ACADEMIC JOURNAL
ISSN 2697-2212

Academic Journal of Digital Economy and Stability
Volume 38, Issue 1 | January-2025

Available Online: *https://economics.academicjournal.io/*

Article

Digital Economy for The Formation of A Virtualized Innovation Infrastructure of The Service Sector

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Abstract: Given the current need to transform Uzbekistan into a digital economy, this study explores the function of the digital economy in development of a virtualized innovation infrastructure in the service sector. Yet, despite the impressive global progress in service virtualization, a huge knowledge gap exists regarding how to integrate electronic economy tools and the organizational structures needed to exploit them in developing economies. Data was collected through an aggregate sampling of official databases and statistical analyses with qualitative insight from case studies. Feadings reveal that while banking and finance have adapted to virtualization, education and healthcare, among other services, have not been so lucky as infrastructure and management constraints hamper its adoption. Findings suggest that targeted investments in digital tools and capacity building will greatly expand service accessibility, economic efficiency, and employment opportunities. This research highlights the relevance of policy reform and regional collaboration in developing sustainable digitally driven service infrastructures as a critical idea of modernization of economy for stakeholders and policy makers.

Keywords: economy, digital economy, services, financing, virtualization, education

1. Introduction

The modern economy is based on new technologies and scientific and technical innovative activities. This also includes the formation of a virtualized innovative infrastructure. The process of virtualization of the service sector is underway in developed countries of the world. The provision of virtual services makes it possible to overcome some economic problems. For example, the level of provision of services to the population increases, free time increases, new jobs appear, and the standard of living of the population improves. Especially during the pandemic and global problems, virtualization of the service sector has been recognized as the most convenient means for the population. Therefore, the formation of a virtualized innovative infrastructure of the service sector is expedient.

Scientific research on the virtualization of services is being conducted in leading scientific centers and higher educational institutions around the world. However, our theoretical studies have shown that the scientific and organizational conditions for using electronic economy tools in the process of virtualization of the service sector are being ignored and that research work in this area is insufficient.

2. Literature Review

Some research works consider the process of virtual service provision as a type of human activity and consider it to be associated with the formation of an innovative

Citation: Murodovna, M. Z. Digital Economy for The Formation of A Virtualized Innovation Infrastructure of The Service Sector. Academic Journal of Digital Economics and Stability 2025, 38(1), 341-347.

Received: 4th January 2025
Revised: 11th January 2025
Accepted: 28th January 2025
Published: 12th February 2025

infrastructure. For example, researcher G.P. Gulomova divides the main structures of the innovation infrastructure into two main parts. The first is the resources of innovative activity, and the second is the forms of infrastructure. The forms of infrastructure include: innovative technology centers, technoparks, technological clusters, implementation centers, technology commercialization offices, business incubators, innovation centers, information networks, electronic commerce tools, special intermediary structures, etc. These innovative infrastructures are important elements in the virtualization of the economy. They are an effective tool for accelerating economic processes and mitigating social problems. Innovative infrastructures develop virtual services in the national economy.

In order to form a virtualized innovation infrastructure in the economy, it is first necessary to improve organizational mechanisms, as well as to establish free market relations between them. In this regard, one of our local scientists A.M. Kadirov expressed the following opinions: "...this can be achieved by creating markets for intellectual property and innovative infrastructure objects. "Infrastructure objects are understood as business innovations, telecommunications and trade networks, technology parks, business incubators, innovation-technological centers, consulting firms, finance and other structures." Infrastructural facilities for the development, exchange, distribution and targeted use of electronic economy tools should be developed.

in scientific articles, monographs, and textbooks about the importance and role of innovative infrastructures in the development of virtual services. Some even show that the scientific aspects of using virtualized innovative infrastructure in sectors and industries of the economy are developing. A vivid example of this is the scientific research work conducted by researchers and the commercialization of innovative developments. However, in our opinion, the organizational conditions for the provision of virtual services in the service sector are developing somewhat slowly. The organizational aspects of using innovative infrastructures in the service sector, including the practical implementation of innovative ideas, are still being delayed. For example, this problem is clearly demonstrated in the scientific article by M. Muminova entitled "Introduction of innovative types of services - an important condition for ensuring sustainable economic growth of banks." "……The National Bank for Foreign Economic Activity of the Republic of Uzbekistan, the Central Bank of Uzbekistan, and the Transbank Bank responded in a survey that the implementation of innovative ideas depends more on the bank's management. Virtual services are practically not provided in service enterprises due to the lack of organizational conditions (mechanisms) for the use of electronic economy tools. In our opinion, there are several reasons for this. For example, the lack of innovative infrastructure in all regions, the lack of regular electricity and security of virtual services in some regions (rural areas), the lack of skills and distrust of customers in using virtual services, etc. It is also worth noting that an important reason for the lack of use of electronic economy tools in service enterprises is the excess supply of labor resources in the labor market relative to demand . This, in turn, encourages managers of service enterprises not to use electronic economy tools. According to estimates, the use of labor resources is 7-8 times cheaper than the use of electronic economy tools in service enterprises. Based on this, it can be noted that the stability of demand and supply of labor in the labor market determines the use of electronic economy tools in service enterprises. Managers of service enterprises in regions with cheap labor do not attract funds for digital economy tools.

Integration relations between enterprises also play an important role in the development of virtual services in service enterprises. However, integration relations between economic entities have not been established in Uzbekistan. Integration relations have been established only in some areas (between state institutions, commercial banks, higher education and tax authorities). In most of them, the types of virtual services provided are limited. This means that there are no electronic economy tools. In Uzbekistan, there are no higher education institutions that would develop electronic economy tools

and train specialists with higher education who can apply them in practice. Existing higher education institutions train only oil, gas, aviation engineering operators, and computer engineering specialists with higher education. We import electronic economy tools used in the implementation of virtual services in the digital economy. Therefore, it is expensive for service enterprise managers to purchase innovative resources to provide virtual services.

In developed countries, the integration links established between service sectors have led to the virtual development of some types of services in the sector. For example, lending for investment activities, the development of electronic commerce, placing orders for transport services, providing electronic services to customers, etc. Virtual services in commercial banks serve as the most important factor in implementing their long-term strategy in the global financial market and, through it, developing international relations and experiences.

Studies conducted in Uzbek commercial banks also revealed that the introduction of virtual services has increased the volume of interest income to customers several times. The data presented in Table 1 below is a clear proof of our opinion.

3. Materials and Methods

In this article, the methodology presented centers around a wide and multi-dimensional perspective in studying the virtualization of the service sector under the condition of the digital economy. A holistic perspective was obtained through both qualitative and quantitative research methods. Data collection based on official databases and using secondary sources including statistical reports, academic research and institutional publications on Uzbekistan's service sector was conducted. Quantitative data was analyzed statistically for indicators of income and profitability trends in the banking sector, and virtualization at various sectors of the service industry. By reviewing previous studies and case analyses cases in Uzbekistan and other nation, the study noted organizational and infrastructural challenges inhibiting adoption of electronic economy tools for qualitative insights. This dual approach created the conditions to ground the findings in economic impacts that are tangible and behavior that is nuanced at the organizational and the consumer levels. We highlight the importance of contextual variables that shaped the adoption of digital tools: labor and managerial attitudes and regional infrastructure deficiencies among others. The methodology synthesizes these elements to create a robust framework for analysis of the dynamics of virtualization and its effects on the economy of the service sector.

4. Discussion

The data in Table 1 show that the volume of interest income in commercial banks is growing rapidly. For example, in 2024, the volume of interest income of commercial banks increased by 130.1% compared to 2023. When we carefully analyze the data in this table, we see that the volume of interest income in 2024 is 2.1 times higher than the volume of non-interest income. These figures, in turn, indicate that the volume of virtual services provided to the population in commercial banks is increasing.

Table 1. Profitability indicators of the banking system of Uzbekistan, billion soums[10]

Income and expenses of the banking system	Years								Of bank income in 2024 compared to 2023 change, in %
	2017	2018	2019	2020	2021	2022	2023	2024	

Interest income	5506.5	9911.9	17840.8	26719.0	34302	46635	62327	81032	130.1
Interest expenses	3152.5	5698.5	10877.0	16543.0	22294	28877	41231	56518	137.1
Interest margin	2354.0	4213.4	6963.8	10176.0	12013	17757	21114	24514	116.1
Interest-free income	5212.3	4250.8	6652.7	8401.0	13372	25053	31062	38302	123.3
Interest-free expenses	1591.7	1003.8	2030.3	2422.0	3492	8385	8777	16090	183.3
Operating expenses	2776.1	3814.9	4473.3	5475.0	7546	9995	13611	16183	118.8

Also, the data in Table 2 show that the volume of credit investments made by commercial banks not to sectors of the economy, but to individuals (the population), is also increasing. For example, the volume of credit investments allocated to individuals increased by 4.5 times in 2024 compared to 2019. In other sectors, including the housing and communal services sector, credit investments increased by only 1.1 times in 2024 compared to 2019, and the sector for the development of material and technical support increased by 1.2 times. These data indicate that virtual services have not been introduced in all sectors of the service sector.

Some sectors of the service sector in Uzbekistan, including commercial banks, finance, insurance, trade, catering, and transport services, have been virtualized. According to our estimates, about 55 percent of the services provided to the population in these sectors have been virtualized. In the remaining service sectors, education, medicine, and others, the level of virtualization of services has not even reached 10 percent. Virtual services in them are used only to collect payments for services provided. However, in the conditions of the digital economy, virtual services can be established in all sectors of the service sector. For example, healthcare sectors can offer online services to patients, people with disabilities, and people living alone who are being treated at home. Or, for example, organizing some types of services in the educational sector (audience classes in small groups) online would be highly effective.

Table 2. of commercial banks' credit deposits by sector[11]

Indicator name	Years												Changes in credit investments by sector in 2024 compared to 2017, times
	2019		2020		2021		2022		2023		2024		
	billion soums	share, in %	billion soums	share, in %	billion soums	share, in %	billion soums	share, in %	billion soums	share, in %	billion soums	share, in %	
Total credits	234673	100.0 %	260712	100.0 %	311591	100 %	362933	100 %	451610	100%	515641	100 %	2.2

Industry	91876	39.2 %	96537	37.%	112267	36.0 %	121229	33.4 %	130205	29%	147892	29%	1.6
Agriculture	16762	7.1%	25234	9.7%	334825	10.7 %	37229	10.3 %	46507	10%	52042	10%	3.1
Construction industry	6116	2.6%	6956	2.7%	9172	2.9 %	10030	2.8 %	12261	3%	12959	3%	2.1
Sales and general service	12862	5.5%	18572	7.1%	24803	8.0 %	28603	7.9 %	31554	7%	34637	7%	2.7
Transport and communication	26950	11.5 %	26098	10.0 %	28241	9.1 %	27838	7.7 %	33117	7%	34508	7%	1.3
Development of material and technical support	2941	1.3%	3907	1.5%	3777	1.2 %	3441	0.9 %	3693	0.8%	3682	0.7 %	1.2
Housing and communal services	1989	0.8%	3626	1.4%	6272	2.0 %	1888	0.5 %	2432	0.5%	2338	0.5 %	1.2
Individuals	37857	16.1 %	51465	19.7 %	65795	21.1 %	90542	24.9 %	139126	31%	169715	33%	4.5
Other areas	37318	15.9 %	28318	10.9 %	27782	8.9 %	42217	11.6 %	52716	12%	57869	11%	1.5

While the means of the electronic economy are developing, it is a big mistake for enterprise managers not to use them purposefully. In the conditions of the digital economy, the process of virtualization covers all sectors and industries of the economy. In this, the means of the electronic economy play an important role. In our country, today, the virtualization of the service system for various segments of the population, taking into account their age, gender, social status, and physical capabilities, is becoming one of the main priorities of state policy. "The lack of departmental information systems, electronic resources, and databases related to the improvement of the social sphere and reforms in this area also hinders the development of our work in this area." Also, despite the large-scale reforms being carried out in the country, there are enough problems in the service sector that are waiting to be solved. In particular, the failure of the roadside infrastructure to meet the standards of foreign countries, the failure to implement the results of innovative research in the service sector, and others. Towards this goal, the need for research on the organization of new mechanisms for the development of social services and the formation of a virtualized innovation infrastructure based on the tested experiences of developed countries is increasing.

According to research work, 700 bln. it is possible to create additional services worth soums. In particular, there is a need for more than 400 large service facilities on a 10,000-kilometer road passing through more than 150 districts and cities.

The development of virtual services creates new jobs in the sector, creating opportunities for additional income. The population's free time outside of official work increases, transportation costs decrease. In general, the potential of this type of service is wide. In countries such as Japan, Germany, and South Korea, where virtual services have developed rapidly, a large part of the population is employed in this sector. There are

several signs that we can use to determine the level of development of virtual services. The first is that they are based on a digital economy, the second is that the volume of services in the GDP structure exceeds 60-65 percent, the third is that the share of spending on services in the structure of consumer spending of the population is not less than 60 percent, the fourth is that more than 70 percent of the employed population in the economy is employed in the service sector, the fifth is that the service sector is developing rapidly, the sixth is that the share of services in the structure of exported goods and services is increasing, and other indicators can explain this.

5. Conclusion

In conclusion, it should be noted that The decision on the development of the digital economy and the adoption of relevant programs sets new tasks for regional innovative development, namely the creation of an innovative infrastructure with information, institutional and research components. These tasks, in turn, are to be based on the modernization of communication facilities, scientific and research institutes, This raises the issue of creating regional data processing centers and centers of authority.

The complexity of the task of forming a digital economy both in the country as a whole and at the regional level requires the formation of an institutional innovation environment in which the state should play a decisive role. Also, in order to implement projects that implement the concept of a digital economy in the region, there is a need to train personnel and specialists in the field of IT, innovation and digitalization of the economy, aimed at solving not only innovation management problems, but also problems in this area.

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