THE STATE OF THE DIGITAL ECONOMY IN CENTRAL ASIA AND ITS ROLE IN PROMOTING REGIONAL INDUSTRIAL COOPERATION

Urinboev Khabibullo Sadulla ugli

Abstract

Digital transformation in Central Asia is driving economic change with significant growth in e-commerce, digital infrastructure investment and the emergence of technology-based industries. These developments are fostering regional industrial cooperation by increasing connectivity, efficiency and innovation across borders. The article analyzes the importance of several factors in promoting digital innovations and creating a favorable environment for the flourishing of the digital economy and integration into industrial cooperation.

Keywords: Digital economy, digital technologies, digitization, industrial revolution, industrial cooperation, intersectoral integration, Industry 4.0, sustainable development.

Introduction

Currently, the issue of digitization and automation of the economy is in the center of attention of many countries and international organizations. In particular, in the countries of Central Asia, a number of digital technologies have been introduced in recent years. In Central Asia, Kazakhstan and Uzbekistan demonstrate high digital economy indicators. Kazakhstan is among the 30 digitally developed countries in the world.[1] Uzbekistan is also actively developing the digital economy, increasing the general digital literacy of the population and introducing digital solutions to the industry.

Tajikistan, although showing progress, is at a low level of digital development. Kyrgyzstan is working to bridge the digital divide through the Digital CASA project, which aims to provide high-speed internet access and lower prices.

As for the countries of Central Asia, before the pandemic, Kazakhstan was one of the leaders in Central Asia in introducing digital technologies within the framework of the "Digital Kazakhstan" program launched in December 2017. In 2008, the country was one of the first in the region to launch electronic state services.[2] According to the government's plans presented in the "Digital Kazakhstan" program, the country will undergo a complete digital transformation, which will be implemented with the help of 23 different projects. Former prime minister of the republic Bakhitjon Sagintayev informed about this in September 2017.[3] In July 2023, the President of Kazakhstan, Kasim-Jomart Tokayev, mentioned the five main priorities of the country's digital transformation: humanitarianism, creating favorable conditions for the IT sector, large-scale modernization of the IT infrastructure, development of the digital economy and industry, human capital strengthening.

It is noted that Kazakhstan is an attractive area for the development of innovation, digital production and creativity. This is especially important in the context of the current geopolitical

situation and macroeconomic problems. At the same time, digital transformation is one of the factors determining the competitiveness of both individual companies and large regions.

The following key indicators are used to assess the development of the digital economy of the Central Asian countries:

- **E-Government Rating:** The E-Government Development Index helps determine the level of digitization of administrative structures and the provision of online services. The "e-Government" rating usually evaluates various aspects of the use of information and communication technologies in government bodies, such as access to information and services via the Internet, the quality and accessibility of government websites and portals, the level of e-democracy and the level of citizenship.

- **The level of digital literacy of the population:** People with high digital literacy have the skills to work with various digital tools and technologies, which will enable them to actively participate in the digital economy. A high level of digital literacy creates a favorable environment for the development of digital innovation, entrepreneurship and start-ups, which will serve the growth of the digital economy and the creation of new jobs. Providing access to digital technologies for the entire population and developing their digital literacy will help reduce the digital divide and involve all segments of the population in the digital economy.

- **Share of households connected to the Internet:** High-speed Internet access is one of the foundations of the development of the digital economy. The increase in the number of households connected to the Internet is expanding access to digital resources and services such as online education, e-commerce, online banking and e-government.

- **Share of IT investment in GDP:** The share of IT investment in GDP reflects how much businesses and organizations in the region are investing in digital technologies and infrastructure. A high level of investment usually indicates that more attention is being paid to digitization and modernization in various sectors of the economy. IT investments are often associated with innovation and technological advances, which are key drivers of economic growth. Areas with high levels of IT investment are likely to experience high rates of innovation, leading to increased productivity and economic development.

- **Number and scale of IT companies operating in the country:** The presence of large IT companies increases the country's global competitiveness by demonstrating its capabilities in the field of technology and innovation. Leading IT companies can compete in the international arena, attract foreign investments and facilitate trade relations with other countries. The presence of a strong IT sector indicates the development of the digital economy. IT companies employ a wide range of professionals, including software developers, engineers, project managers, and sales representatives. The scale of IT companies determines the scale of job creation within the digital economy, which contributes to overall employment levels and economic stability.

- **Digital goods and services market size:** A large digital goods and services market encourages innovation and entrepreneurship. This creates a fertile ground for startups and small businesses to develop and commercialize new digital products, services and business models,

leading to technological advancement and market disruption. A large digital goods and services market offers consumers a wide range of choices. It enhances the well-being and satisfaction and empowers consumers by providing access to innovative products, services and content.

At a time when the digital economy is rapidly entering some areas, its implementation in other areas is having some difficulties. Although the digitization policies of the Central Asian countries are different, the main areas that have been prioritized and digitized faster and more efficiently than other areas are:

1. Manufacturing and Services: The digital economy has facilitated the integration of automation and robotics into manufacturing processes, increasing productivity, reducing labor costs, and improving product quality. Automated systems can perform tasks with precision and consistency, leading to more efficient production lines.

2. Learning Opportunities: The digital economy has made learning more efficient by eliminating geographic barriers and providing online learning opportunities to individuals regardless of location. Through e-learning platforms, online courses and digital learning resources, people can access education and its opportunities from anywhere with an internet connection. Digital resources, such as interactive textbooks, online courses and materials, provide people with the benefits of additional learning without being separated from their primary professional and educational activities.

3. Telecommunications and the Internet: Expanding regional and local communications infrastructure and creating conditions for digital transformation are key to developing a digital economy in Central Asia. The digital economy has helped expand telecommunications and internet services to previously unserved or remote areas, improving connectivity and bridging the digital divide.

4. Health: The digital economy has the potential to improve health care access and equity by reducing barriers to care, expanding telemedicine services, and empowering patients to be more actively involved in health care decisions. Digital technologies can bridge gaps in health care delivery, address disparities in health care access, and ensure health equity for all people, regardless of geographic location or socioeconomic status.

The digital economy is playing an increasingly important role in regional industrial cooperation and economic development across Central Asia. Enhanced connectivity through digital platforms and e-commerce solutions has opened up new markets and simplified cross-border trade in the region. Effective digital infrastructure, including high-speed internet and electronic payment systems, are reducing trade barriers and enabling small-scale industries in the region to expand their customer base and gain a foothold in the market.

Digital transformation and automation are tools that helps to reduce the human factor, reduce the time and financial costs of activities, and in the near future, this direction is expected to serve as an important factor in determining the level of development of the country's economy, in particular, its industry. Encouraging the implementation of Industry 4.0 principles, including automation, robotics, big data analytics, and cloud computing, to optimize production processes and improve supply chain efficiency is highly profitable.

Table 1. The main components of Industry 4.0 integration.[4]

Concepts	Definition
Big Data analytics and artificial intelligence	Using large-scale data analytics and AI algorithms to optimize processes, predict outcomes, and make data-driven decisions.
Vertical and horizontal integration	Vertical integration involves linking different stages of production and supply chains, while horizontal integration links processes between different functional units or departments of an organization to ensure consistency and efficiency.
Cloud technologies	Using cloud platforms and services for data storage, management and processing.
Augmented Reality (AR)	Integrate digital data and virtual elements into real-world environments to enhance user experience, improve training, service processes, and support remote collaboration.
Internet of Things (IoT) in Industry	Connecting physical devices, machines and sensors via the Internet for data exchange and remote control of industrial processes.
Autonomous robots	Introducing robots and robot systems capable of autonomously performing tasks with minimal human intervention, increasing efficiency, safety and accuracy in production and logistics.
Cyber security	Implement robust cyber security measures to protect related systems, data and networks from cyber threats while ensuring the integrity and confidentiality of critical data.
3D printing technologies	This technology enables rapid prototyping, customization and decentralized manufacturing of complex components and products. Central Asian countries can use 3D printing technologies based on cooperation to reduce production time, reduce material waste and facilitate on-demand production.
Simulation	Use digital simulation and virtual models to test scenarios and simulate production environments, reduce time to market and improve operational efficiency.

Industry 4.0 is a high level of integration of smart digital technologies into production and industrial processes, which includes industrial Internet of Things (IoT) networks, artificial intelligence (AI), Big Data, consists of a range of technologies including robotics and automation. Industry 4.0 enables the creation of smart production and smart factories. It aims to increase productivity, efficiency and flexibility while enabling smarter decision-making and adaptation in manufacturing and supply chain operations. It is based on 9 modern technologies.

In addition to facilitating trade, the digital economy is driving innovation and entrepreneurship in Central Asia. Lower barriers to entry and increased access to digital resources are enabling startups and innovators to succeed. Incubators, accelerators and innovation centers develop technological entrepreneurship and support the development of new products, services and business models. This will help diversify the economy and create new jobs.Central Asian governments are investing

in digital skills development to create a skilled workforce capable of digital transformation. Initiatives promoting STEM education, vocational training and education in digital technologies are improving workforce productivity. A digitally skilled workforce enables enterprises to effectively adopt advanced technologies and participate in the digital economy.

In addition, the digital economy is driving the modernization of traditional industries such as agriculture, manufacturing and mining in Central Asia. Such technologies are increasing efficiency, optimizing the use of resources and improving product quality. Digitization and automation will revive the main sectors for the economy of the Central Asian countries listed above, making them more competitive and stable.

Central Asian governments are using digital technologies to provide public services, manage and develop policies. E-government initiatives simplify administrative processes, increase transparency, and increase citizen engagement. Smart city projects provide digital solutions for transport, energy management and public services that support sustainable urban development and create opportunities to integrate them into one system for high efficiency.

The digital economy will develop cross-border cooperation and regional integration between the countries of Central Asia. Cooperation on digital infrastructure projects, harmonization of the regulatory framework and information exchange will strengthen digital integration. It facilitates joint research initiatives, collaborative innovation projects and strengthens regional partnerships.

Central Asia's growing digital economy is attracting foreign investment and cooperation from global technology companies, investors and international organizations. Partnerships with international stakeholders provide access to expertise, financing and market opportunities and increase market share.

Below is the change of the share of the digital economy and industrial production in Uzbekistan over the years:

The share of Digital Economy in Uzbekistan (%)
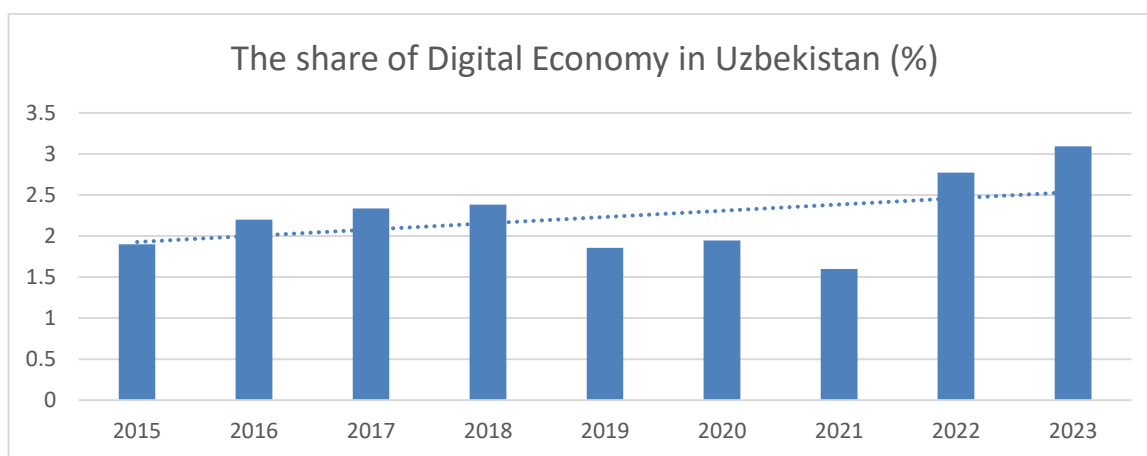
Graph 1

The share of the digital economy in GDP in Uzbekistan in 2015-2023.[5]

It should also be noted that the digital economy contributes to sustainable development and inclusive growth in Central Asia. Today, digital solutions increase resource efficiency, environmental protection and climate resilience in Central Asia, especially in Uzbekistan. Access to digital technologies empowers marginalized communities, women entrepreneurs and rural populations, reduces the digital divide and promotes social inclusion.
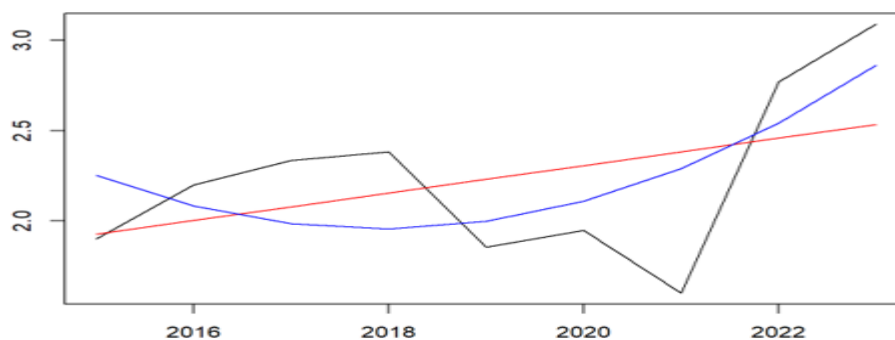
Although the share of the digital economy in Uzbekistan has been changing over the years, the overall trajectory indicates an increasing focus on digital transformation and technological development. The significant growth observed in 2022 in particular highlights the growing importance of digital technologies in economic development and increasing competitiveness.
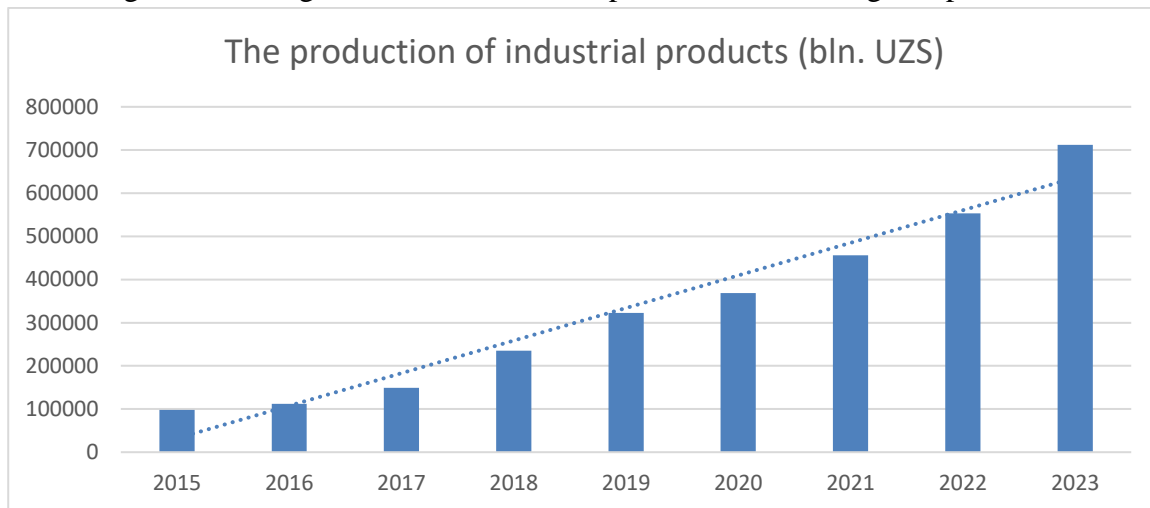
Graph 2

The production of industrial products in Uzbekistan from 2015 to 2023.[6]

Through the econometric analysis of the above indicators, we can roughly calculate how these two areas are related and how these indicators will change in the coming years:

Graph 3

---- - Real value   ---- - Linear model   ---- - Parabolic model
Estimating the share of the digital economy using linear and parabolic models

By analyzing the time series using the RStudio program, the following equations and a line graph were created.

$$X_{t1} = 1.85054 + 0.07608 \cdot t$$
$$X_{t2} = 2.49234 - 0.27399 \cdot t + 0.03501 \cdot t^2$$

In this case, since the evaluation efficiency of the parabolic model is higher than that of the linear model, we made the prediction of the size of the digital economy for the coming years based on

this model. According to him, the results of predictions for the next 3 years with 95% accuracy are as follows:

Table 2. Prediction of the share of the digital economy for the next 3 years

Years	Value (%)	Lower limit (%)	Upper Limit (%)
2024	3.253152	1.582188	4.924117
2025	3.714314	1.522865	5.905763
2026	4.245490	1.371778	7.119201

In this way, when we forecast changes in the volume of industrial production, it became clear that the linear model better describes the real situation. The equation was able to find the real state change with 99.3% accuracy. One of its advantages is that the model is simpler.
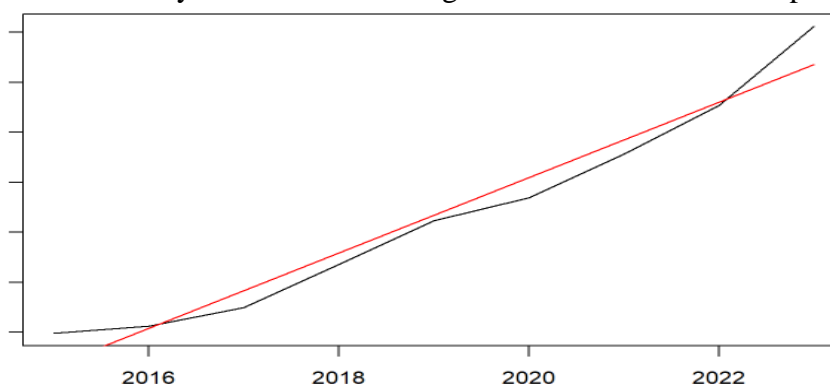
Graph 4

---- - Real value   ---- - Linear model

Estimating the volume of industrial production in Uzbekistan using linear model

The equation of the linear model is:

$$X_t = -43402 + 75481 \cdot t$$

Based on this equation, we make a forecast for the next 3 years and get the following results:

Table 3. Industry volume forecast for the next 3-year period (bln. UZS)

Years	Estimated value	Lower limit	Upper limit
2024	711405.9	578590.6	844221.1
2025	786886.7	646328.3	927445.1
2026	862367.5	713175.3	1011559.8

At the final stage, we calculate the degree of correlation between the share of the digital economy in GDP and the volume of industrial production using the cor(x, y) command. According to him, there is a moderate positive correlation between these two variables, and the value of the correlation coefficient is equal to 0.5143478.

In short, the digital economy is reshaping regional industrial cooperation in Central Asia by fostering innovation, connectivity and economic diversification. Embracing digital transformation offers important opportunities for cooperation, investment and sustainable development, reduces the risk of dependence on external cooperation and enhances the position of Central Asia as a dynamic player in the global digital landscape, especially in the industrial sector.

References:

1. Information of the Statistics Committee under the President of the Republic of Uzbekistan https://www.stat.uz/uz/rasmiy-statistika/industry-2

2. Smartgopro website - Цифровые технологии и промышленное развитие в Центральной Азии: опыт Казахстана и Узбекистана (Digital technology and industrial development in Central Asia: the case of Kazakhstan and Uzbekistan) https://smartgopro.com/novosti2/Asian_digital_technology/

3. Muratbekova A. - Цифровая центральная Азия: текущее положение. (Digital Central Asia: current situation.) Eurasian Research Institute of Kazakhstan. Article. 2020. https://www.eurasian-research.org/publication/digital-central-asia-state-of-the-art/?lang=ru

4. Shadmankulova D.A - Iqtisodiyotning tarmoq va sohalarida raqamlashtirish jarayonining muammolari. (Problems of digitization process in branches and sectors of the economy.) Iqtisodiyot va ta'lim (Economy and education) 5/22. Article. 2022. https://doi.org/10.55439/ECED/vol23_iss5/a9

5. Tadviser analytical agency. Цифровой Казахстан (Digital Kazakhstan). Article. 2023. https://www.tadviser.ru/index.php/Статья:Цифровой_Казахстан

6. SAP company website information. https://www.sap.com/uk/products/scm/industry-4-0.html.