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The issue of developing Digital economy of Mongolia

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Abstract: In the first part of the article, the author compares various definitions of digital economy and spells out his own version of its essence and content. He defines digital economy as one of the models of new economy based on digital technology system. The author believes that digital technology system consists of various technologies, such as Big Data, high-speed wireless Internet, blockchain, cloud computing, Internet of things, artificial intelligence, 3D printing, virtual reality and others.

The second part examines the current state of development of digital economy in various sectors of the economy and notes that the development of digital economy is led by the telecommunications industry, followed by the financial sector. The author emphasizes the need to develop a specific state policy to support the development of digital economy and suggests some ways to further expand it.

Keywords: *digital economy, digital technology, new economy;*

INTRODUCTION

As a result of the fourth stage of industrial revolution, digital technology is developing at an accelerated pace and its new types are emerging and improving. The peculiarity of the current technological revolution is that its results are quickly introduced into practice and immediately yield public benefit. Modern achievements of digital technology is being especially intensively applied in the economy in order to enhance its productivity and efficiency.

In Mongolia, as in other countries, digital technologies are also being introduced into various socio-economic sectors. Our task is to study in which industries these technologies are being introduced, and how this process affects the growth of the country's gross domestic product. In the article, we will also consider ways to accelerate the development of digital technology and its implementation in various sectors of the economy.

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The essence and content of digital economy

To understand the current process of development of modern economy, it is necessary, first of all, to define what is digital economy. There are different opinions about this concept.

For example, professors of the University of Manchester R. Bucht and R. Hicks maintain that “Digital economy is an economy based on digital computing technology and is a business based on digital products and services”[1].

The World Bank defines the digital economy as a "new way of the economy based on knowledge and digital technology, and within its framework, society, business and the state acquire a new digital ability and opportunity"[2]. The Australian Government believes that “The worldwide network of economic and social activities, which is carried out with the help of the Internet and a driving sensor, constitutes the digital economy”[3].

Scientists from the National Research University of the Moscow Economic Institute believe that “Digital economy is the activity of creating, disseminating and using digital technology and related products and services”[4]. We can cite many more varying definitions regarding digital economy. However, none of the above definitions fully convey the essence and content of digital economy. In our opinion, digital economy is one of the models of new economy based on the digital technology system with an array which consists of many multiple types and classes [5]. In order to understand digital economy, one needs to know what digital technology system is (Figure 1).

As we can see from Figure 1, digital technology system consists of 10 different

technologies that are closely interconnected and interdependent on each other. In this system, the Big Data technology plays a decisive role, which is the most complex system of collecting, processing, systematizing, storing and finding a huge amount of systematized and non-systematized information. Thanks to this technology, we can quickly find any information that we need, which allows us to make our work more efficient and increase its productivity. High-speed wireless Internet is becoming the main channel for instant transmission of very many different and countless information over all distances. With the help of this technology, the Internet of things has arisen and is developing, which allows us to remotely control various types of industrial and social activities. With the improvement of the Internet, blockchain appeared, which transmits information without any intermediaries. The Internet not only transmits information, it also provides numerous services to consumers through cloud computing. For example, we can store our digital photo album in the Internet space.

Artificial intelligence is replacing many types of human mental activities and is increasingly being introduced into various areas of public life. 3D printing carries out the production of some products starting from drafting and design.

In this way, digital technology plays a major role in shaping the digital economy and transforming the old or conventional economy into a new economy. The new economy that emerged and is developing at the turn of the twentieth and twenty first centuries consists of such models as knowledge economy, digital economy, circular economy, sharing economy, and green economy (Figure 2).

In our opinion, knowledge economy is the key backbone of the new economy,

while digital economy is its core, or the main driving force. And green economy is the centralized expression of the new economy. In other words, humanity is

ultimately striving for a green economy that will save it and provide inexhaustible sources of life.

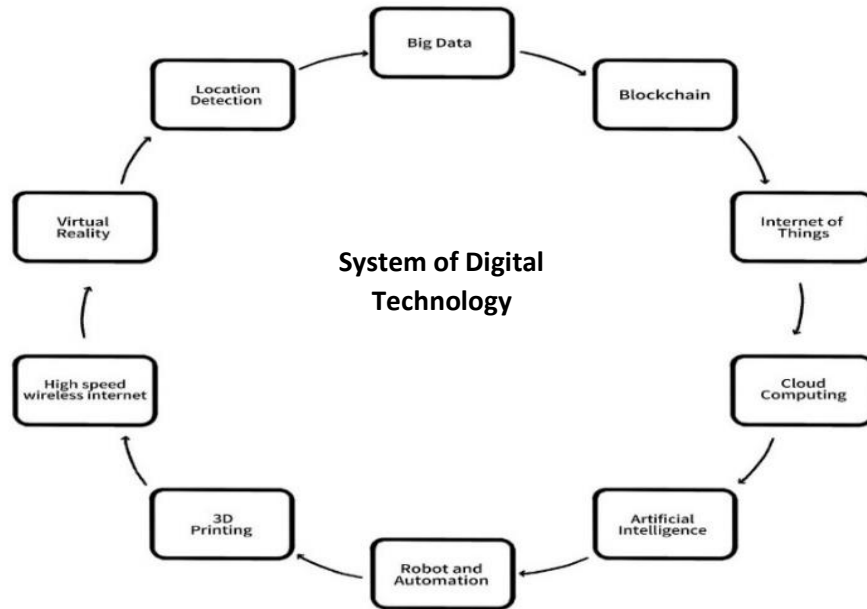


Figure 1. Digital technology system

However, it is impossible to form a new economy without the accelerated development of digital technology, and, accordingly, the digital economy.

Therefore, leading countries of the world are investing heavily in the development of both knowledge and digital economies.

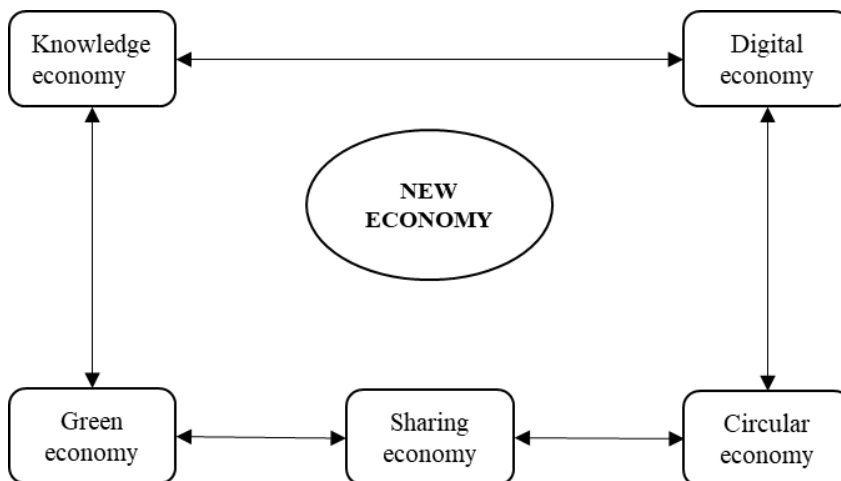


Figure 2. The structure of new economy

Digital technology is widely used not only in the financial sector, but also in the real sector of the economy. For example, now the process of robotization and automation of production is accelerating more and more, and even the process of managing, controlling and regulating production is carried out with the help of artificial intelligence. And so, according to the World Economic Forum, in 2018, 29% of the total working time of production was carried out by robots, and by the year 2025 this figure will reach 50% [6]. Japan leads the world in the production and use of robots. Automation of production processes through the use of robots reduces labor costs and increases competitiveness. For example, if the cost of one hour of labor is 40 Euros in Germany and 10 Euros in China, then the cost of one hour of work by an industrial robot is 5-8 Euros only. Moreover, the quality and speed of the robot's work is higher than that of a human worker.

In Russia, digital technology is being introduced into metallurgy, aviation industry, automotive industry and other major economic sectors. For example, Russian Helicopters Joint Stock Company is introducing a set of digital technologies into design and technological training. During the implementation of the Ka-226T pilot project, the creation of a light helicopter was carried out entirely in virtual space. The implementation of the project showed that digital technologies can not only reduce development costs, but also reduce related risks. In the future, this Russian company plans to create a well-functioning automated mass production system of products based on the virtual design of new models [7].

Digital technology is also being introduced into agricultural production. In the United States, sowing seeds, spraying fertilizers and crop protection substances are now carried out by digitally controlled

flying drones. As well as soil moisture and fertility, the spread of pests and weeds, soil temperature and precipitation conditions are measured using the Internet of Things and transmitted to the production control center.

Artificial intelligence (AI) is used in the management of complex production processes. AI controls the production process and detects possible damage, defects and ensures the timely supply of the necessary materials and parts for the continuous operation of the automatic production line, etc.

3D printing has a great future potential for improving and even replacing entire enterprises for the production of various products, as well as carrying out construction work. For example, in the Chinese city of Shanghai, a 5-storey house was built using 3D printing. It has a programmed digital control and therefore, produces products without any defects.

Digital technology is being used for developing circular economy, which is an integral part of the green economy. Circular economy is aimed firstly at reducing waste and pollution, secondly, at the reuse and recycling of products and materials, and thirdly at the restoration of natural resources. The combination of such types of digital technology such as Big Data, the Internet of Things, artificial intelligence, and blockchain, ensures the successful functioning and development of circular economy.

Today, a circular model is being implemented in many sectors of the economy. For example, in the automotive industry, old and worn-out car parts, such as electric battery, turbo engine, speed box and others are recycled, refurbished and reused for new cars. As a result, the amount of waste is being significantly reduced, which serves to protect the nature and the

environment. And so, technological progress, and especially advances in digital technology, eventually leads to a green economy, which is based on safe and renewable energy sources and waste-free production and the conservation and protection of natural resources.

Issues of digital economy development in Mongolia

In Mongolia, the telecommunications industry is leading in the development and application of digital technology. Especially in recent years, the number of people using high-speed Internet has been growing rapidly thanks in part to the development of the relevant infrastructure (Table 1).

Table 1. Main indicators of the telecommunications industry [8]

Indicators	2017	2018	2019	2020	2021
Active users of mobile phones, million people	3.8	4.2	4.4	4.3	4.6
Regular Internet users, million people	3.2	3.7	3.9	3.9	4.1
Cable television users million people	0.86	0.89	0.92	0.92	0.95

Table 1 shows that the number of mobile phone users has been constantly growing every year and has today reached 4.6 million. There are 135 mobile phones per 100 people. According to this indicator, Mongolia surpasses the global average. Mongolia has a territory of 1.5 million square kilometers and 21 aimags (provinces) and 330 soums (administrative districts). The fiber optic cable network has reached 49.9 thousand km and connects all these administrative units.

Today in Mongolia, mobile communications are available throughout the territory of the country and the Internet is available in all administrative units. 94% of all Internet users are consumers of broadband channels.

The development of the telecommunications industry based on digital technology opens up a wide opportunity for cooperation between Mongolia and the countries of our region. So, a Chinese scientist gives the following comparison (Table 2).

Table 2. Main indicators of Internet use in countries of Northeast Asia, 2021[9]

Countries	Number of mobile phone users per 100 people	Number of active mobile-broadband and fixed-broadband subscriptions per 100 inhabitants	Percentage of Internet users in total population
China	121.5	37.6 / 104.8	73.1
Japan	160.9	36.1 / 223.6	90.2
Republic of Korea	140.6	44.3 / 117.2	97.6
Russia	169.0	23.7 / 107.7	88.2
Mongolia	140.0	11.3 / 116.2	84.3

Table 2 shows that Mongolia has come close to the leading countries in the region in terms of the main indicators of

Internet and mobile communications use. What is now important is to widely use these

achievements to expand cooperation in the field of digital economy in the region.

In accordance with the five-year "Digital Nation" program, adopted in 2022,

the level of development of the telecommunications industry will be increased significantly by 2027 (Table 3).

Table 3. Strategic objectives for the development of the telecommunications industry [10]

Indicators	Unit of measurement	Baseline level	Target level
Transit of information through high-speed network connecting Asia and Europe	Gbps	780	Growth by 5 times
Level of family access to broadband Internet percent	percent	33	70
Level of access of the population to the use of the Internet	percent	90	95
The level of use of 5G technology by the population	percent	0 /as of 2022/	70

Table 3 shows that the speed of transmission of information will increase by 5 times in 5 years and the level of access of families to broadband Internet will more than double. So far, 5G technology has not yet been introduced in Mongolia, but within the next 5 years, 70% of the population will use this high-speed technology.

In 2020, the E-Mongolia digital public service system was created, through which citizens can receive about 600 different information and services from 56 government agencies. This service has made it much easier to serve the population and saves a lot of time for the people and increases the productivity of public services.

The banking sector of Mongolia is successfully implementing digital transit. As of 2023, the Mongolian National Payment System had largely switched to digital technology. Over the past 5 years, a modern automatic clearing center was created and the unified system of payment cards has been updated. A new technology has been introduced to ensure security and support for consumers ₮ card /tugrik card/, which is a national brand. There is a unified exchange and settlement platform for the money market and the foreign currency market. Today, money transfers between the central

bank and commercial banks, and between commercial banks themselves are carried out using digital technology in real time. Mongolian banks are also connected to the international system for the exchange of payments SWIFT and exchange messages.

93% of Mongolian citizens have bank accounts and many of them use a bank card and mobile communications for various kinds of payment and financial settlement. A Mongolbank study shows that about 90% of all payments and settlements are carried out by bank transfer [11].

The development strategy of the Mongolian payment system in 2022-2026 states that by 2026 the number of non-cash transactions per person will increase by 30% and the number of POS (point of sale terminal) terminals in rural areas will grow by 40%. Under this strategy, an international standard for digital risk management will also be introduced [12]. New fintech companies are emerging in the banking and finance sectors. The introduction of an open banking service is being considered.

As of 2021, the mining industry accounted for 25.8% of the gross domestic product and the products of this industry account for 81.5% of Mongolia's total

exports. Therefore, the introduction of digital technology in this industry is of fundamental importance for increasing the competitiveness of Mongolia in the international market. Mining and processing plant "Erdenet is a leader in the development of digital technology. It operates a unified automated control system, which consists of such subsystems as 'ASU Finance', 'ASU BTiPS', 'ASUEnergo', 'Summary' and others. The plant has a sector for automation and telecommunication technology, which is responsible for the introduction of digital technology in the production process and management. A new automated control system "PITRAM" has been recently put into operation, which monitors the condition and performance of mining technology, and thereby prevents damage and reduces the downtime of various mechanisms and it also monitors the extraction of copper ores [13].

An example of introducing high technology into the mining industry is the Oyutolgoi mining company, which extracts copper ores from more than 1.3 km of depth and uses the most modern digital control of production process. It was put into operation in March 2023 and the total investment for its construction was \$7 billion. 66% of the shares of this enterprise are owned by the Rio Tinto group and the remaining 34% are owned by the Mongolian Government.

In addition to mineral products, light industry has a great export potential, especially goat down processing. In Mongolia, as of the end of 2022, there were 27.6 million goats, roughly 10 thousand tons of cashmere is prepared every year, which constitutes 40% of the total world production. High-quality products are made from cashmere, the demand for which is growing both domestically and internationally.

Mongolia currently has 15 enterprises that carry out deep processing of cashmere, and almost all of them are introducing digitally controlled automated lines. They import state-of-the-art machinery and technology from leading industrialized countries, such as Japan, Germany and Italy. About 90% of these enterprises have modern computer-controlled technologies [14].

So, for example, the Naran company has introduced 3D printing into production, which produces finished cashmere products without the involvement of human labor. The design and style of products are prepared by computer programming, after which they are transferred to an automated three-dimensional production line. Products produced in this way are of high quality and fully meet international standards.

The Government of Mongolia plans to introduce digital control and registration technology in the transport and roads industry. Work is underway to create a unified information center for the national transport system and a unified information system for the transport and roads industry. Alongside this, more than 20 different services related to this industry have been digitized. For example, booking tickets for various types of transport, orders for the transportation of goods, etc. are already on-line.

Nowadays, the issue of using digital technology in the livestock breeding industry, traditional for Mongolia, is being actively discussed. In recent years, the population of the five basic types livestock, including cattle, horses, camels, sheep and goats, has increased dramatically. As of the end of 2022, the number of livestock population had reached 71.1 million, which compared to 1990 is 2.7 times more. In this connection, the increase in the livestock

population is compounding the problem of pasture overload, which further complicates the issue of export of meat and meat products. In order to comply with export requirements, it has become necessary to implement a livestock tracking system so that the origin of livestock products and raw materials is known. This brought forth the challenge of providing 5.5 million heads of cattle with electronic earrings, the automatic reading of which indicated the necessary data about a particular livestock or its products. Of course, this requires heavy financial investment, which is one of the many hindrances to this important work.

However, it should be noted here that new technology is being successfully introduced into intensive production. For example, the poultry farm company "Tumen Shuvuut" ("Ten thousand birds"), which is located near Ulaanbaatar, breeds more than 30% of all the chickens of the country and supplies the population of the capital with fresh eggs. This poultry farm is equipped with digitally controlled automated technology and boasts of a modern laboratory, which guarantees the farm's high productivity and profitability.

There are many similar examples of how digital technology is being rapidly and successfully introduced into various sectors of the Mongolian economy. However unfortunately, we cannot yet determine the share of the digital economy in Mongolia's GDP. There are no such data in the statistical compilation of Mongolia. In our opinion, the reason for this is that the transition to a digital economy is at an early stage and digital technology does not cover all enterprises, in a particular sector of the economy. Today, old and new technologies are functioning simultaneously in Mongolia. Apparently it will take some time before a transition from the old technology to the new one will be accomplished.

In order to make this transition faster, we suggest that the following measures can and should be taken. First, develop a specific public policy to support the development of the digital economy. The five-year Digital Nation program was approved by the Ministry of Digital Development and Telecommunications in 2022. The program, however, is not extensive and it does not sufficiently indicate the policy and objectives of the development of the digital economy. Therefore, a special program for the development of digital economy should be developed and adopted by the Parliament. In this connection, it can be mentioned that the establishment of a new Ministry of Digital Development and Telecommunications in 2022 was an important step towards the development of digital technology in the country. The next step in this direction should be the adoption of a state program for the development of digital economy, clearly and comprehensively spelling out the long-term and medium-term goals and objectives of promoting digital economy.

Secondly, it is extremely important to update the curricula of universities and colleges, so that future specialists receive modern knowledge about digital technology and master the skills of implementing this technology into practice. In addition, young people who desire to specialize in digital technology and digital economy, should be given government scholarships to foreign prestigious foreign educational institutions.

Thirdly, it's important to further streamline the existing investment laws and create favorable conditions for attracting foreign investment and advanced technology. A new draft investment law has now been submitted to the Mongolian Parliament. We hope that it includes the necessary incentives for the expansion of modern technology.

It is absolutely necessary to speed up work on the creation of a light industry park near the capital city, so that enterprises processing raw materials of livestock origin can move there and acquire favorable conditions for further expansion and development of their industry. Currently, all raw material processing enterprises are located in the city of Ulaanbaatar and cannot expand and upgrade production due to limited space and lack of necessary infrastructure. It would be a good idea if the areas in the park were allocated mainly for joint companies with advanced technology and focus is given to supporting the green economy.

Fourth, it is important to steadily pursue a policy of transition from the initial stage of processing mineral raw materials to its deep processing and manufacturing of final products in the mining industry. The technology of deep processing of raw materials using automated line, robot technology and digital control is highly developed today. The Erdenet plant, which has been producing copper concentrates by enriching copper ores over the last 45 years since its establishment, now it plans to start producing cathode copper, i.e. make a move towards the manufacture of final product. If this important plan is implemented, the share of the digital economy will increase significantly.

Fifth, in Mongolia it is important, on the basis of urgency, to develop a circular economy based on the use of digital technology. It must be stressed here that the beginning of its development has already been made thanks to an agreement between Mongolia and the United States on increasing water sources for the residents of the capital city and deep purification of used water. As a result of the completion of this \$350 million project, the Ulaanbaatar Thermal Power Plants will use treated water for its process needs.

Finally, all necessary measures must be taken to strengthen cyber security.

CONCLUSIONS

Digital economy is one of the models of new economy based on the digital technology system, which consists of many types, such as Big data, high-speed wireless Internet, Internet of things, blockchain, cloud computing, artificial intelligence, 3D printing, virtual reality and others.

Despite some achievements, the transition of the Mongolian economy to digital technology is at an early stage and digital technology does not cover all enterprises in a particular sector of the economy. Today, old and new technologies are functioning side-by-side in Mongolia. Apparently it will take some time before transition from the old technology to the new one would be accomplished.

In order to speed up this transition, it is necessary first of all to develop specific public policies to support the development of digital economy in Mongolia.

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