Development of Digital Economy: Current Situation and Future Prospects for Azerbaijan

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***Abstract*— This study examines the digital economy and its differences from the traditional economy, researches the strategic course that develops digitalization in world practice, and identifies the development and future prospects of the digital economy in Azerbaijan.**

Keywords— digital economy, big data, artificial intelligence, digital strategy

I. INTRODUCTION

In a rapidly developing world, digitalization is already at the forefront as a criterion measuring the pace of development and modernization. We can see how our lives and all spheres surrounding us are integrating with technological innovations, in other words, the partial or complete digitalization. Digitalization is also causing great changes in the economy. Thus, "digital economy", used as a contemporary term, is a new form of economy based on digital knowledge and technological innovation. This form of economy provides high-level information and communication technology (ICT) infrastructure and their mobilization for the benefit of users. Covering civil society, government, and business, this area is forming new digital knowledge and skills.

II. TECHNOLOGIES THAT FORM THE DIGITAL ECONOMY

A. Selecting a Template (Heading 2)

The following are the main technological trends that form the digital economy.

- **Big data** is a real-time e-technology that collects, processes, stores, presents, retrieves, transmits data and performs other data operations. Different procedures also have algorithmic and workflow information. In short, the inception of digitalization is the emergence of big data.

- **Artificial intelligence** is the second most widespread technological trend and the builder of many other technological innovations. It also acts as a base technology.

- **Neurotechnologies** are cyber-physical systems that affect or control the functions of the nervous system of a biological object, fully or partially, through artificial intelligence.

- **Blockchain technologies** (distributed registry technology) are algorithms and protocols consisting of blocks of information that are linked together in a chain and cannot be changed later.

- **Quantum technologies** are calculating systems working on quantum-effects-based new principles. These technologies allow changing the transmission and processing of data radically.

- **Additive technologies** builds 3-dimensional models of objects based on digital twins. It also includes highly complex geometric figures and profiles. 3D printers are the most vivid example of this technology.

- **Supercomputer technology** allows faster and precise calculations based on the processing of data on parallel and distributed principles.

- **New production technologies** mean digitalization of production processes. They enable the production of better quality products at a lower cost by ensuring more efficient use of resources, development of individual approaches, and design

- **Computer engineering** performs digital modeling of all objects and processes that surround people throughout their life.

- **Industrial Internet** is a network that provides internal circulation of information covering the manufacturing sector, as well as communication with external databases without the human interference.

- **Robotics components** provide the development of systems with 3 or more criteria of mobility (walking,

talking, hearing, etc.) through sensors and artificial intelligence. These systems are able to perceive the environment, adapt to it and control their behavior.

- **Sensorics** are technologies that create devices collecting and transmitting information about the environment through data transmission networks. These technologies are applied in the production of all sensory items (phones and tablets, computers, home appliances, devices, etc.)**.**

- **Wireless network technologies** provide transmission of through a standardized radio interface without the need for a cable connection. This includes the well-known Wi-Fi, Bluetooth, etc.

- **5G** is the 5th generation of wireless communication technology with speed much higher than others (provided that it is not less than 10Gbps). At the same time, the waiting time during data processing is also very short (provided it does not exceed 1 millisecond).

- **Virtual reality technology** is a technology that provides computer modeling of 3D images and environments. Application of these technologies let connect people to virtual reality through sensors. This type of technology is used in various games, psychological research, treatments, teaching methods, and simulators.

- **Augmented reality technology** makes the real world more interactive through visual effects. It is made possible by adding graphic design or sound effects to data or objects.

III. How does digital economy differ from traditional economy, and what are its advantages?

A) The digital economy increases efficiency

By introduction of new technological solutions, the digital economy is able to make all economic processes faster, more accurate, and efficient. Digitalization saves time, manpower and wages, which is considered one of its advantages. Thus, artificial intelligence and other opportunities created by technology allows perform more simultaneous work and attract less workforce. Consequently, increased productivity and reduced costs result in more productive activity.

Another indicator of the digital economy is the emergence of hyper-communication between different industries, sectors and individuals. These connections are made possible by the Internet, mobile technologies, and the Internet of Things (IoT).

The development of the economy, which is called a big organism, entails the development of its various sectors as interconnected ecosystems. In its turn, the strong communication created by the digital economy, strengthens the interaction between individuals in the ecosystem and ensures more efficient operation.

B) Ensures the access to new markets

Digitalization leads to the elimination of geographical barriers, access to new markets, and new partnerships. Unlike traditional economies, digitalization makes digital integration of markets possible. Various platforms are used for the exchange of information as well as transaction of documents and payments are transacted through various platforms. This makes a particularly positive contribution to international trade. Thus, import-export procedures are carried out more efficiently. In its turn, the expansion of markets and the increase in the range of products serve as a positive factor for both producers and consumers. Thus, by gaining access to new markets, producers can sell more products. Buyers can expand their options and take advantage of more affordable offers. In other words, a market with a productive and competitive environment is being formed. A competitive economy is known for its absolute tendency to development and improve. These interrelated procedures trigger economic development.

3.3. Digitalization causes economic development

We should also mention the positive effects of digitalization on economic development. The world practice demonstrates that the growth rate of the digital economy is twice as high as the traditional economy. At the same time, this pace is expected to continue with increasing dynamics. Digitalization has both direct and indirect effects on economic development. An example of a direct effect is the investment multiplier. According to international researches, investments are higher in countries with high digitalization. Savings in transaction costs also increase macro-level GDP. Certainly, the increase in education and work skills is also a factor in economic development. Coming to the indirect effects, we can mention such positive effects as increased productivity, increased coverage, elimination of geographical restrictions, etc.

New opportunities created by digitalization and new business models lead not only to the transformation of individual sectors, but also to the displacement of the entire economy as a single ecosystem. As more awareness, a higher level of accessibility, a more transparent, competitive and mobile market environment increases consumption, new technological solutions also create more modern and efficient production environment. For example, the Fero Labs' new platform, which predict the undesirable acidic environment in metallurgy (with 80-100% accuracy), allows to reduce this phenomenon to 15% and save millions of dollars every year by using technological devices. Following international experience, Russia also aims to increase the number of smart factories of the future based on machine learning and artificial intelligence to 40 by 2035.

Nowadays, development is considered an inevitable factor: all states enter a certain stage of development over a period of time. However, only agility makes it is possible to take advantage of this development for the sake of prosperity.

Agile adaptation to innovative solutions without lagging behind the global agenda helps countries to take their share of global value chains by entering a wave of development in a large ecosystem. In other words, it is important to be in the right place at the right time. The incredible pace of digitalization around the world makes prompt reaction and agility necessary for adaptation. In this regard, the term agile approach has already become a trend.

Considering the impact of digitalization on various sectors of the economy and its rapid spread, we can evaluate it as a key driver of economic development. According to Russian researchers, in 2030 more than half of the GDP (gross domestic product) growth will depend on digitalization (2.75% GDP growth with 1.47% of digitalization)

C) Social aspects of the digitalization

Along with a positive impact on the development of the overall economy and, indirectly, on the well-being of the population, the digital economy leads to positive changes in various aspects of people's lives. In other words, digitalization causes not only quantitative but also qualitative growth. Thus, by offering full or partial solutions to a wide range of problems that will arise in human life, digital solutions improve and facilitate people's living conditions. In parallel with the digitalization of the economy, there are formed a concept of a smart society. This society is more creative, quicker in adaptation to change, faster in development, and more prone to flexible solutions.

The mass character of digitalization does not cover only smart things, but also new concepts such as smart homes, smart cities, digital factories and jobs. Technology is involved in almost all areas of human life and is becoming an indispensable part of it.

Digitalization leads to changes in labor market, healthcare, education, and work of various service sectors.

IV. THE ROLE OF A STATE IN THE DEVELOPMENT OF DIGITAL ECONOMY

In all developed countries, the state and its reforms, as well as strategic measures play an initiative role in the development of digital technologies. Almost all countries set technological development as a priority in the national strategies. The approaches to ensuring technological development are the same but the implementation mechanisms are different. European Union countries are developing their strategies based on the Digital Agenda for Europe.

The first strategies in this field date back to the late 1990s and early 2000s. Thus, the e-Europe initiative came into force in 1999. At that period, the main goal was to build a digital infrastructure and ensure the integration of ICT into various sectors.

The next stage of the political and strategic course in the field of technological transformation began during the financial crisis of 2008-2009. The main goal of that period was to increase productivity by applying new technological solutions to various areas of production. That was the purpose of creation of 4th Industrial Initiative, launched in 2011.

Today, the strategy of the states in this area is focused on complex development. This approach covers such issues as ensuring the overall digital transformation, the development of new technologies-based information and communication infrastructure, strengthening information security, and the development of digital knowledge and skills. However, there are also strategies that include mainly separate areas of technological development. For example, among them we can mention the German National Strategy for the Development of Artificial Intelligence. Besides, the International Digital Strategy, approved by France in 2017, is mainly focused on cybersecurity.

The **Going Digital** project of the Organization for Economic Co-operation and Development's (OECD) aims to address the following issues:

• Define common political principles for the development of the digital economy, focusing on sustainable economic development and improving the welfare of the population, covering all sectors of the economy;

• Carry out an in-depth analysis of the current digital transformation policy, as well as the current level of development, future development prospects and risks;

• Investigate how different sectors will be affected as a result of digitalization.

One of the most important factors for the successful implementation of digitalization is the implementation of this process in a complex manner, as well as the involvement of all stakeholders (government officials, business entities, experts in science and education, etc.). In accordance with this model, during the preparation of Strategic Road Maps, which were approved in 2016, Azerbaijan also ensured the participation of all stakeholders – first, in discussions, and then, in providing of written proposals. Discussions also covered a broader format with visits to the regions. This type of approach is very effective for in-depth study of real gaps and needs.

Another important condition for the success of strategies is the definition of targets in accordance with performance indicators and timing, followed by monitoring. In the case of Germany, as a result of these inspections, the **Digital Economy Index** was calculated in 2013. Conducting inspections and delivering them to the public imposes additional responsibilities on executors and motivates them. In Azerbaijan, all strategies and state programs are also monitored upon the implementation and the results are disseminated via media portals.

We can see a wide difference between application mechanisms of technological innovations. During the implementation of innovations, there were created various pilot sites for the implementation of pilot projects (automatic driving in Germany, blockchain technology in the Republic of Korea on), 4th Industrial Testing Laboratories (Australia), Innovation Centers (Republic of Korea, as well as in Azerbaijan), production innovation institutes (USA) etc.

To solve the problem of the lack of legal and regulatory framework for new technologies and the inability to legally regulate their application, there was created a new concept called "Sand Box". According to this concept, innovations that have no legal basis are implemented in a test mode under state control and are monitored during their operation. Then, once they are successful, the legal framework is updated and amended as needed.

Another task of the state is to provide financial support to stimulate technological development. Thus, startups with a large share in innovation often do not have the financial resources and need financial support to implement their ideas. Although there are various Venture Funds, Seed and Angel investors in this area, state funds and various concessions and subsidies applied by the state also play a highly significant role. For example, Japan offers tax credits to companies specializing in technology. European Union countries have established subsidies for small and medium-sized businesses specializing in the given area. Australia sets softer tender conditions for local technology companies to take part in public procurement. A similar mechanism is applied in Azerbaijan. A special fund has been set up in France to finance innovations for the development of the digital economy. The United States has Technology Modernization Fund.

The creation of technological solutions and the development of infrastructure is not sufficient for the development of digitalization and the wider application of technological. The needs of users also play an important role in this area. Thus, an increase in demand without supply does not lead to development. The formation of the supply primarily depends on the increase of public awareness, as well as the increase of literacy in this area. In this regard, it is important to conduct various trainings, prepare informative social videos.

V. DEVELOPMENT OF DIGITAL ECONOMY IN AZERBAIJAN AND FUTURE PROSPECTS

Azerbaijan is distinguished by its propensity for innovation and development in many areas. The entrepreneurs and the people, especially the state has always been interested in introduction and application of new global trends in our country. Our country has always focused on the implementation of the latest digital trends and included it in various state strategies and programs as one of the important parts of Azerbaijan's state policy.

D) The level of economy digitalization in Azerbaijan

In 2020, the information and communication sector accounted for 2% of GDP. During 2005-2019, the added value in the ICT (information and communication technologies) sector increased from 320 million manat to 1,279 million manat. With a share of 41 percent mobile communication ranks first in the structure of the ICT sector. The biggest increase over the last 10 years has been in the use of websites (web portals) and *software* development. After the launch of the first satellite Azerspace 1, there were launched satellite communication services. Between 2013 and 2019, there has been 8-time increase in the provision of services for this kind of activity.

The world experience demonstrates that the development of the ICT sector is directly proportional to the share of the private sector in this area. In other words, the development of the general ICT market is characterized by greater involvement of the private sector. There are 4,115 micro, small and medium enterprises operating in the information and communication sector in Azerbaijan. 96% of these enterprises are representatives of the private sector. In the telecommunications sector, mobile operators are private companies, while the largest fixed broadband network providers are state-owned.

Today, people in Azerbaijan can use 450 e-public services through a One-Stop-Shop system. In total, more than 1,000 e-services are offered by public and private organizations. Mobile network covers 100% of the country. Over the past 7 years, there have been made more than 100 million mobile e-signature transactions, saving hundreds of millions of working hours.

Coming to the digitalization of education in Azerbaijan, we can mention that ADA University is the most digitalized university. The university has an internal e-mail system, an online library with a cloud system, online forums for students, online conduction of tests and exams, and electronic homework assignments. In addition, the application of interactive methods, the use of "smart" boards, demonstration of audio and video materials were added to the traditional teaching process. Another university with a high level of digitalization is UNEC (Azerbaijan State University of Economics). The university's advanced electronic systems allow for a high level of online education. In addition, UNEC has implemented structural reforms on the road to digitalization. As a result, there were created the Faculty of Digital Economics, the Distance Education Research Institute, and the Digital Volunteers Organization. The technical base (unibook - electronic information system of education and "AZII e book house" electronic library), which is also available at the Azerbaijan State University of Oil and Industry, helps to continue the educational process online and conduct online exams. There are also several other educational institutions which are characterized by rapid digitalization.

E) Reforms in the field of digital development of Azerbaijan's economy

Measures to strengthen digitalization in Azerbaijan started with the "National Strategy for Information and Communication Technologies for the Development of the Republic of Azerbaijan" signed by national leader Heydar Aliyev in 2003. The work carried out in the field of application of "e-government" was continued with the adoption of the "State Program for the Development of Communications and Information Technologies in the Republic of Azerbaijan for 2005-2008" (E-Azerbaijan). Next was the the second E-Azerbaijan State Program for 2010-2012 and "Action Program for the formation of e-government in the Republic of Azerbaijan". Such initiatives as "smart city", "smart village" and "green zone" in Karabakh should also be considered as part of the digital transformation.

The strategy of electronic and digitalization in Azerbaijan has been implemented in a comprehensive manner. There were created such digitalized sites as State Control Information System, Azerbaijan Digital Trade Hub, Electronic Agricultural Information System, e-procurement platform for public procurement, e-document circulation system for obtaining state statistics, e-judicial system, e-health service, e-education, e-social services, electronic cadastre of property and lands, etc.

The digitalization of public administration has also led to a number of important government projects. Thus, the Center for Analysis of Economic Reforms and Communication established **monitoring.az** portal to monitor and evaluate state programs, strategic road maps, action plans, economic incentive projects, as well as activities in industrial parks, neighborhoods, and agro-parks. At the same time, the process of e-government is underway to improve local governance in local executive bodies in accordance with the principles of e-government and open government. Since May 2021, Government Development Center (EGD) of the State Agency for Citizen Services and Social Innovations under the President of the Republic of Azerbaijan operates Digital Executive Power portal, the creation of which has started **with e-municipality** system.

The process, which began with the e-municipality system, has been continued since May initial version of the by the e- with the. In addition, the Decree of the President of the Republic of Azerbaijan dated April 27, 2021 "On improving governance in the field of digital transformation" states that the digital transformation of the economy and society has become one of the priorities of the Republic of Azerbaijan in recent years. Moreover, the Decree of the President of the Republic of Azerbaijan "On improving governance in the field of digital transformation" dated April 27, 2021 states that the digital transformation of the economy and society has become one of the priorities of the Republic of Azerbaijan in recent years.

F) The position of a country in international digital assessment rankings

The implemented reforms have a positive impact on the country's position in international rankings. Thus, for two years now, World Bank has evaluated Azerbaijan and put in the list of the top 10 most reformist countries in the world. According to the **Global Cyber Security Index 2020** (GCI) of the International Telecommunication Union - one of the leading reports at the international level, this year, Azerbaijan has moved up 15 positions and reached 40th place. With a total of 89.31 points, our country ranks third among the CIS countries after Russia and Kazakhstan. It is no coincidence that this year, Estonia - our closest partner in the field of digital solutions, ranks third in the index.

Digitalization also contributes to the country's global development, integration with other countries, as well as increase of international trade and cross-border transactions. According to **the UN Global Survey on Trade Facilitation**, Azerbaijan has shown 5% growth compared to 2019 and ranked first among both neighboring countries and the CIS with a total of 86.02%.

The establishment of the **Digital Trade Hub** as a result of the reforms implemented in this sphere by President Ilham Aliyev and implementation of tasks set in the Decree of the President of the Republic of Azerbaijan on additional measures for strengthening the position of the Republic of Azerbaijan as a Digital Trade Hub and expansion of foreign trade operations has led to the simplification of cross-border trade procedures and stimulated the development of e-commerce and paperless trade, particularly, cross-border paperless trade. It is no coincidence that in 2 years, Azerbaijan has achieved a 33% increase for cross-border paperless trade sub-indicator of the rating and gained a leading position at the global level in terms of the pace of development in this area.

Reforms in the field of customs - creation of "Green Corridor", "Automated Customs System" and One-Stop-Shop electronic systems, e-filling of customs declarations and e-submission of certificates, as well as e-payment of customs duties and taxes served to simplification of trade procedures in Azerbaijan.

At the same time, the fact that Azerbaijan was one of the first countries to sign the Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific, which came into force on February 20, 2021, has made a positive contribution to improving the country's position in this area.

G) Development prospects for the digital economy

Azerbaijan has favorable opportunities for the development of the digital economy. The geographical position of our country, its participation in the global digital agenda, and international cooperation are among the factors accelerating this process in a positive way. Digitalization is one of the main drivers of economic development, having a two-way interaction in the field of international integration. Thus, as

international integration provides an opportunity to be closer to global trends, to adapt to them, and to apply them more flexibly, the increase in the level of digitalization also facilitates international integration.

Given the important role of digitalization in the development of the country, this area is considered a priority in all future strategies. It is no coincidence that the development strategy of Karabakh includes the task of building cities and villages with high-tech infrastructure such as "smart city" and "smart village" in the liberated territories. This factor can be considered a very important step for economic development. High digitalization will attract more investment as a factor that increases the investment multiplier and will stimulate the economic development of the whole country, not just the region. The existing e-government-private partnership platform - Digital Trade Hub - also allows investors to make these investments in digital format, i.e. through this platform without coming to Azerbaijan. Non-residents can become electronic or mobile residents of Azerbaijan online, set up their own company in Azerbaijan, open a bank account and carry out various operations online.

According to the Decree of the President "On measures to create a" government cloud "(G-cloud) and provide" cloud "services", all state bodies, state-owned legal entities and legal entities the controlling stake of which belongs to the state, as well as budget organizations and public legal entities has started shifting to cloud technologies. It is planned to completed this transition by 2024. Such transformation in itself will be a very important step towards the digitalization of public administration, as well as a positive contribution to the introduction of other technological innovations in the future.

CONCLUSION

The of the political and economic course of the country's leadership, as well as the people's own propensity for innovation and the ability to adapt to innovations, allows predicting that the transition to digitalization will be easier and faster in Azerbaijan. It means that Azerbaijan has high prospects for development in this area.

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