Trajectory of economic development of Bukhara region during digitalization

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Abstract: This research demonstrates the beginning of the trajectory of the economic development of the Bukhara region during digitalization. Such indicators as the size of resident working-age population, the number of enterprises and organizations connected to the Internet, the length of fiber-optic communication lines, which are the factors affecting the growth of the gross regional product, have been analyzed based on the multifactorial econometric models. This research, along with the relevant literature review, provides opinions, conclusions and proposals of the authors of this research.

1   Introduction

Today, no one can imagine the development of economic activity without modern information technologies. At present, information and communication technologies are rapidly developing, which in turn sets the task for each industry to introduce new innovative methods and technologies into its activities, and increase competitiveness using high technologies.

The digital economy is a virtual environment in which the industrial complex creates products and services that provide convenience for people, and it is also an economic production system using digital technologies.

Digitalization leads to the growth of the global economy; for example, according to the influential consulting company McKinsey Global Institute, the use of the latest digital technologies will increase the gross domestic product by USD 3-6 trillion by 2025. The company predicts that this growth will be induced by 12 types of high technologies (including mobile internet, advanced robotics, cloud technology, renewable energy, Internet of Things (IoT), wireless data transmission, mobility and artificial intelligence, etc.) [1].

Today in Uzbekistan, the task of developing the digital sector of the economy has been set at the state level, and large-scale measures are being implemented in this direction. In particular, electronic document management systems are being introduced, electronic payments are being developed, and the legal framework built in the field of electronic commerce is being improved. At the same time, the digital economy operating on information technology platforms is rapidly developing.

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According to the authors of this research, in order to achieve progress, it is necessary to master digital knowledge and modern information technologies, which will allow choosing the shortest path to growth. Therefore, an active transition to a digital economy is one of the main priorities for the next 5 years. Digital technologies not only improve the quality of goods and services, but also reduce unnecessary expenses [2].

A lot of work is being done in Uzbekistan to develop modern information and communication technologies, create an integrated system for the provision of electronic public services, and introduce new mechanisms for communication between government bodies and the population.

Measures to develop the concept of "Digital Uzbekistan" will be implemented until 2030. The Decree of the President of the Republic of Uzbekistan "On measures to develop the digital economy in the Republic of Uzbekistan" was adopted on July 3, 2018 in order to further improve the public administration system, create conditions for the introduction and development of the digital economy, improve the investment environment, as well as implement the Action Strategy in five priority areas for the development of the Republic of Uzbekistan in 2017-2021.

According to the Decree, one of the most important tasks for the development of the digital economy is the diversification of various types of investment, economic and entrepreneurial activities in the field of circulation of crypto assets, including mining (measures to support the distribution platform and create new blocks that allow receiving rewards in the form of new units and commissions in various cryptocurrencies), smart contracts (an electronic contract with signed rights and obligations for the automatic execution of digital transactions), consulting, emission, exchange, storage, distribution, management, insurance, crowdfunding (collective financing) and blockchain technologies; training of qualified personnel; establishing cooperation with cryptocurrencies and foreign organizations; building the relevant legal framework.

In Uzbekistan, the Smart City Concept has been adopted, according to which such projects as "smart transport", "smart education", "smart medicine", "smart energy system", "smart construction", "smart utilities" are being developed. As the main directions for the implementation of "smart city" technologies, such projects as "smart home", "smart government", "smart district" have been identified. At the same time, the implementation of information and communication technologies in most enterprises in the Uzbekistan is accompanied by a number of problems.

The Bukhara region is one of 12 regions of the Republic of Uzbekistan. Among the regions of Uzbekistan, it is the second largest after Navoiy region, and was established on January 15, 1938. The Bukhara region is mainly located on the territory of the Kyzylkum desert. Zeravshan valley occupies the southeast of the region. It borders on the Khorezm region and the Republic of Karakalpakstan in the northwest, the Navoiy region in the north and east, the Qashqadaryo region in the southeast and Turkmenistan in the southwest. The area is 39.4 thous. km [3].

At present, digitalization is becoming one of the main factors in the socio-economic development of the Bukhara region. Digitalization is a new factor in the economic growth that can increase the efficiency and productivity of business processes.

Many world scientists expressed their opinion on the role of advanced information technologies and telecommunication systems, as well as digitalization in the economy.

The ability of the region to fully exploit the potential of the digital economy is the most important competitive advantage in the fight for investors, and the regions will definitely compete for investors by means of creating the appropriate environment. Much will depend on how quickly the information about the registration of an enterprise, registration of a land plot, building permits, communications, historical monuments and other conditions is

provided. In these matters, the issue of competition is more important than the human capital [4].

Based on digitalization tools, the authors of this research proposed an innovative development model (Bessonova E. & Battalov R. 2020), where they drew attention to opportunities and threats while taking into account the events of the 2020 pandemic, identified restrictions on economic activity, developed support measures including the specifics of digital transformation, summarized the results and focused on improving and integrating the infrastructure of the information and communication technologies. Based on the results of this research, recommendations were given on the implementation of the innovative development model and measures to support innovation in the context of digital transformation, and to increase their efficiency. This model could be used for laying-out of plans and programs for the development of this area [5].

Another group of foreign scientists studied the relationship between the level of digitalization development and the tourism industry, as well as the relationship between the factors of development and sustainability of the tourism industry, and the relationship between sustainability and economic growth [6].

Other scientists, having studied the modern dynamic trend in the development of China's digital economy and its impact on qualitative economic development, empirically analyzed the digital economy development index of 30 cities in China to create an econometric model based on panel data, analyzed the relationship between the digital economy and qualitative economic development, and considered the mediating effect of technical progress [7].

According to Vorontsovskiy, digitalization could not be considered as an important factor in economic growth and has the opposite effect on the growth and size of the gross domestic product; in its conditions, further development of the theoretical foundations for analyzing and measuring economic growth is required [8].

A group of scientists substantiated the need for digital transformation of the management of the socio-economic development of society and organizations, and also formed a model for the development of an IT strategy for the digital transformation of business processes in an enterprise. Accordingly, a matrix of opportunities for implementing the IT strategy of an enterprise has been proposed for choosing the most optimal IT strategy for an enterprise in any area [9].

Some scientists also studied the role of digital technologies in the economic development of modern society, considered examples of the world's largest companies influencing the digital economy development, and identified the impact of digital technologies on the economy [10].

Other researchers concluded that during the transition period, a mechanism for continuous cooperation of all key economic entities and their active participation in a digital economy, as well as mechanisms for its continuous coordination at all levels of government should be developed [11].

Scientists who have studied the main features of assessing the digital economy development as a means of managing digital transformation processes at the national, regional and sectoral levels, have developed a methodology that includes a system of indicators, measurement tools and criteria to assess the current situation with the conditions, processes and effects of digital transformation [12].

In order to develop the national digital economy, scientists of the Republic of Uzbekistan conducted research on blockchain technology, the efficiency and basic principles of digitalization, as well as a set of blocks that required material resources, on the basis of which they proposed using blockchain technology in the national economy [13].

In the economic development of the region, the use of innovative advanced technologies in terms of optimizing the time spent on choosing the necessary tourist product for travelers

has great potential. Real-time information exchange, reduction of required documents and elimination of language barriers are of great benefit to potential clients [14].

According to researchers who have studied the strong impact of digitalization on the overall growth of the Indian economy and trade, digitalization automated the process of manufacturing products and services, which led to improved quality and increased performance rate [15].

Another group of scientists researched the impact of the digital economy on accelerating the economic development of the city and the region, as well as improving the quality of life. They managed to study the process of digital economy development at the regional level and determine indicators for assessing the impact of digitalization on the economic situation of the region and the welfare of the population [16].

The researchers also studied human-oriented aspects of digitalization, such as changing the nature of management in a digital company, the system for training specialists, their professional activities and educational directions [17].

According to the studies of the other group of scientists, during the period of digital transformation, it is advisable to form a regional innovation system for the development of the region. The proposed system of principles is based on the interconnection between the economic development of the region and the innovation system performance. This regional innovation system, while taking into account the potential of the region, allows effectively performing the processes of production, transfer, distribution and commercialization of new technologies and including them in innovation processes [18].

In order to achieve digitalization and intellectualization of innovations, integration of information technologies, researchers who expressed an opinion on changing the traditional manufacturing industry came to the conclusion that it was necessary to create an innovation system focused on the integration of higher education institutions and research institutes with enterprises [19].

According to other researchers, along with the development of tourism, the digitalization of the economic development of the region, the introduction of innovative sources of information in all areas related to the development of tourism, and their rapid improvement will form a digital space, the effective use of which will be one of the important factors in attracting not only local tourists but also foreign ones [20].

One more research was conducted by the scientists who came to the conclusion that the development of the digital economy affected energy consumption mainly due to the impact on economic growth, energy efficiency and industrial structure [21].

Scientists who have studied the degree of influence of the digital generation on the transformative factor of economic growth stated that digitalization had become an urgent need in all sectors of the economy, being the basis of long-term success [22].

A group of researchers who analyzed the role of digitalization of the system of economic relations as a factor in the development of small innovative enterprises came to the conclusion that it was necessary to study foreign experience in the participation of municipalities in digitalization programs, as well as the compatibility of local experience with foreign advanced solutions, on the basis of which they proposed a set of IT tools for increasing the economic efficiency of interaction among all institutional participants [23].

Scientists argue that the digitalization of all economic activity is necessary for the efficient innovative development of the regional and national economy. Due to the low level of development of regional digital infrastructures in the current economic conditions, the problem of digital inequality between regions is of crucial importance. This negatively impacts the innovative development of enterprises and the quality of life of every citizen of the country. While taking into account the peculiarities of innovative development, the characteristics of the digitalization of regional economies were also determined, and an

algorithm for assessing the level of regional innovative development was developed, which included the specific features of the digitalization of regional economies [24].

Literature review allowed concluding that during digitalization the economic development was determined by many interrelated factors. Herewith, an important role in this process was played by digital technologies and the telecommunications environment.

2   Materials and methods

The research methodology included the study and analysis of the relevant literature. A comprehensive literature review method was used in the research. In the course of the work, studies of digitalization of economic sectors conducted earlier and being currently performed were reviewed. Relevant lectures, conference materials, Internet publications and journals as well as new literature and promising project data were studied in this research; methods of scientific abstraction, induction and deduction, analysis and synthesis, statistical analysis, economic and mathematical methods, as well as a method of multifactorial econometric models were used.

3   Results and discussion

The current state of the economy heavily depends on Internet connection, electronic transactions and web-based services; therefore, increasing the use of digital solutions is a must for businesses to adapt to business needs.

According to Datareportal.com "Digital 2023: global overview report" for January 2023, of the world's 8.01 bln people, 64.4%, i.e. 5.16 bln people, are Internet users, 68% (5.44 bln people) are mobile phone users, and 4.76 bln people, i.e. 59.4% of the world's population, are active users of social networks [25]. In turn, these figures increase every year. At the same time, Internet users are people of different ages, wealth and social status. It should be also noted that among the active users of Internet resources, the number of older and younger people who communicate in social networks and use the Internet to search for information is increasing every year.

In accordance with the global trend, the total number of Internet users in Uzbekistan has exceeded 31 mln people, and the number of mobile Internet users has exceeded 29.5 mln people. The speed of connection to the international Internet channel has increased by 2.6 times over the past two years, reaching 3,200 Gbps. [26].

As of January 1, 2023, 627,475 enterprises were registered in Uzbekistan. Of these, 12,204 enterprises and organizations operate in the information and communication sphere. This figure is higher than the last year's one by 1,647 units or 15.8%.

As of January 1, 2023, a total of 35,905 enterprises were registered in the Bukhara region. This is 2,747 enterprises more than it was the last year.

Table 1. Indicators of digital economic development of the Bukhara region (relative to 2015, growth rate was calculated as a percentage).

No.	Indicators	2016	2017	2018	2019	2020	2021	2022
1	Gross regional product (at the beginning of the year, bln soums)	14,390.7	17,191	21,817.4	27,963.2	31,334.2	38,350.1	45,797.3
2	Gross regional product (at the beginning of the year, growth rate, %)	116.3	139.0	176.4	226.1	253.3	310.1	370.3

3	Resident population size (at the beginning of the year, thous. people)	1,815.2	1,843.5	1,870.2	1,894.8	1,923.9	1,947.1	1,976.8
4	Resident population size (at the beginning of the year, growth rate, %)	101.7	103.2	104.8	106.1	107.7	109.0	110.7
5	Size of resident working-age population (at the beginning of the year, thous. people)	1,123.1	1,131.9	1,140.5	1,146.6	1,151	1,154.1	1,157
6	Size of resident working-age population (at the beginning of the year, growth rate, %)	101.0	101.7	102.5	103.0	103.4	103.7	104.0
7	Number of subscribers connected to the Internet (at the beginning of the year, thous. people)	430.9	482.6	547.3	694	855.2	1,011.2	1,204.5
8	Share of enterprises and organizations connected to the Internet (at the beginning of the year, growth rate, %)	110.6	123.9	140.5	178.1	219.5	259.5	309.2
9	Length of fiber-optic communication lines (at the beginning of the year, thous. km)	1.3	1.4	1.5	1.6	2.3	4.3	8.3
10	Length of fiber-optic communication lines (at the beginning of the year, growth rate, %)	118.2	127.3	136.4	145.4	209.1	390.9	754.5
11	Availability of personal computers (except servers) at enterprises and organizations (at the beginning of the year, pcs)	36,642	39,506	41,003	45,294	51,280	55,888	56,058
12	Availability of personal computers (except servers) at enterprises and organizations (at the beginning of the year, growth rate, %)	106.0	114.3	118.6	131.0	148.3	161.7	162.2

Source: authors' development based on stat.uz and mitc.uz data.

The following indicators were chosen as exogenous factors influencing the gross regional product (Y) and being the resulting factor of the econometric model: the size of resident working-age population (x1), the share of enterprises and organizations connected to the Internet (x2), the length of the fiber-optic communication lines (x3).

All selected factors influencing the result had a stable growth rate during 2016-2022.

Based on the identified data, a multifactorial econometric model was created for changing the volume of the gross regional product under the impact of factors influencing it. In order to describe the whole process, the following regression equation (1) was built:

$$Y = -1669.8483 + 16.5706X_1 + 0.9857X_2 + 0.01292X_3 \tag{1}$$

where Y was the gross regional product (at the beginning of the year, growth rate, %);

X_1 was the size of resdident working-age population (at the beginning of the year, growth rate, %);

X_2 was the share of enterprises and organizations connected to the Internet (at the beginning of the year, growth rate, %);

X_3 was the length of fiber-optic communication lines (at the beginning of the year, growth rate, %).

A 1% change in the size of resident working-age population led to a 16.6% change in the gross regional product. A change in the share of enterprises and organizations connected to the Internet by 1% led to a change in the gross regional product by 0.99%.

The coefficient of determination was calculated as follows:

$$R = \sqrt{1 - \frac{0.000165}{0.0398}} = 0.9979 \tag{2}$$

Since this coefficient was close to 1, the found regression equation was considered highly reliable.

The paired correlation coefficients were defined as follows:

$$r_{yx_1} = \frac{23439.857 - 102.857 \cdot 227.143}{0.99 \cdot 85.089} = 0.909$$
$$r_{yx_2} = \frac{49392.286 - 191.857 \cdot 227.143}{68.743 \cdot 85.089} = 0.994 \tag{3}$$
$$r_{yx_3} = \frac{77387.143 - 268.857 \cdot 227.143}{217.276 \cdot 85.089} = 0.883$$

The defined coefficients showed that the influence of the selected indicators on the gross regional product was very high.

The reliability of the coefficients of the regression equation was evaluated with the probability of 95%.

$$t_{nabl} = 0.91 \cdot \frac{\sqrt{7-1-1}}{\sqrt{1-0.91^2}} = 4.89 \tag{4}$$

According to Student's table, tcrit (n-m-1; α / 2) = (5; 0.025) = 3.163

Therefore, as the tnabl > tcrit, the condition was met. As a result, the H0 hypotheses were rejected and the H1 hypothesis was accepted, i.e., the coefficients of the regression equation being determined were statistically significant.

The standard form of the regression equation was as follows:
$$t_y = 0.193x_1 + 0.796x_2 + 0.033x_3 \tag{5}$$

In this case, it was defined that the share of enterprises and organizations connected to the Internet was the factor that most influenced the change in the gross regional product compared to the base period.

The average approximation error was determined as follows:

$$A = \frac{\sum |\epsilon:Y|}{n} \cdot 100\% = \frac{0.145}{7} \cdot 100\% = 2.07\%$$

(5)

The average error of the difference between the value of the gross regional product determined using the econometric model and the actual value was small. This showed that the reliability of the regression equation was high.

4   Conclusion

In Uzbekistan, the issue of developing the digital sector of the economy has been raised at the state level and relevant large-scale measures are being implemented. In particular, electronic document management systems are being introduced, electronic payments are being developed, and the legal framework built in the field of electronic commerce is being improved. At the same time, the digital economy, operating on information technology platforms, is rapidly developing. This necessitates the creation of new models of such platforms.

During digitalization, the following priorities for the economic development of the Bukhara region should be determined:

a)   Today, in order to increase the competitiveness of employees of all enterprises in the Bukhara region, it is necessary to ensure the regular participation of local and foreign specialists in educational seminars and trainings on digital knowledge and modern information technologies such as innovative methods of online advertising, digital marketing; opportunities of e-business, Google Analytics, Yandex.Metrika, Social media, Facebook, Instagram, WhatsApp, Telegram; e-mail marketing; and mobile marketing (QR code, mobile applications). As a result, employees who have received modern knowledge during training will be able to identify shortcomings in their activities, eliminate them, develop promising practical recommendations and proposals, and develop their areas.

b)   Tourism enterprises, organizations and institutions of the Bukhara region should gradually transform their activities (use online mode) by means of communicating with consumers and introducing new forms of electronic payments in order to eliminate the backwardness of the economy and management. Support for scientific research, practical development, creation of textbooks and training tools for the economic development of the Bukhara region during digitalization will further improve this area.

c)   A 1% change in the size of resdident working-age population results in a 16.6% change in gross regional product. A change in the share of enterprises and organizations connected to the Internet by 1% leads to a change in the gross regional product by 0.99% .

d)   In order to achieve progress, digital knowledge and modern information technologies should be mastered, which allows choosing the shortest path to growth. After all, information technologies today deeply penetrate into all corners of the world.

References

1. Software complex of the Ministry of economic development and poverty reduction of the Republic of Uzbekistan-data management system. Accessed on: March 15, 2023. [Online]. Available: https://mineconomy.uz/
2. Address of President of the Republic of Uzbekistan Shavkat Mirziyoev to the Supreme Assembly of the Republic of Uzbekistan dated January 24, 2020. Accessed on: March 15,   2023.   [Online].   Available:

http://uza.uz/oz/politics/zbekiston-respublikasi-prezidenti-shavkat-mirziyeevning-oliy-25-01-2020

3. Buxoro viloyati. Accessed on: March 15, 2023. [Online]. Available: https://uz.wikipedia.org/wiki/Buxoro_viloyati

4. The development of the digital economy in the regions of Russia. Potential and prospects. Accessed on: March 15, 2023. [Online]. Available: https://forumspb.com/news/news/razvitie-tsifrovoj-ekonomiki-v-regionah-rossii-potent sial-i-perspektivy/

5. Bessonova, E., & Battalov, R. (2020). Digitalization as a tool for innovative economic development. *Economic Annals-XXI*, *186*.

6. Filipiak, B. Z., Dylewski, M., & Kalinowski, M. (2020). Economic development trends in the EU tourism industry. Towards the digitalization process and sustainability. *Quality & Quantity*, 1-26.

7. Zhang, W., Zhao, S., Wan, X., & Yao, Y. (2021). Study on the effect of digital economy on high-quality economic development in China. *PloS one*, *16*(9), e0257365.

8. Vorontsovskiy, A. V. (2020). Digitalization of the economy and its impact on economic development and social welfare.

9. Borremans, A. D., Zaychenko, I. M., & Iliashenko, O. Y. (2018). Digital economy. IT strategy of the company development. In *MATEC Web of Conferences* (Vol. 170, p. 01034). EDP Sciences.

10. Magomedov, I. A., Murzaev, H. A., & Bagov, A. M. (2020, May). The role of digital technologies in economic development. In *IOP Conference Series: Materials Science and Engineering* (Vol. 862, No. 5, p. 052071). IOP Publishing.

11. Niyazbekova, S. U., Moldashbayeva, L. P., Zhumatayeva, B. A., Mezentseva, T. M., & Shirshova, L. V. (2021). Digital economy development as an important factor for the country's economic growth. *Socio-economic Systems: Paradigms for the Future*, 361-366.

12. Ershova, T. V., Hohlov, Y. E., & Shaposhnik, S. B. (2018, October). Methodology for digital economy development assessment as a tool for managing the digital transformation processes. In *2018 Eleventh International Conference" Management of large-scale system development"(MLSD* (pp. 1-3). IEEE.

13. Kryshtanovych, S., Prosovych, O., Panas, Y., Trushkina, N., & Omelchenko, V. (2022). Features of the Socio-Economic Development of the Countries of the World under the influence of the Digital Economy and COVID-19. *International Journal of Computer Science and Network Security*, *22*(1), 9-14.

14. Kayumovich, K. O., Alimovich, F. E., Khudoynazarovich, S. A., Shavkatovna, S. S., & Supiyevna, B. M. (2020). Opportunities of mobile marketing in tourism. *Journal of Critical Reviews, 7*(12), 94-98. doi:10.31838/jcr.07.12.15

15. Maiti, M., & Kayal, P. (2017). Digitization: Its impact on economic development & trade. *Asian Economic and Financial Review*, *7*(6), 541-549.

16. Domnina, S. V., Podkopaev, O. A., & Salynina, S. U. (2021). The digital economy: challenges and opportunities for economic development in Russia's regions. *Current Achievements, Challenges and Digital Chances of Knowledge Based Economy*, 149-157.

17. Guryanova, A. V., Krasnov, S. V., & Frolov, V. A. (2020). Human transformation under an influence of the digital economy development. In *Digital Transformation of the Economy: Challenges, Trends and New Opportunities* (pp. 140-149). Springer International Publishing.

18. Morozova, I. A., Kuzmina, E. V., Kuzmina, M. I., Shevchenko, S. A., & Avdeyuk, O. A. (2021). Economic development of the territory on the basis of formation of regional innovation system in conditions of digitalization. In *Modern Global Economic System:*

Evolutional Development vs. Revolutionary Leap 11 (pp. 974-982). Springer International Publishing.

19. Zhou, J. (2013). Digitalization and intelligentization of manufacturing industry. *Advances in Manufacturing*, *1*(1), 1-7.

20. Khurramov, O. K., Fayzieva, S. A., Saidova, F. K., Khalilov, B. B., & Fayzieva, S. K. (2020). Directions for improvement digital tourism and tourism info structure in Uzbekistan. *Journal of Critical Reviews, 7*(5), 366-369. doi:10.31838/jcr.07.05.72

21. Xue, Y., Tang, C., Wu, H., Liu, J., & Hao, Y. (2022). The emerging driving force of energy consumption in China: does digital economy development matter?. *Energy Policy*, *165*, 112997.

22. Nosova, S., Norkina, A., Makar, S., Arakelova, I., & Fadeicheva, G. (2022, March). Digitalization as a new paradigm of economic progress. In *Biologically Inspired Cognitive Architectures 2021: Proceedings of the 12th Annual Meeting of the BICA Society* (pp. 344-354). Cham: Springer International Publishing.

23. Gromova, E., Timokhin, D., & Popova, G. (2020). The role of digitalisation in the economy development of small innovative enterprises. *Procedia Computer Science*, *169*, 461-467.

24. Antipina, O., Kireeva, E., Ilyashevich, N., & Odoeva, O. (2022, March). Digitalization of Regional Economies in the Context of Innovative Development of the Country. In *Digital and Information Technologies in Economics and Management: Proceedings of the International Scientific and Practical Conference" Digital and Information Technologies in Economics and Management"(DITEM2021)* (pp. 224-235). Cham: Springer International Publishing.

25. Digital 2023: global overview report. Accessed on: March 15, 2023. [Online]. Available: https://datareportal.com/reports/digital-2023-global-overview-report

26. The number of internet users in Uzbekistan has exceeded 31 million. Accessed on: March 15, 2023. [Online]. Available: https://www.gazeta.uz/oz/2022/12/15/internet-users/