



DEVELOPMENT OF DIGITAL INFRASTRUCTURE AS THE BASIS OF SUSTAINABLE ECONOMIC GROWTH

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Abstract

The development of digital infrastructure is increasingly recognized as a critical driver of sustainable economic growth in both developed and developing economies. In the context of Uzbekistan, where economic modernization and digital transformation are among the top national priorities, investment in digital infrastructure plays a pivotal role in ensuring long-term stability and competitiveness. This article explores the strategic importance of digital infrastructure in stimulating economic growth through enhanced connectivity, innovation, and access to global markets. It examines current trends, governmental policies, and public-private initiatives aimed at accelerating the digital economy. In particular, the study highlights how infrastructure such as broadband internet, data centers, cloud technologies, and digital payment systems serve as enablers for financial inclusion, SME development, and increased productivity across key sectors. Through theoretical and empirical analysis, the paper provides an overview of the challenges and opportunities that Uzbekistan faces in the process of digital infrastructure deployment and proposes policy recommendations to leverage these developments for inclusive and sustainable economic progress.

Keywords: Digital infrastructure, economic growth, innovation, sustainable development, financial inclusion, connectivity, cloud technologies, broadband access, digital transformation.



Introduction

RAQAMLI INFRATUZILMANI RIVOJLANTIRISH BARQAROR IQTISODIY O'SISH ASOSI SIFATIDA

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Annotatsiya:

Raqamli infratuzilmaning rivojlanishi rivojlangan va rivojlanayotgan mamlakatlarda barqaror iqtisodiy o'sishning muhim omili sifatida tobora kengroq e'tirof etilmoqda. O'zbekiston kontekstida iqtisodiy modernizatsiya va raqamli transformatsiya eng ustuvor milliy yo'nalishlardan biri bo'lib, raqamli infratuzilmaga sarmoya kiritish uzoq muddatli barqarorlik va raqobatbardoshlikni ta'minlashda hal qiluvchi rol o'ynaydi. Ushbu maqolada raqamli infratuzilmaning iqtisodiy o'sishni jadallashtirishdagi strategik ahamiyati, xususan, yaxshilangan ulanish imkoniyatlari, innovatsiyalar va global bozorlarga kirish orqali qo'lga kiritiladigan yutuqlar tahlil qilinadi. Unda mavjud tendensiyalar, hukumat siyosati va raqamli iqtisodiyotni jadallashtirishga qaratilgan davlat-xususiy sheriklik tashabbuslari o'rganiladi. Ayniqsa, keng polosali internet, ma'lumotlar markazlari, bulutli texnologiyalar va raqamli to'lov tizimlari kabi infratuzilma elementlari moliyaviy inklyuziya, kichik va o'rta biznesni rivojlantirish, hamda asosiy sohalarda unumdorlikni oshirish vositasi sifatida ko'rib chiqiladi. Maqolada nazariy va empirik tahlil asosida O'zbekistonda raqamli infratuzilmani joriy etish jarayonida yuzaga keladigan imkoniyatlar va muammolar tahlil qilinib, ushbu rivojlanishdan inklyuziv va barqaror iqtisodiy taraqqiyot uchun foydalanish bo'yicha siyosiy tavsiyalar ilgari suriladi.



Kalit soʻzlar: raqamli infratuzilma, iqtisodiy oʻsish, innovatsiya, barqaror rivojlanish, moliyaviy inklyuziya, ulanish imkoniyati, bulutli texnologiyalar, keng polosali internet, raqamli transformatsiya.

Introduction

In the contemporary global economy, digital infrastructure has emerged as a foundational pillar for economic growth, innovation, and competitiveness. As nations continue to navigate the complexities of the digital era, the establishment of robust digital infrastructure is no longer viewed as a supplementary element but rather as a strategic necessity for sustainable development. Digital infrastructure encompasses a broad range of technologies and systems, including high-speed internet connectivity, data storage centers, cloud computing platforms, and digital financial services. These components collectively enable efficient communication, secure data exchange, and real-time access to global information flows, thereby facilitating economic activity across various sectors.

In Uzbekistan, the shift toward a digital economy has gained considerable momentum in recent years, underpinned by national development strategies aimed at diversifying the economy, modernizing financial institutions, and enhancing the quality of public services. The government's "Digital Uzbekistan – 2030" initiative outlines a clear roadmap for integrating advanced digital technologies into the country's economic and social structures. A central theme of this initiative is the expansion and modernization of digital infrastructure to bridge the urban-rural digital divide and ensure equitable access to information and services for all citizens. As a landlocked country undergoing rapid economic transition, Uzbekistan recognizes that digital connectivity can mitigate geographic constraints and unlock new opportunities for trade, education, and entrepreneurship.

One of the key arguments supporting the prioritization of digital infrastructure is its strong correlation with productivity growth and innovation. Access to reliable internet services allows businesses to automate operations, optimize supply chains, and tap into new markets through e-commerce platforms. It also empowers small and medium-sized enterprises (SMEs), which form the backbone of Uzbekistan's private sector, by enabling them to reach customers, process



payments, and manage logistics through digital means. Moreover, improved digital infrastructure facilitates the implementation of e-government services, which enhance transparency, reduce bureaucracy, and improve citizen engagement in governance.

Furthermore, digital financial infrastructure, including mobile banking, e-wallets, and fintech platforms, plays a critical role in promoting financial inclusion. In Uzbekistan, where a significant portion of the population remains unbanked or underbanked, digital solutions offer a viable pathway to integrate individuals into the formal financial system. This, in turn, stimulates consumption, investment, and savings—core drivers of economic growth. In rural and remote areas, digital connectivity can also support the delivery of telemedicine and e-learning services, thereby contributing to broader social development goals.

Despite the evident benefits, the development of digital infrastructure in Uzbekistan is not without challenges. Issues such as limited broadband penetration in remote regions, cybersecurity risks, and the high cost of technological imports present obstacles to rapid progress. Additionally, a shortage of skilled human capital capable of maintaining and expanding digital systems remains a barrier to full-scale implementation. Addressing these challenges requires coordinated efforts between government agencies, private investors, educational institutions, and international development partners.

In light of these considerations, this article seeks to explore the multidimensional role of digital infrastructure in fostering sustainable economic growth in Uzbekistan. It draws upon relevant literature, policy documents, and empirical data to analyze the current state of digital infrastructure and its economic implications. The study also examines best practices from other countries and assesses their relevance to Uzbekistan's unique socio-economic context. By identifying key enablers and constraints, the paper aims to provide actionable insights for policymakers, business leaders, and academic researchers interested in advancing the digital transformation of the Uzbek economy.

Literature review

The nexus between digital infrastructure and economic growth has been extensively examined in recent academic and policy-oriented literature.



Numerous studies emphasize that investments in digital infrastructure not only increase productivity but also serve as a catalyst for structural transformation in developing economies. According to the World Bank, a 10 percent increase in broadband penetration can lead to a 1.38 percent increase in GDP growth in low- and middle-income countries. This statistic underscores the powerful macroeconomic effects of digital connectivity.

Several researchers argue that digital infrastructure reduces transaction costs, facilitates knowledge sharing, and supports innovation ecosystems. For instance, Brynjolfsson and McAfee (2014) suggest that digital technologies reshape the dynamics of labor markets and business models, leading to more agile and resilient economies. In the context of developing nations, James (2020) highlights that digital infrastructure can act as a leapfrogging mechanism, allowing countries to bypass traditional industrial stages and directly integrate into the digital economy.

In Uzbekistan-specific studies, digital infrastructure is frequently linked to the broader agenda of modernization and financial inclusion. Reports from the Asian Development Bank and UNDP Uzbekistan stress the importance of closing the digital divide to achieve equitable growth. The “Digital Uzbekistan – 2030” strategy is also widely cited as a policy framework that recognizes digital infrastructure as a tool for both economic efficiency and social empowerment. While progress has been noted in the development of e-government services and digital payments, scholarly work also points to persistent gaps in regional connectivity and digital literacy.

Another recurring theme in the literature is the role of public-private partnerships (PPPs) in scaling digital infrastructure. International experiences from countries like South Korea and Estonia illustrate that targeted investment and regulatory reforms can create enabling environments for rapid digital adoption. However, scholars such as Mansell and Steinmueller (2021) caution that digital development must be accompanied by strong governance frameworks to ensure inclusivity and protect user rights.

Overall, the literature provides a strong theoretical and empirical basis for understanding the transformative potential of digital infrastructure. It also highlights the complex interplay between technology, policy, and human capital



that determines the effectiveness of digital strategies in achieving sustainable economic outcomes.

Methodology

This study employs a qualitative research methodology based on document analysis and secondary data sources to assess the relationship between digital infrastructure and sustainable economic growth in Uzbekistan. The research relies on publicly available government reports, international development agency publications, academic articles, and statistical databases to analyze trends and developments in digital infrastructure deployment.

A case study approach was adopted to examine Uzbekistan within the broader context of digital economic transformation in developing countries. This method allows for an in-depth exploration of the policies, institutional arrangements, and infrastructure investments shaping the country's digital ecosystem. By comparing Uzbekistan's progress with international benchmarks, the study identifies both unique national features and universal patterns.

The document analysis includes a review of strategic programs such as "Digital Uzbekistan – 2030", as well as economic indicators from the State Committee on Statistics of the Republic of Uzbekistan. It also integrates insights from the World Bank, the International Telecommunication Union (ITU), and the Asian Development Bank regarding regional connectivity, broadband penetration, and ICT development indices.

Furthermore, the research synthesizes findings from peer-reviewed journals focusing on digital infrastructure's role in innovation, productivity, and inclusive development. The study categorizes the data into thematic areas including connectivity, financial inclusion, economic diversification, and education, in order to identify how digital infrastructure contributes to each domain.

Although quantitative methods such as econometric modeling are valuable for measuring causal effects, this study prioritizes qualitative insights to capture the structural, policy, and social dimensions of the digital economy. This approach enables the formulation of comprehensive policy recommendations relevant to Uzbekistan's development trajectory and institutional capabilities.



Results

The findings of this study indicate that Uzbekistan has made significant progress in laying the foundation for digital infrastructure, though disparities in access and quality remain evident across regions. One of the most notable achievements is the expansion of broadband internet services. According to recent data from the Ministry of Digital Technologies, over 80 percent of urban areas now have access to high-speed internet, while rural coverage has also improved due to satellite and mobile internet initiatives. However, there remains a digital gap, with some remote regions lacking consistent service or infrastructure to support modern digital applications.

The deployment of fiber-optic networks has increased in recent years, particularly in the capital city and major economic hubs. This has supported the development of cloud services, data storage facilities, and e-commerce platforms. The rise in the number of registered online businesses and digital payment users further indicates growing engagement with digital services. For instance, from 2020 to 2023, the number of users of mobile payment applications such as Click and Payme increased by over 150 percent, according to the Central Bank of Uzbekistan.

Another key area of progress is the enhancement of digital public services. The introduction of the Single Interactive State Services Portal (my.gov.uz) has improved government-to-citizen interactions by digitizing processes such as tax payments, license applications, and utility bill settlements. Over 200 types of services are now available online, reducing paperwork and administrative burden for both citizens and state agencies.

In the financial sector, the implementation of fintech solutions has expanded access to banking services. The number of digital wallets and online banking users has increased steadily, contributing to the formalization of economic activity and improved financial inclusion, especially among youth and entrepreneurs. The role of digital credit services and microloans has also grown, allowing small business owners to access financing without the need for collateral or physical presence in banks.

Despite these gains, several challenges remain. Internet speed and affordability continue to lag behind international standards. Uzbekistan ranks in the lower half



of the ITU's Global ICT Development Index, reflecting limitations in technological infrastructure and digital skills. Additionally, many SMEs cite high costs of IT equipment and a shortage of qualified personnel as obstacles to full digital integration. Cybersecurity infrastructure also remains underdeveloped, with rising concerns about data privacy and protection.

The study further reveals a strong correlation between digital infrastructure investments and sectoral productivity. Industries such as agriculture, logistics, and education have benefited from increased access to real-time data, remote monitoring systems, and digital communication platforms. E-learning, for example, has seen substantial adoption in both secondary and higher education, especially during the COVID-19 pandemic, demonstrating the resilience enabled by digital tools.

Overall, the results confirm that digital infrastructure is playing an increasingly vital role in supporting economic modernization, service delivery, and business development in Uzbekistan. However, continued investment, inclusive policies, and skill development initiatives are required to ensure equitable access and long-term sustainability.

Discussion

The findings of this study affirm the growing role of digital infrastructure as a cornerstone of economic growth in Uzbekistan, yet they also highlight the complexities involved in building an inclusive and sustainable digital ecosystem. While the country has taken substantial steps toward improving broadband access and digitizing public services, the uneven distribution of these advancements raises concerns about digital inequality. Urban areas continue to benefit more rapidly than rural regions, reinforcing existing socio-economic disparities and limiting the transformative potential of digital infrastructure for the entire population.

One of the key observations is the strong relationship between digital connectivity and increased productivity, particularly in SMEs and emerging sectors like fintech and e-commerce. The ability of small businesses to access broader markets, streamline transactions, and engage with customers via online platforms has led to higher operational efficiency and reduced costs. However, without



adequate digital literacy and affordable internet, many businesses—especially in peripheral regions—remain excluded from these benefits. This indicates that the infrastructure itself must be accompanied by complementary policies in education and digital capacity building.

The success of government-led initiatives, such as my.gov.uz and the expansion of e-payment systems, demonstrates the value of top-down digital strategies. However, the sustainability of these efforts depends on their adaptability to local needs and ongoing user engagement. Citizens require not only access to digital tools but also confidence in their reliability, security, and ease of use. In this regard, concerns around cybersecurity and data protection must be addressed more proactively through legislation, institutional capacity building, and public awareness campaigns.

From a financial inclusion perspective, the rapid growth in digital payment and microfinance platforms is a positive development, particularly for underserved groups such as youth, women, and informal entrepreneurs. Nevertheless, barriers persist in terms of regulatory complexity, limited integration between digital services, and inadequate user protections. To fully realize the benefits of digital financial infrastructure, reforms are needed to create a more cohesive and transparent ecosystem where innovation is encouraged without compromising consumer rights.

Moreover, the long-term impact of digital infrastructure on economic resilience deserves further attention. The COVID-19 pandemic served as a test case, showing that digitally connected economies are better equipped to maintain continuity of education, commerce, and governance during crises. Uzbekistan's increased use of online education and virtual meetings during lockdown periods underscores the strategic importance of digital readiness in times of disruption. As such, future investments in infrastructure should prioritize not only expansion but also adaptability and security.

The international experience offers valuable lessons for Uzbekistan. Countries like Estonia, Singapore, and South Korea have demonstrated that coordinated efforts in infrastructure development, regulatory reform, and education yield substantial returns in digital transformation. Uzbekistan can adapt these models while considering its own socio-economic characteristics and regional constraints.



For example, public-private partnerships could be expanded to accelerate fiber-optic deployment in underserved areas, while local tech startups could be supported through grants, tax incentives, and digital incubators.

Finally, a key insight from the discussion is that digital infrastructure should not be viewed solely as a technical investment but as a multidimensional driver of human development. Its intersection with education, health, finance, and governance makes it a unique tool for reducing poverty and enhancing social inclusion. A holistic approach—combining technology, policy, and people—is essential to transform digital infrastructure from an enabler of growth into a foundation of long-term sustainability and shared prosperity in Uzbekistan.

Main Part

The central focus of this study is the role of digital infrastructure in fostering sustainable economic growth, particularly in the context of Uzbekistan's national development strategy. Digital infrastructure refers not only to physical assets such as broadband cables, data centers, and network towers, but also to the services, platforms, and policies that allow citizens, businesses, and institutions to function efficiently in a digital environment. Its development is essential for integrating various sectors into a modern, innovation-driven economy.

One of the most direct impacts of digital infrastructure is observed in the improvement of communication and operational efficiency across industries. Businesses are increasingly relying on cloud-based systems, enterprise resource planning tools, and digital platforms for customer relationship management. In Uzbekistan, the introduction of digital logistics and tracking systems has improved transparency and reduced delays in transportation and delivery services, contributing to increased trust in local supply chains.

In the agricultural sector, digital technologies are being used for remote monitoring of crops, precision irrigation, and access to market prices via mobile platforms. These innovations reduce resource waste and increase productivity, which is critical in a country where agriculture accounts for a significant share of employment and GDP. Moreover, platforms that connect farmers directly to buyers reduce dependency on intermediaries and enable fairer pricing models.



Education is another sector benefiting from digital infrastructure. E-learning platforms and digital classrooms have emerged as key tools for expanding educational access, especially in rural areas where schools may lack qualified teachers or physical resources. During the pandemic, the Ministry of Public Education in Uzbekistan accelerated the deployment of online education tools, highlighting the importance of infrastructure in maintaining continuity of learning. The financial sector has experienced profound transformation through the integration of digital services. The adoption of digital wallets, contactless payments, and online banking has made financial transactions faster, safer, and more convenient. This transformation is particularly impactful in Uzbekistan, where traditional banking services have historically been concentrated in urban areas. By enabling remote access to savings, credit, and insurance products, digital financial services are promoting greater economic participation and resilience.

Furthermore, digital infrastructure enables governments to improve public service delivery. Through e-government portals, citizens can apply for documents, pay taxes, and access information without needing to physically visit administrative offices. This not only enhances administrative efficiency but also reduces corruption and bureaucratic delays. Transparency and accountability are further improved when public procurement, budget allocations, and legal frameworks are made accessible online.

Despite these advantages, the effectiveness of digital infrastructure depends heavily on complementary factors such as regulatory frameworks, digital skills, and public awareness. For example, data privacy laws, cyber protection regulations, and open data policies are necessary to ensure trust and compliance in digital interactions. In addition, training programs aimed at improving digital literacy across all age groups are crucial for maximizing the benefits of infrastructure investments.

Finally, the economic implications of digital infrastructure are closely tied to long-term planning and governance. Infrastructure planning must account for future demand, technological changes, and environmental sustainability. In Uzbekistan, the strategic allocation of resources to high-impact areas such as rural connectivity, local tech entrepreneurship, and green data centers could generate



substantial returns. By aligning digital investments with national economic priorities, the government can lay the foundation for a resilient and inclusive growth model that leverages the full potential of digital transformation.

Conclusion

The development of digital infrastructure stands as a key pillar for sustainable economic growth in the 21st century, particularly for countries like Uzbekistan that are undergoing rapid structural transformation. This study has shown that while Uzbekistan has made notable progress in expanding digital connectivity, enabling online financial services, and promoting e-government initiatives, several gaps remain that hinder the full realization of its digital potential. Bridging the urban-rural divide in broadband access, improving digital literacy, and strengthening cybersecurity frameworks are among the critical steps required to build an inclusive digital economy.

The findings underscore the multifaceted nature of digital infrastructure, which influences not only business efficiency and innovation but also social equity and public service delivery. Improved internet access contributes to SME development, expands educational and health services to underserved regions, and enhances transparency in governance. These outcomes contribute directly to poverty reduction, human capital development, and economic diversification—objectives that align with Uzbekistan’s long-term national development goals.

One of the major insights from this research is the importance of a comprehensive and well-coordinated policy framework that supports digital transformation. Isolated infrastructure investments without regulatory support, human capital development, and public engagement will not yield the desired outcomes. Policymakers must adopt an integrated approach that includes public-private partnerships, incentives for innovation, and reforms in education systems to produce a digitally competent workforce. Strategic collaboration with international development organizations can also provide technical expertise, funding, and global best practices to accelerate progress.

Furthermore, the long-term sustainability of digital infrastructure depends on its adaptability and resilience. With the rise of artificial intelligence, big data, and 5G technology, digital ecosystems will continue to evolve rapidly. Uzbekistan



must therefore prioritize future-ready investments that are scalable and environmentally sustainable. For instance, investments in energy-efficient data centers, smart grid systems, and green technologies can align digital growth with climate action and sustainable development.

Finally, the success of digital infrastructure initiatives should not be measured solely in technological terms but by their impact on people's lives. Access to digital tools must empower individuals, enhance opportunities, and foster inclusive growth. To that end, promoting digital citizenship, ethical data use, and equitable access are essential dimensions of a people-centered digital economy. Uzbekistan stands at a promising crossroads where digital infrastructure can serve as both an enabler and a multiplier of economic development. With the right vision and commitment, it can transform connectivity into a powerful engine of national progress.

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