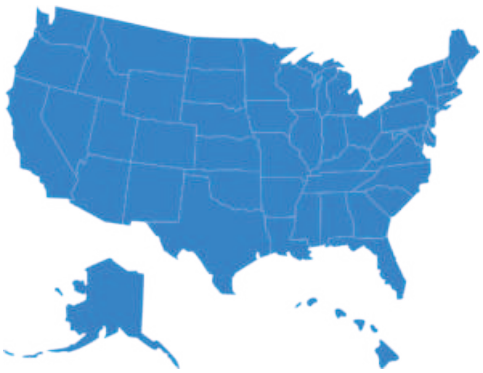
AI is becoming an important part of modern society, and many countries are striving to create legislative frameworks that promote its safe and effective implementation. Let's look at how some of the world's leading countries are adapting their legislation to regulate and stimulate the development of AI.

European Union

The European Union is one of the leaders in developing regulations governing the use of AI. In April 2021, the European Commission presented the draft Artificial Intelligence Act, which became the first comprehensive legislation in this area. This regulation is based on a risk-oriented approach, categorizing AI applications into four risk levels: minimal, limited, high, and unacceptable. The regulation imposes strict requirements on high-risk systems, such as those used in critical infrastructure and healthcare, including mandatory certification and oversight.

In May 2024, the Council of the European Union approved the world's first law on AI regulation. The core of the document is a risk-based approach to AI applications, including mandatory certification and monitoring to minimize potential threats to the rights and freedoms of citizens.

United States of America



In the United States, the approach to AI regulation is more fragmented and industry-specific. In 2020, the White House issued the Memorandum on AI Regulation, which sets out principles for federal agencies when developing regulations and policies related to AI. These principles include transparency, explainability, fairness, and security. Additionally, the U.S. actively invests in AI research and development through the National Institute of Standards and Technology (NIST) and other government agencies.

China

China aims to become a global leader in AI and is actively developing a national strategy to achieve this goal. In 2017, the State Council of China released the New Generation Artificial Intelligence Development Plan, which includes specific goals for establishing a regulatory framework, infrastructure, and workforce training. China is also actively developing standards and certification for AI technologies, with a strong emphasis on safety and ethics.

Canada

Canada is one of the first countries to adopt a national AI strategy. In 2017, the Pan-Canadian Artificial Intelligence Strategy was launched, aimed at developing AI research and ethical use. In 2019, Canada, together with France, founded the Global Partnership on Artificial Intelligence (GPAI), an international initiative aimed at promoting the responsible use of AI through collaboration and knowledge sharing.

Japan

Japan is actively developing its legislative and regulatory framework to support AI. In 2019, the Japanese government approved the AI Development Strategy, which covers various aspects, including research, implementation, and ethics. Japan is also working on establishing standards for the safe use of AI in industries such as healthcare, transportation, and manufacturing.

International Efforts

Many countries and organizations recognize that an international approach is necessary for effective AI regulation. The United Nations (UN), through its ITU AI for Good initiative, aims to bring together governments, industry, and the scientific community to develop global standards and guidelines. The Organisation for Economic Co-operation and Development (OECD) has also developed AI Principles, which have been adopted by many countries and include recommendations on transparency, fairness, and accountability.

02
CHAPTER
Government Artificial Intelligence Readiness Index

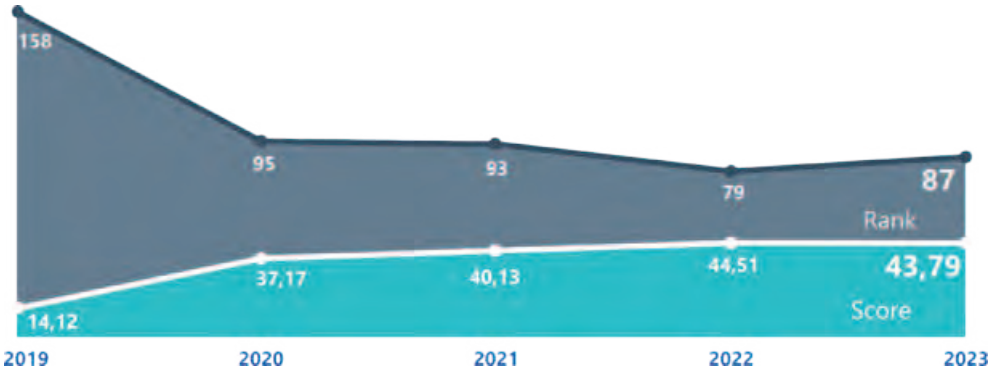
2. Government Artificial Intelligence Readiness Index

Government AI Readiness Index – is a ranking of countries published by Oxford Insights since 2017. It assesses various indicators that collectively determine how prepared the governments of different countries are to use artificial intelligence (AI) in providing public services to their citizens.

The indicators used to compile the ranking are divided into three blocks: government, technology sector, and data and infrastructure. Each of these blocks, in turn, consists of so-called measures (10), which are further broken down into indicator metrics (39).

2.1 Uzbekistan's position in the international Government AI Readiness Index

In the 2023 report, it was noted that Uzbekistan announced its future development and digitalization strategy. The country was awarded 43.79 points, which is slightly below the global average (44.94). This affected the country's ranking, with the republic losing 8 positions compared to the 2022 report, placing it at 87th. Considering all the statistical errors acknowledged and accepted by the study's authors, it is also valid to draw a parallel with the median line (41.37).



The country's average scores in the report are largely explained by a low score in the technology sector, which was most affected by the «Maturity» measure. Overall, 80% of the indicators in this block are considered problematic for the republic and require urgent action.

Block	Measure	Indicator and Uzbekistan's Scores	
Government (49,07)	Vision	National AI Strategy (Yes/No)	50,00
	Governance and Ethics	Data Protection and Privacy Legislation	100,00
		Information Security	71,11
		Quality of Regulation	39,00
		National Ethics System (Yes/No)	0,00
		Accountability	23,40
	Digital Capacity	Online Services	74,40
		Fundamental IT Infrastructure	79,40
		Government Incentives for Investment in New Technologies	24,67
	Adaptability	Efficiency of Government Administration	43,40
		Government Response to Changes	44,91
		Procurement Data	32,00
Technology sector (24,80)	Maturity	Number of AI Unicorn Companies (worth $1 billion or more)	0,00
		Number of Non-AI Unicorn Companies (worth $1 billion or more)	0,00
		ICT Services Trade Size (per capita)	24,05
		ICT Goods Trade Size (per capita)	32,48
		Spending on Computer Software	15,27
	Innovation Potential	Time to Work with Government Regulations	95,10
		Availability of Venture Capital	5,00
		R&D Spending	6,72
		Company Investments in New Technologies	25,38
		Published AI Research	39,33
	Human Capital	STEM Graduates (Science, Technology, Engineering, and Mathematics)	42,84
		GitHub Users per Thousand Population	23,50
		STEM Female Graduates	49,21
		Quality of Engineering and Technology Higher Education	0,00
		ICT Skills	13,20
Data & Infrastructure (57,49)	Infrastructure	Telecommunications Infrastructure	65,75
		Supercomputers	0,00
		Quality of Broadband Access	36,80
		5G Infrastructure	100,00
		Adoption of New Technologies	36,58
	Data Availability	Open Data	69,00
		Data Management	0,00
		Mobile Users	79,31
		Households with Internet Access	95,05
		Statistical Volume	54,91
	Data Representativeness	Gender Gap in Internet Access	39,98
		The cost of a device with internet access relative to GDP per capita	90,00

2.2 Comparison with neighboring countries and global leaders

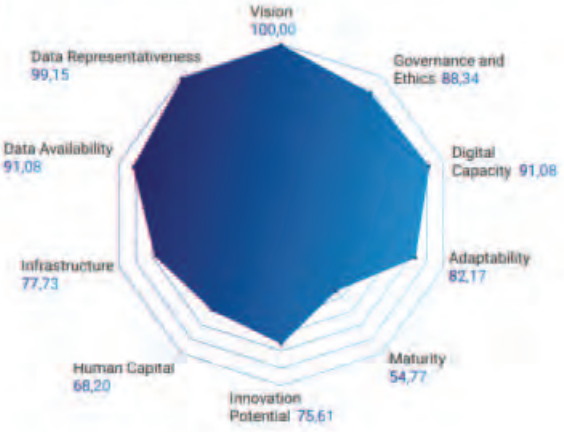
When compared to its closest neighboring country, Kazakhstan, which is ranked 15 positions higher in the final ranking, scoring 48.56 points. Kazakhstan's position remained unchanged from the previous GAIRI report. The most noticeable lag for Uzbekistan is in the technology and infrastructure sectors, whereas the government block data of both republics are comparable.

Country	Pillars			Rating	Position
	Government	Technology	Data & Infrastructure		
USA	84.06	81.02	87.32	84.80	**1**
South Korea	87.55	54.36	85.02	75.65	**7**
Germany	80.78	63.28	81.72	75.26	**8**
China	77.32	60.76	74.75	70.94	**16**
UAE	78.32	56.67	76.28	70.42	**18**
Russia	74.13	43.38	71.26	62.92	**38**
Kazakhstan	48.56	30.97	66.13	48.56	**72**
Uzbekistan	**49.07**	**24.80**	**57.49**	**43.79**	87
Georgia	41.96	30.33	51.50	41.27	**99**
Belorussia	30.95	32.28	54.38	39.20	**107**

One of the country's main economic partners, Russia, is predictably closer to the index leaders, ranking 38th, having improved its position by two places since 2022. As seen, the overall ranking of all compared states is negatively affected mainly by the technology sector. Only the USA shows a slight gap between the blocks; however, even this country has a final score below 85, despite its global leadership in the application of innovative technologies related to the implementation of artificial intelligence.

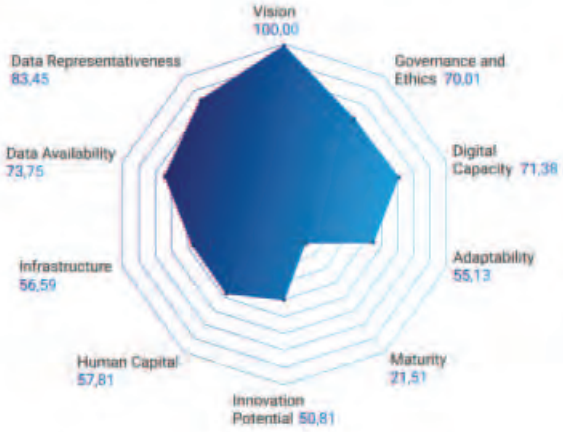
USA

Singapore



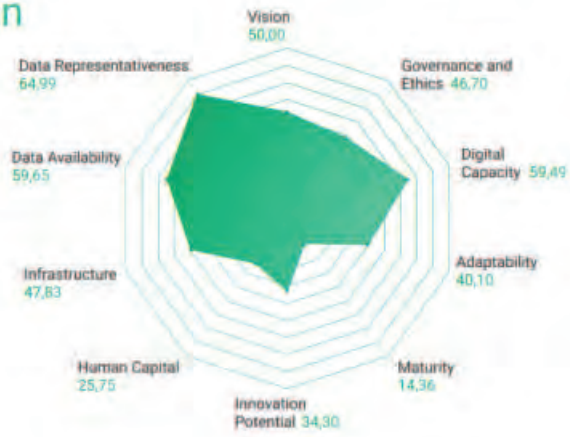
UK

Russia



Kazakhstan

Uzbekistan



03
CHAPTER
International Experience

3. International Experience

3.1 USA

Government AI Readiness Index: ***Rank 1***

Investment and Policy

The US, thanks to significant investment, government support and a strong scientific base, continues to lead in artificial intelligence (AI). Here are key aspects and statistics about the US AI market.

Key Initiatives and Programs

Governmental support:

National AI Strategy: In 2019, the US administration introduced the "National Artificial Intelligence Strategy" aimed at coordinating and strengthening AI development efforts in the country.

National Institute of Standards and Technology (NIST): Works to develop standards and guidelines for the implementation of AI in various industries.

Research Centers and Universities:

MIT: Massachusetts Institute of Technology is active in AI research, including projects such as the MIT-IBM Watson AI Lab.

Stanford AI Lab: The Stanford University lab is dedicated to cutting-edge research in AI and machine learning.

Investment Initiatives:

DARPA: The US Defense Advanced Research Projects Agency is investing heavily in AI development projects.

Private Sector Investments: Private companies such as Google, Microsoft, Amazon and Facebook are investing billions of dollars in the development of AI technologies and startups.

Statistics and Numbers

Market Volume: The AI market in the US is estimated at **$299.64** billion by **2026** (explodingtopics).

Investments: In **2021**, AI investment in the US reached **$77.5** billion, accounting for more than half of the global AI investment. In **2023**, the US AI market was valued at **$42.00** billion, and significant progress has been made in the AI and robotics fields. (Analytics Vidhya)(tortoismedia).

Startups: The US is home to thousands of AI startups, including well-known companies such as OpenAI, DataRobot, and UiPath.

3.2 Singapore

Government AI Readiness Index: ***Rank 2***

Investments and Politics

Singapore is actively developing artificial intelligence (AI) and ranks second in the world ranking of countries for AI development in 2024. Significant investment, government support and the availability of a strong data infrastructure are important factors.

Key Initiatives and Programs

Governmental support:

National AI Strategy: Singapore's AI Singapore program aims to accelerate the adoption of AI in various sectors of the economy, including healthcare, finance and transport.

Smart Nation Initiative: A national program to transform Singapore into a smart city through AI and digital technologies.

Research Centers:

National AI Office: Coordinates efforts to develop and implement AI at the national level.

Institutes of Higher Education: Universities such as the National University of Singapore (NUS) and Nanyang Technological University (NTU) are actively involved in AI research and development.

Educational Initiatives:

AI Apprenticeship Program: An AI training program aimed at creating a skilled workforce.

Statistics and Numbers

Investing in AI: Singapore has allocated $362 million for AI development over five years (Analytics Insight) (Analytics Vidhya).

AI Market: The AI market in Singapore is expected to grow 28% annually over the next five years (Analytics Insight).

Number of Startups: There are more than 165 AI startups registered in Singapore (Techopedia).

3.3 Great Britain

Government AI Readiness Index: ***Rank 3***

Investments and Politics

The UK is actively developing artificial intelligence (AI), ranking third in the world ranking of countries for AI development in 2024. Investment, government support and developed data infrastructure play an important role.

Key Initiatives and Programs

Governmental support:

National AI Strategy: In 2021, the UK government introduced an AI strategy aimed at supporting research and development, workforce training and technology adoption.

Investing in Research: The government has invested £400 million in AI development, including a £100 million supercomputer in Bristol (Techopedia) (techovedas).

Research Centers and Universities:

University of Cambridge: A leading university dedicated to research in AI and machine learning.

Oxford AI Hub: A center specializing in the development of advanced AI technologies.

Educational Initiatives:

AI Doctoral Training Centers: Government-funded AI training programs.

Statistics and Numbers

Market Volume: The UK AI market is valued at **$21** billion, with growth forecast to reach **$1** trillion by **2035** (Techopedia) (Analytics Insight) (techovedas).

Investments: In 2023, the UK attracted around £1.5 billion of AI investment (gov.uk).

Number of Startups: There are over 2,600 registered AI start-ups in the UK (Thedatacity).

3.4 Finland

Government Readiness Index: ***Rank 4***

Investments and Politics

Finland is actively developing artificial intelligence (AI), and its high positions in global rankings are largely due to strong government support, substantial investments, and rapid advancement of domestic technologies. Below are key aspects and statistical data on the country's AI market.

Key Initiatives and Programs

Government Support:

«Artificial Intelligence 4.0» Program (AI 4.0): Aimed at integrating AI into industry and other economic sectors.

National AI Strategy: Developed to support research and AI implementation across various industries.

Research Centers:

VTT Technical Research Centre of Finland: A leading research center in the country engaged in AI technology development and implementation.

Aalto University: A top Finnish university actively involved in AI research and development.

Educational Initiatives

«Elements of AI» Course: Developed by the University of Helsinki in collaboration with Reaktor. A free online course on AI basics, educating over 750,000 people from more than 170 countries.

Statistics and Figures:

Investments: The AI market in Finland is valued at **$2** billion in **2023**. In the next seven years, Finland's AI market is projected to more than triple in size, reaching approximately **$7** billion by **2030** (STATISTA).

AI Market Growth: Studies put the annual growth rate of the AI market in Finland at 12%, attracting significant private and public investments.

Number of Startups: Finland is home to over 400 AI startups (Helsinkipartners)..

3.5 Canada

Government AI Readiness Index: ***Rank 5***

Investment and Policy

Canada is actively developing artificial intelligence (AI) and becoming one of the leading innovation centers in this field. The strengths of Canada include government support, significant investments in research and development, and a strong academic foundation.

Key Initiatives and Programs

Government Support:

CIFAR **Pan-Canadian Artificial Intelligence Strategy:** Launched in 2017 and updated in 2021, this program aims to support research centers, develop human resources, and promote AI innovations.

Research Investments: The Canadian government has invested $124 million in the University of Montreal to advance responsible AI through the Canadian First Research Excellence Fund (Techopedia) (techovedas).

Research Centers:

Vector Institute: A leading institute in Toronto specializing in machine learning and AI research.

Mila (Quebec Artificial Intelligence Institute): A center in Montreal renowned for its achievements in deep learning and AI developments.

Amii (Alberta Machine Intelligence Institute): A center in Edmonton working on projects in machine learning and artificial intelligence.

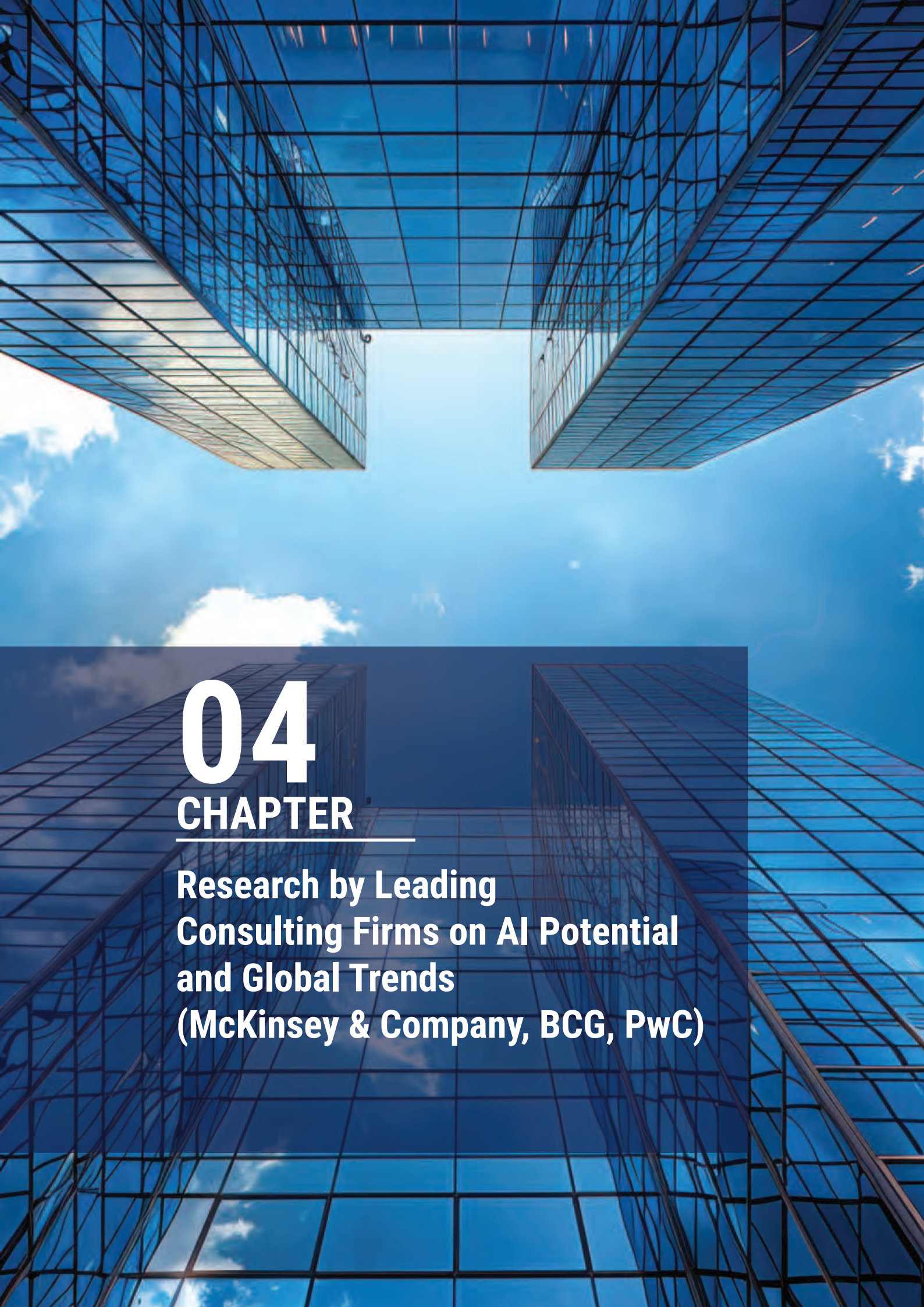
Educational Initiatives:

AI Doctoral Training Centres: Programs for training AI specialists, funded by the government and universities.

Statistics and Figures

Market Size: The AI market in Canada is valued at $8.64 billion, with AI investments amounting to $2.57 billion in 2023 alone (Analytics Insight) (Deloitte).

Number of Startups: Canada is home to numerous AI startups, including notable companies such as Cohere (provider of large language model solutions), Scale AI (generative AI platform), and Coveo (intelligent search system) (Techopedia) (Analytics Insight) (Analytics Vidhya) (techovedas).



04
CHAPTER

Research by Leading Consulting Firms on AI Potential and Global Trends (McKinsey & Company, BCG, PwC)

4. Research by Leading Consulting Firms on AI Potential and Global Trends (McKinsey & Company, BCG, PwC)

AI represents a revolutionary technology capable of significantly transforming economies and social landscapes of countries around the globe. According to leading consulting firms such as McKinsey & Company, PwC, and BCG, AI can substantially boost productivity, improve the quality of services and products, and generate novel economic opportunities.

4.1 Economic Prospects of AI (by PwC)

According to PwC forecasts, AI could boost global GDP by **14% by 2030,** which will amount to **$15.7 trillion.** The greatest benefits are expected to accrue to sectors such as retail, financial services, and healthcare.

Key Benefits:

• **Productivity Increase:** Automation of processes and improvement of product and service quality through AI. Specifically, 55% of GDP growth will be driven by increased labor productivity.

• **Consumption Growth:** Enhanced quality and personalization of products and services stimulate consumer demand. PwC estimates that **58%** of GDP growth in **2030** will be related to increased consumption.

Regional Differences:

• **China:** AI is expected to contribute **26.1%** to China's GDP, equivalent to **$7** trillion.
• **North America:** Potential GDP growth of **14.5%,** equivalent to **$3.7** trillion.
• **Developing Countries:** Potential overall GDP growth in developing Asian and African countries is **5.6%,** equivalent to **$1.2** trillion.

Recommendations:

• Promote AI adoption in key economic sectors.
• Support initiatives around AI technology and startup incubation.
• Ensure access to training and reskilling for workers to adapt to AI-driven changes.

4.2 Impact of AI on Public Administration (by BCG)

Generative AI can significantly enhance the efficiency of government entities, reduce task completion times, and enhance the quality of interactions with citizens.

Key Benefits:

• **Productivity Increase:** BCG estimates a potential annual productivity boost of **$1.75** trillion in the public sector by **2033** due to AI adoption.

• **Improved Government Services:** AI implementation can significantly raise the quality of services provided, making them more personalized and efficient.

Recommendations:

• Start with pilot projects to test AI technologies in various government bodies.
• Invest in training employees in AI skills.
• Establish clear ethical and legal norms for AI use.

4.3 Impact of AI on Agriculture (by McKinsey & Company)

Agriculture is one sector where AI can bring significant benefits. Generative AI (gen AI) can analyze large volumes of unstructured data, such as geospatial and weather data, improving agricultural processes and increasing crop yields.

Key Benefits:

• **Economic Efficiency:** Gen AI can reduce labor costs and optimize resource use. McKinsey estimates that AI can create an economic benefit of **$100** billion by improving field processes and **$150** billion by increasing enterprise productivity.

• **Sustainable Development:** Gen AI can help reduce environmental impact through more precise application of fertilizers and pesticides.

Recommendations:

- Invest in data infrastructure for agriculture.
- Support scientific research and development of gen AI technologies.
- Create training programs for farmers on using AI in agronomy.

4.4 Early Adoption of Generative AI in Healthcare (by McKinsey & Company)

McKinsey & Company

Generative AI can transform nearly every aspect of the medical science industry. McKinsey Global Institute estimates that generative AI can produce **$60–110** billion in annual economic gains for pharmaceutical and medical companies, with **$18–30** billion from commercial functions alone.

Key Benefits:

- **Improved Interaction between Patients and Medical Staff:** The use of generative AI improves interaction with patients and medical staff by **30%** through insights generation and content personalization.
- **Efficiency Gains:** Generative AI can enhance the efficiency of various processes in the biological sciences.

Recommendations:

- Develop a clear strategy for generative AI implementation with an allocated budget.
- Create and develop in-house AI solutions tailored to the unique requirements of companies.
- Train and retrain staff to work with new AI technologies.

AI holds an immense potential for transforming various economic sectors and enhancing government efficiency. To fully leverage these opportunities, strategic initiatives need to be developed, and sizable investments should be made in infrastructure, skills, and legal frameworks to support these technologies.

05
CHAPTER

Strategy for the Development of Artificial Intelligence Technologies until 2030

STRATEGY for the Development of Artificial Intelligence Technologies until 2030

Chapter 1: General Information

The Strategy for the Development of Artificial Intelligence Technologies until 2030 (hereinafter referred to as the Strategy) has been developed in accordance with the Decree No. PF-132 of the President of the Republic of Uzbekistan, dated August 30, 2024, «On Measures to Implement the Tasks Defined at the Fourth Open Dialogue between the President of the Republic of Uzbekistan and Entrepreneurs.» This Strategy aims to create the necessary conditions for the introduction of artificial intelligence technologies in the social sphere and economic sectors, including the establishment of legal, technological, and economic foundations.

The Strategy defines the objectives, tasks, and priority areas for the broad application and accelerated development of artificial intelligence in our country, taking into account the current state of artificial intelligence technologies and the advanced practices of other countries.

Additionally, the Strategy outlines medium- and long-term tasks, including those in scientific and technological development, for the implementation of projects aligned with national interests using artificial intelligence technologies.

The following key concepts are used in the Strategy:

Artificial Intelligence: A set of technological solutions that enable the imitation of human knowledge and skills (including independent learning and problem-solving), delivering results comparable to those of human intellectual activity when performing specific tasks.

Neural Network: A mathematical model and software-hardware solution based on the principles of biological neural connections, employed in machine learning.

Machine Learning: A field focused on developing algorithms that draw conclusions by studying and analyzing patterns, identifying relationships in data, and applying various methods, including neural networks and statistics.

Deep Learning Platform: A set of software and hardware tools designed for deep learning using artificial neural networks.

Artificial Intelligence Technology: Technologies based on artificial intelligence, including advanced methods for intelligent video analysis, speech recognition and synthesis, and decision-making support.

Big Data: Large datasets distinguished by their volume, variety, and/or velocity, requiring efficient storage, management, and analysis.

Chapter 2: The Current State of Artificial Intelligence Technologies Development in Uzbekistan

To create conditions for the development of artificial intelligence technologies, the President of the Republic of Uzbekistan issued Resolution No. PQ-4996 on February 17, 2021, «On Measures to Create Conditions for the Accelerated Implementation of Artificial Intelligence Technologies.» According to this resolution:

Starting from the **2021/2022 academic year**, courses and subjects focused on the practical application of artificial intelligence technologies in economic sectors and public administration were introduced in **15** higher education institutions;

Beginning with the **2023/2024 academic year**, **572 students** (**510** undergraduates and **62** master's students) were admitted to **12** higher education institutions to study in the field of "Artificial Intelligence";

The "El-Yurt Umidi" Foundation sent young people who expressed a desire to study artificial intelligence to leading foreign higher education institutions.

The Ministry of Digital Technologies established the **Digital Technologies and Artificial Intelligence Development Research Institute**, which includes specialized laboratories.

As part of the activities of the Open Data Portal of the Republic of Uzbekistan, a digital data platform (data.egov.uz) was launched to provide access to datasets and state agency data through software solutions based on artificial intelligence.

Experimental projects were implemented in priority sectors and industries—such as agriculture, banking, finance, transport, healthcare, pharmaceuticals, energy, and taxation — to introduce artificial intelligence technologies.

Chapter 3: Objectives and Tasks of the Strategy

The Strategy aims to achieve specific targets for the development of artificial intelligence technologies by 2030. The following are defined as the primary objectives and tasks for the successful implementation of the Strategy in Uzbekistan:

Target indicators for the development of artificial intelligence technologies until 2030 are presented in the Appendix of this Strategy.

1) Developing a Legal Framework for the Advancement of Artificial Intelligence Technologies:

drafting and improving national legislation based on international best practices;

creating a favorable environment to support scientific research and innovation in the field;

establishing security and ethical requirements for artificial intelligence technologies.

2) Implementing Artificial Intelligence Technologies in the Social Sphere and Economic Sectors:

promoting the development and introduction of artificial intelligence

technologies to generate new high-value products and services.

3) Improving Standards and Strengthening International Cooperation:

aligning national standards with international standards;

establishing connections with international organizations and leading foreign companies in the field, as well as strengthening regional and international cooperation.

4) Establishing Technical Infrastructure for Data Processing Based on Artificial Intelligence Technologies:

creating the necessary infrastructure for the training, testing, and development of artificial intelligence models;

forming open data and "big data" collections.

5) Enhancing Knowledge and Skills of the Population and Developing Human Resources:

raising public awareness and knowledge about the use of artificial intelligence technologies;

training qualified personnel, improving staff competencies, engaging foreign specialists, and enhancing the skills of teachers and professors.

1-§. Developing a Legal Framework for the Advancement of Artificial Intelligence Technologies

To draft and improve national legislation based on international best practices, the following measures will be implemented:

establishing a robust legal framework to support the development of artificial intelligence technologies by studying research outcomes and the experience of advanced countries;

creating a comprehensive system to regulate relations among entities involved in the widespread adoption and use of artificial intelligence technologies;

developing state standards and legal frameworks specific to the field;

forming institutional foundations for the governance of artificial intelligence technologies;

strengthening the foundations to ensure data integrity and security in cloud technology services at data processing and storage centers.

To create a favorable environment supporting scientific research and innovation, the following steps will be taken:

facilitating patent research, involving leading organizations in identifying priority areas for research, and ensuring the regular updating of such research;

simplifying the processes related to conducting scientific research in the field of artificial

intelligence across various economic sectors;

enhancing the legal framework for the commercialization of scientific research outcomes.

To introduce security and ethical requirements, the following actions will be carried out:

developing ethical guidelines for artificial intelligence technologies;

improving legal frameworks for data collection, storage, processing, and security;

2-§: Implementing Artificial Intelligence Technologies in the Social Sphere and Economic Sectors

To promote new high-value products and services through the widespread development and application of artificial intelligence technologies, the following measures will be implemented:

a) In Agriculture:

developing technologies for remote sensing of soil and crops and monitoring agricultural equipment (including combines) through global positioning systems;

assisting decision-making processes to increase crop productivity using artificial intelligence;

enabling online monitoring of the growth and production of crops, livestock, poultry, fish, and other agricultural products;

using artificial intelligence to forecast crop yields, determine soil moisture levels, and recommend ways to conserve water and fertilizers.

b) In the Banking Sector:

assessing customers' solvency and other characteristics during the provision of banking services;

developing intelligent technologies for monitoring, analysis, planning, and forecasting within the banking sector.

c) In Transport, Logistics, Industry, Services, and Public Safety:

monitoring the number, net weight, and contents of wagons in the transport sector using modern methods;

identifying customers in stores with modern cameras, analyzing their behavior, and monitoring the products they purchase;

utilizing autonomous intelligent devices and robotic complexes in intelligent logistics management systems;

monitoring and optimizing production and service processes using artificial intelligence algorithms, machine learning, and forecasting methods.

d) In Geology and Energy:

optimizing production processes and improving the efficiency of technological equipment;

forecasting the production and consumption of energy resources;

introducing IoT technologies for efficient management and monitoring of energy facilities.

e) In Healthcare and Pharmaceuticals:

implementing projects focused on forecasting, diagnosing, and planning the treatment of diseases.

optimizing the production and delivery of pharmaceuticals.

using artificial intelligence to detect pneumonia through CT analysis of lungs.

diagnosing breast cancer in its early stages through

mammography analysis using artificial intelligence technologies.

analyzing medical needs, production levels, and financial information to ensure adequate pharmaceutical supply.

introducing early detection systems for diseases by analyzing 3D CT images.

using segmentation methods to accurately identify patients' diseases.

automating surgical interventions to enhance precision.

f) In Education, Culture, and Tourism:

monitoring students' attendance and ensuring their safety through biometric identification technologies in educational institutions.

identifying gaps in learning across subjects and grades, analyzing students' intellectual and physical development, and improving school management effectiveness.

automating the assessment of knowledge and analyzing educational outcomes.

expanding opportunities to learn programming languages and artificial intelligence technologies.

developing game-based and experimental programs to foster children's understanding of and interest in artificial intelligence from an early age.

providing students with essential knowledge of programming languages and artificial intelligence to prepare them for the future.

offering high-quality and interactive services to tourists at cultural sites, including museums.

g) In Digital Government:

implementing biometric identification (Face-ID) technologies to enable remote access to digital government services;

advancing technologies for speech recognition, speech synthesis, and natural language processing (LLM and NLP) ;

developing chatbots for the unified interactive public services portal;

fully automating service delivery to enhance efficiency and quality;

improving planning, forecasting, and decision-making processes in public administration;

increasing the quality of public services while providing user-friendly options for citizens;

developing supercomputers and cloud platforms for working with artificial intelligence and big data.

3-§. Improving Standards and Strengthening International Cooperation

The following measures will be implemented **to align national standards with international ones**:

conducting an inventory of existing national standards, analyzing them, and ensuring their alignment with international standards;

developing new national standards based on international requirements;

organizing training sessions and seminars for individuals involved in the standardization process and forming expert groups to create new national standards

in accordance with international standards;

hosting international forums and conferences to strengthen cooperation;

establishing scientific and technological partnerships to exchange innovative technologies and adapt them to local conditions;

developing platforms and programs to promote national products and services in international markets;

creating favorable conditions to encourage the development of internationally compliant products and services.

To foster international cooperation and strengthen relationships with regional and international partners, the following actions will be undertaken:

establishing scientific and technological partnerships with foreign countries;

implementing joint scientific and practical research projects with foreign countries;

hosting joint seminars and conferences to facilitate knowledge exchange;

localizing advanced artificial intelligence technologies from abroad;

presenting the solutions of local companies and organizations on international platforms and strengthening their relations with foreign partners;

implementing projects in collaboration with international organizations.

4-§. Establishing Technical Infrastructure for Data Processing Based on Artificial Intelligence Technologies

To establish the necessary infrastructure for training, testing, and developing artificial intelligence models, the following steps will be taken:

introducing “cloud services” and expanding the capabilities of existing data centers while creating new ones;

increasing the share of allocated computing resources for artificial intelligence at data processing centers;

inhancing the quantity and quality of digital data required for developing artificial intelligence;

meeting the growing demand for information by citizens, regardless of their geographical location, through automated services;

developing data storage and processing centers based on cloud computing technologies;

designing an online learning platform for citizens interested in developing and utilizing artificial intelligence technologies;

equipping government institutions, economic associations, and higher education institutions with the necessary

technical equipment for practical use of artificial intelligence, thereby establishing relevant infrastructure.

To create comprehensive open data and big data collections, the following actions will be taken:

processing and analyzing big data using artificial intelligence-based solutions;

introducing efficient methods and advanced business analytics technologies for working with big data;

ensuring the continuous operation and enhancement of digital data platforms designed for data placement, collection, and analysis;

increasing the availability of open digital datasets, ensuring their quality, and regularly updating them;

raising the level of openness of digital data held by government institutions and integrating them into the Open Data Portal;

forming specialized datasets for tasks such as voice, video, and communication analysis in the Uzbek language.

5-§. Enhancing Knowledge and Skills of the Population and Developing Human Resources

To enhance public knowledge and skills in using artificial intelligence technologies, the following measures will be implemented:

Promoting the use of artificial intelligence technologies among youth and developing digital skills across all segments of the population;

Developing online courses and expanding remote and online learning technologies;

Organizing events (forums, seminars, conferences) and competitions(hackathons,contests) to discuss new achievements in artificial intelligence applications in the real economy;

Engaging organizations in initiatives focused on the development of general and vocational education;

Increasing the number of activities aimed at fostering students' intellectual and creative abilities;

Raising awareness among employers about the benefits of artificial intelligence to encourage their support in promoting knowledge and skills;

Continuously upgrading the knowledge and skills of public administration employees and those responsible for digitalization in government and economic associations;

Informing the public and organizations about the advantages and safety of using artificial intelligence solutions, as well as available education and retraining programs;

developing specialized training programs on artificial intelligence for government and private sector employees.

To train skilled personnel, improve staff competencies, and involve foreign specialists, the following actions will be taken:

establishing laboratories at universities to study robotics, IoT, and artificial intelligence technologies and providing grants for modern equipment;

creating conditions to teach programming to secondary school students to develop a pool of highly skilled professionals;

organizing free online courses with foreign professors and experts for students specializing in artificial intelligence;

increasing the number of graduates specializing in artificial intelligence;

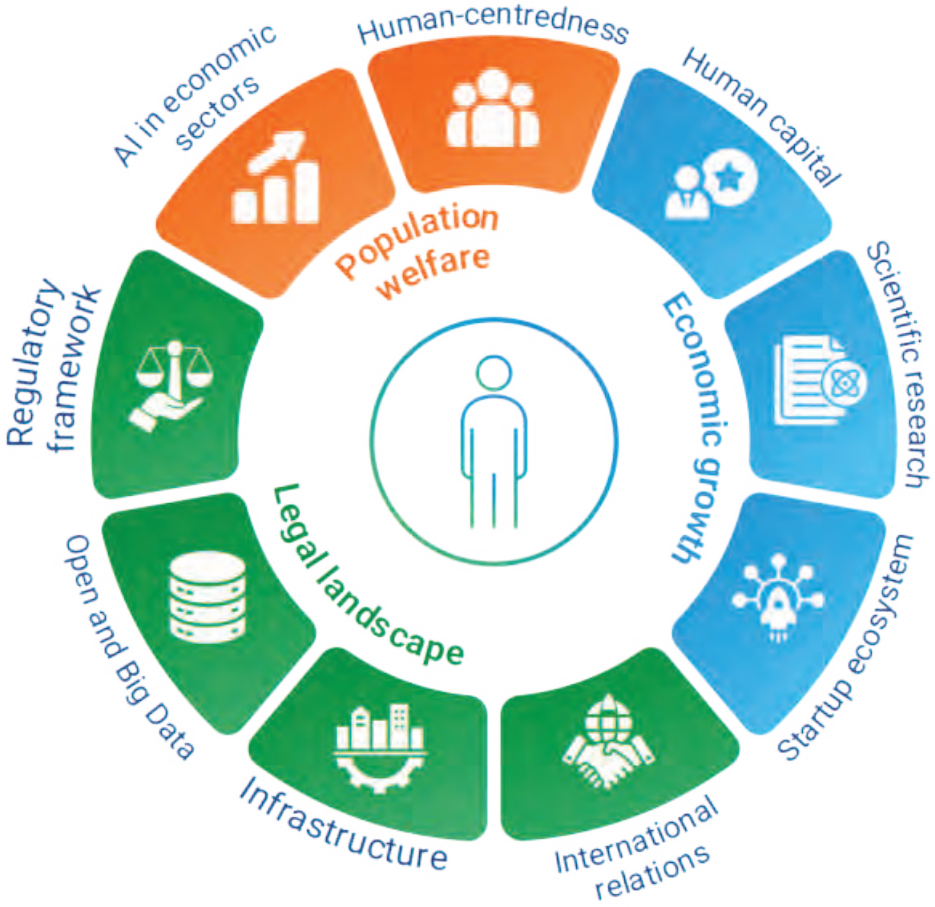
deepening knowledge in mathematics, logic, mental arithmetic, and programming to ensure students reach an intermediate level in artificial intelligence;

supporting talented professionals and promoting their achievements to encourage their development;

developing training programs with major international companies to enhance the skills of personnel in artificial intelligence;

facilitating personnel exchanges and experience-sharing programs, and supporting joint research and projects between scientific institutions and the private sector;

ensuring that joint research and projects address the real needs of society.



Chapter 4: Expected Outcomes of the Strategy's Implementation

The successful implementation of the tasks outlined in the Strategy is expected to yield the following outcomes:

a) Legislative and Regulatory Framework:

establishment of a legal framework that regulates artificial intelligence technologies, including relevant laws, international and local standards, and mechanisms for their implementation;

foundations for ensuring the integrity and security of data in cloud-based services at data processing centers;

formation of institutional governance for artificial intelligence technologies;

development of ethical guidelines for the use of artificial intelligence technologies.

b) Implementation in Social and Economic Sectors:

widespread adoption of artificial intelligence technologies across the social and economic sectors;

increased efficiency in organizations through the automation of workflows, optimizing time and resources;

continuous monitoring of production processes and real-time decision-making through data analysis;

cost reduction through the use of artificial intelligence technologies;

extended lifespan of equipment through predictive monitoring and maintenance;

improved quality control of products and services through data analysis;

enhanced competitiveness through the production of higher-value products and services using new technologies.

c) Standards and International Cooperation:

greater global integration through the alignment of national standards with international ones;

increased interest from foreign investors and companies in investing in the local economy;

simplified access to export markets by enhancing the quality and competitiveness of local products and services;

additional financial resources attracted for innovative projects and startups.

d) Technical Infrastructure Development:

availability of high-speed computing capabilities for artificial intelligence infrastructure;

improved speed and efficiency in data processing;

provision of state-of-the-art equipment for specialized research institutes;

continuous updating and expansion of digital datasets for artificial intelligence algorithms;

safe storage and processing of big data, with robust security measures in place;

reduced workloads through the automation of routine tasks;

development of models and algorithms through the integration of big data;

increased accuracy in forecasting and decision-making processes;

effective deployment of machine learning models and deep learning platforms.

e) Human Resource Development:

training of qualified specialists in artificial intelligence at higher education institutions, with an increase in graduates;

growth in the number of training centers focusing on artificial

intelligence, robotics, and related fields;

expansion of IT companies developing software and services based on artificial intelligence;

increased number of specialists with scientific qualifications in the field;

improved evaluation of researchers' activities using new metrics beyond academic publications;

broader public knowledge and skills in using artificial intelligence technologies;

increased transparency and availability of digital public services powered by artificial intelligence.

Literature:

1. PwC. “Sizing the Prize: What’s the real value of AI for your business and how can you capitalise?” 2024.
2. Boston Consulting Group. “Generative AI for the Public Sector: The Journey to Scale,” 2024.
3. McKinsey. “From bytes to bushels: How gen AI can shape the future of agriculture,” 2024.
4. McKinsey. “Early adoption of generative AI in commercial life sciences,” 2024.
5. https://bostondynamics.com/about/